Energy & Sustainability Report

Cardiff Peninsula, Plot 1

Orion Land & Leisure

25 June 2024

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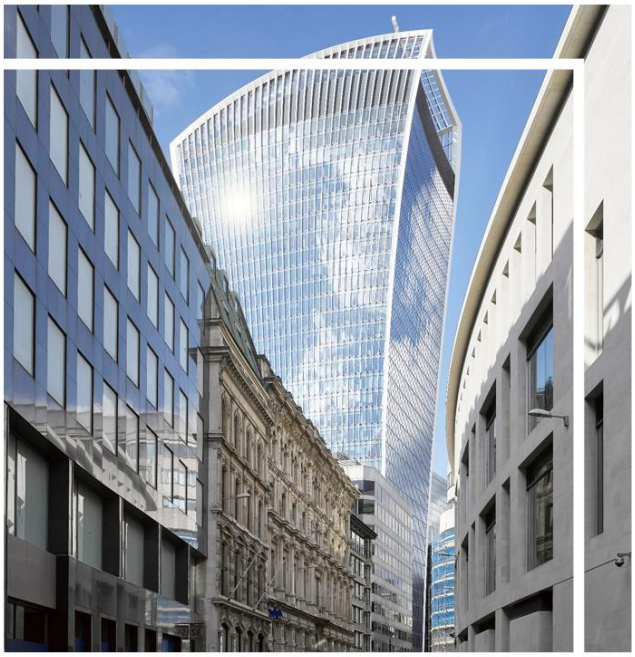
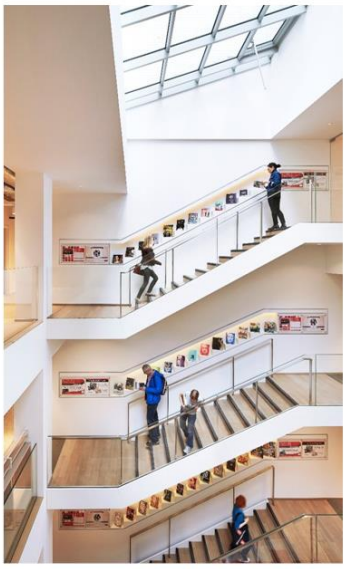
Issue P02





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We have sought to ensure that this document is accessible for all users. Should you have any comments on how we can improve accessibility of our documents please do let us know. We are happy to provide this report in a HTML format should this be required.

Contents

1. Introduction

Hilson Moran has been instructed by Orion Land and Leisure Ltd to provide an Energy and Sustainability statement for Plot 1 at Plot 1, Cardiff Peninsula, Cardiff, hereafter referred to as the 'Proposed Development' or 'Application Site'. The Application Site is located in the administrative area of Cardiff City Council (CCC) (National Grid Reference 318500 172500), as identified in **Figure 1.1**.

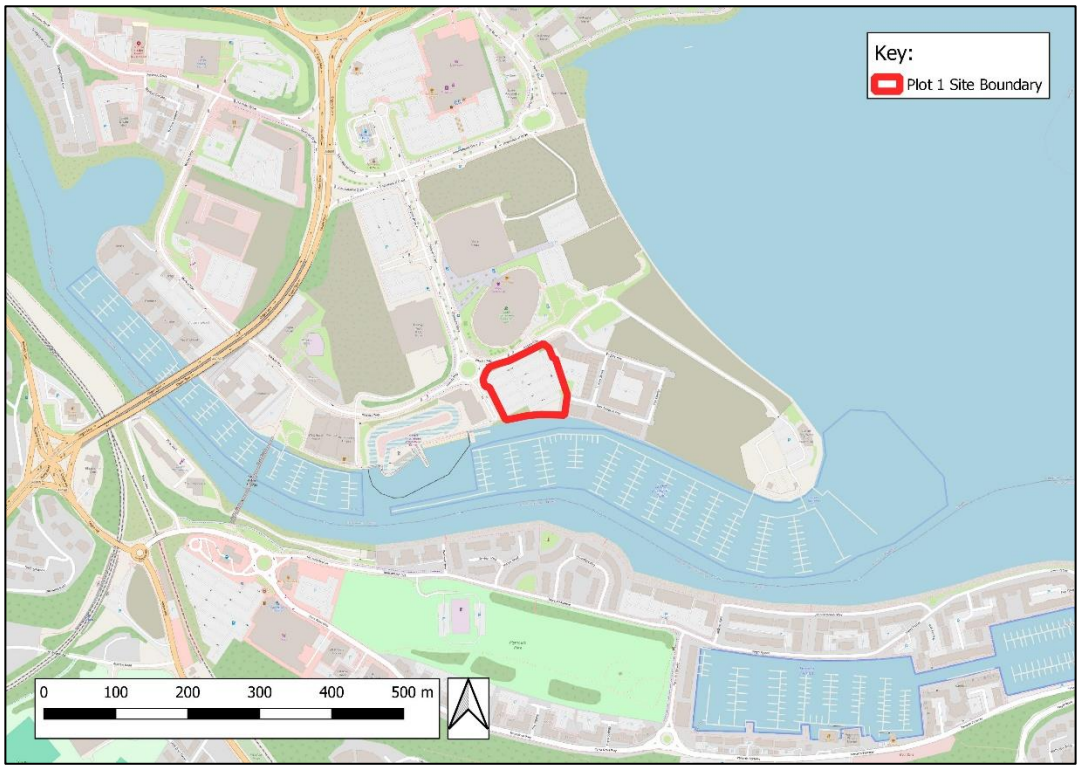

Figure 1.1 Site Boundary (OpenStreetMap 2024)

1.1. Proposed Development

The proposals comprise of the following:

'Senior living accommodation with associated car parking, cycle parking, and landscaping.'

1.2. Purpose of Report

This report highlights the direction of the Energy and Sustainability strategy of the RIBA stage 3 and sets guidelines and projections for upcoming stages. It is constructed in line with the goals of the development to deliver an

environmentally and socially cantered developed, by incorporating the industry's best practices.

The Energy and Sustainability statement provides a summary of how the proposed development is responding to key sustainability policies, relating to:

- Energy and Carbon;
- Climate change;
- Social value; and,
- Environmental sustainability.

In line with Cardiff City Council (CCC), an energy assessment has been undertaken to demonstrate best practice in reducing energy demand, optimising energy use as a resource and implementing new renewable energy technologies onsite. The Statement aims to identify opportunities for the proposed development to increase energy efficiency through site layout, building design and energy supply. The purpose of this document is also to report on the process and design route of the Energy Strategy for the Proposed Development and to present energy efficiency and CO_2 emissions reduction targets and opportunities.

The statement will highlight how Plot 1 has built in flexibility to respond to the anticipated regulatory changes that will occur related to national policies and local planning policies, as well as technology advancements and changes in consumer needs.

2. Legislation, Policy & Guidance

This section outlines the key national, regional, and local regulatory and planning policy context related to energy and sustainability that should be considered within the design of the proposed development.

2.1. Legislation

2.1.1. Climate Change Act 2008

In June 2019, the Climate Change Act (2008)[1] has been amended to mandate that "the net UK carbon account for the year 2050 is at least 100% lower than 1990 baseline."

The Act outlines the requirements and framework to help the UK tackle and respond to climate change, as recommended by the Committee on Climate Change. The carbon budgets, under the Act, are legally binding and intended to act as steppingstones towards the net zero target by 2050.

2.1.2. Net Zero Strategy: Build Back Greener (October 2021)

The Governments Net Zero Strategy[2] has set out a strategy, with supporting policies, for the decarbonisation of all sectors of the UK economy to meet the net zero target by 2050. It outlines a 10-point plan for a green industrial revolution laying out the foundations for a green economic recovery from the COVID-19 pandemic and positioning the UK at the forefront of the growing green economy. The key energy policies relevant to this statement include:

- "By 2035, the UK will be powered entirely by client electricity, subject to security to supply;
- An ambition that by 2035, no new gas boilers will be sold.
- A new £60 million Heat Pump Ready programme that will provide funding for pioneering heat pump technologies and will support the government's target of 600,000 installations a year by 2028.
- Further funding of £620 million for zero emission vehicle grants and EV Infrastructure, including further funding for local EV Infrastructure, with a focus on local on street residential charging."

The Net Zero Strategy highly relies on the widespread of low carbon and renewable technologies, such as heat pumps and solar PVs, and their integration with the built environment. The electrification of heating and transportation is key element of this strategy that should be considered in the Proposed Development proposals brought forward.

2.1.3. Building Regulations Part L 2022

The Building Regulations 2010 Approved Documents Part L Conservation of Fuel and Power (2022 edition incorporating 2024 amendments, for use in Wales) outlines the minimum energy and carbon dioxide emissions performance standards for all elements of the built environment along with assessment methodologies necessary to meet compliance within new developments.

In 2022, the Building Regulations was revised to help UK delivery net zero. The new Approved Documents for Part L now include Volumes 1 (dwellings) and 2 (buildings other than dwellings). The documents set out new limiting U-Values for improved fabric performance and introduced design submissions as well as built submissions. Volume 1 and Volume 2 specifications set a provision for new buildings to produce 27% less CO2 compared to the 2014 Part L standards. Incentives were placed for new heat networks to be low carbon and limiting fabric standards for thermal elements such as walls, floors, roofs, and windows were tightened. The minimum standards for building services have been uplifted for new and existing non-domestic buildings and are now included in the approved document instead of the non-domestic building services compliance guide (NDBSCG).

The Approved Documents Volume 1 and Volume 2 came into effect on the 23 November 2022 and 29 March 2023, respectively, for use in Wales. It does not apply to work subject to a building notice, full plans application or initial notice submitted before the aforementioned dates, provided the work for each building is started before the aforementioned dates and it does not apply to sites where a building notice, initial notice or full plans application were submitted before 31 July 2014 and building work commenced before 31 July 2015. Therefore, transitional arrangements do not apply to this scheme and the Proposed Development should comply with Part L 2022.

2.2. Local Regulation

The following key policies and documents for Cardiff Council have been reviewed in detail in the context of the scheme, to identify and target compliance with relevant requirements to inform the viable sustainability design features and opportunity across all measures of the Proposed Development.

2.2.1. Future Wales: The National Plan 2040[3]

Policy 1 – Where Wales will grow

"The Welsh Government supports sustainable growth in all parts of Wales. In three National Growth Areas there will be growth in employment and housing opportunities and investment in infrastructure. The National Growth Areas are: • Cardiff, Newport and the Valleys…"

Policy 2 – Shaping Urban Growth and Regeneration – Strategic Placemaking

"The growth and regeneration of towns and cities should positively contribute towards building sustainable places that support active and healthy lives, with urban neighbourhoods that are compact and walkable, organised around mixed-use centres and public transport, and integrated with green infrastructure. Urban growth and regeneration should be based on the following strategic placemaking principles:

- *creating a rich mix of uses;*
- *providing a variety of housing types and tenures…"*

Policy 7 – Delivering Affordable Homes

"The Welsh Government will increase delivery of affordable homes by ensuring that funding for these homes is effectively allocated and utilised……"

Policy 8 – Flooding

"Flood risk management that enables and supports sustainable strategic growth and regeneration in National and Regional Growth Areas will be supported."

Policy 9 – Resilient Ecological Networks and Green Infrastructure

"To ensure the enhancement of biodiversity, the resilience of ecosystems and the provision of green infrastructure, the Welsh Government will work with key partner to:

- *identify areas which should be safeguarded and created as ecological networks for their importance for adaptation to climate change, for habitat protection, restoration or creation, to protect species, or which provide key ecosystems services, to ensure they are not unduly compromised by future development…"*

Policy 12 – Regional Connectivity

"The Welsh Government will support and invest in improving regional connectivity. In urban areas, to support sustainable growth and regeneration, our priorities are improving and integrating active travel and public transport".

"Active travel must be an essential and integral component of all new developments, large and small".

"Where car parking is provided for new non-residential development, planning authorities should seek a minimum of 10% of car parking spaces to have electric vehicle charging points."

Policy 13 – Supporting Digital Communications

"New developments should include the provision of Gigabit capable broadband infrastructure from the outset."

Policy 16 – Heat Networks

"Within Priority Areas for District Heat Networks planning authorities should identify opportunities for District Heat Networks and plan positively for their implementation.

Large scale mixed-use development should, where feasible, have a heat network with a renewable / low carbon or waste heat energy source. Planning applications for such development should prepare an Energy Masterplan to establish whether a heat network is the most effective energy supply option and, for feasible projects, a plan for its implementation."

"Our spatial priority is for the suitability and viability of District Heat Networks to be investigated in the towns and cities identified as Priority Areas for District Heat Networks"

"As a minimum, proposals for large-scale, mixed-use developments of 100 or more dwellings or 10,000sqm or more of commercial floorspace should consider the potential for a heat network. However there is also potential for heat networks below this threshold and developers and planning authorities should explore these opportunities wherever possible."

"The design of new development should maximise the opportunities to accommodate a heat network. Particular consideration should be given to the form, density, mix of uses and phasing of development."

Policy 17 – Renewable and Low Carbon Energy and Associated Infrastructure

"The Welsh Government strongly supports the principle of developing renewable and low carbon energy from all technologies and at all scales to meet our future energy needs."

Policy 33 – National Growth Area – Cardiff, Newport and the Valleys

"Cardiff, Newport and the Valleys will be the main focus for growth and investment in the South East region."

"Cardiff will remain the primary settlement in the region, its future strategic growth shaped by its strong housing and employment markets and it will retain its capital city role, accommodating higher level functions and attractions. Strategic and Local Development Plans will need to consider the interdependence of Cardiff and the wider region. Cardiff relies on people from across the full region and ensuring communities around the Capital are vibrant, prosperous and connected helps to maximise the strength of the region."

Policy 36 – South East Metro

"Strategic and Local Development Plans must support the South East Metro. Planning authorities should plan growth and regeneration to maximise the opportunities arising from better regional connectivity, including identifying opportunities for higher density, mixed-use and car-free development around new and improved metro stations."

2.2.2. Cardiff Local Development plan 2006-2026[4]

KP1: LEVEL OF GROWTH

"The Plan makes provision for 45,415 new dwellings (including a 4,000 dwelling flexibility allowance) to deliver a housing requirement of 41,415 new dwellings and 40,000 new jobs in Cardiff between 2006-2026."

KP5: GOOD QUALITY AND SUSTAINABLE DESIGN

"To help support the development of Cardiff as a world-class European Capital City, all new development will be required to be of a high quality, sustainable design and make a positive contribution to the creation of distinctive communities, places and spaces….."

KP6: NEW INFRASTRUCTURE

"New development will make appropriate provision for, or contribute towards, all essential, enabling and necessary infrastructure required as a consequence of the development in accordance with Planning Policy Guidance."

KP7: PLANNING OBLIGATIONS

"Planning obligations will be sought to mitigate any impacts directly related to the development and will be assessed on a case by case basis in line with Planning Policy Guidance."

KP8: SUSTAINABLE TRANSPORT

"Development in Cardiff will be integrated with transport infrastructure and services…

iii. Enable and maximise use of sustainable and active modes of transport;

iv. Integrate travel modes;

v. Provide for people with particular access and mobility requirements;…."

KP12: WASTE

"Waste arisings from Cardiff will be managed by:

iii. Supporting the provision and maintenance of sustainable waste management storage and collection arrangements in all appropriate new developments;…"

KP13: RESPONDING TO EVIDENCED SOCIAL NEEDS

"A key part of the successful progression of the city will be to develop sustainable neighbourhoods, tackle deprivation, and improve the quality of life for all. This will be achieved through:

i. Providing a range of dwelling sizes, types and affordability including seeking to provide a target of 6,646 affordable dwellings over the remaining 12 years of Plan period;

iii. Encouraging the provision of a full range of social, health, leisure and education facilities and community infrastructure for both existing and new communities that are accessible to all by walking and cycling and public transport;"

KP14: HEALTHY LIVING

"Cardiff will be made a healthier place to live by seeking to reduce health inequalities through encouraging healthy lifestyles, addressing the social determinants of health and providing accessible health care facilities. This will be achieved by supporting developments which provide for active travel, accessible and useable green spaces, including allotments."

KP15: CLIMATE CHANGE

"To mitigate against the effects of climate change and adapt to its impacts,

development proposals should take into account the following factors:

i. Reducing carbon emissions;

ii. Protecting and increasing carbon sinks;

iii. Adapting to the implications of climate change at both a strategic and

detailed design level;

iv. Promoting energy efficiency and increasing the supply renewable energy; and

v. Avoiding areas susceptible to flood risk in the first instance in accordance with the sequential approach set out in national guidance; and vi. Preventing development that increases flood risk."

KP16: GREEN INFRASTRUCTURE

"Cardiff's distinctive natural heritage provides a network of green infrastructure which will be protected, enhanced and managed to ensure the integrity and connectivity of this multi-functional green resource is maintained. Protection and conservation of natural heritage network needs to be reconciled with the benefits of development. Proposed development should therefore demonstrate how green infrastructure has been considered and integrated into the proposals. If development results in overall lo ss of green infrastructure, appropriate compensation will be required."

KP18: NATURAL RESOURCES

"In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city's natural resources and minimise pollution, in particular the following elements:

i. Protecting the best and most versatile agricultural land;

ii. Protecting the quality and quantity of water resources, including underground surface and coastal waters; iii. Minimising air pollution from industrial, domestic and road transportation sources and managing air quality; and

iv. Remediating land contamination through the redevelopment of contaminated sites."

H3: AFFORDABLE HOUSING

"The Council will seek 20% affordable housing on Brownfield sites and 30% affordable housing on Greenfield sites in all residential proposals that: i. Contain 5 or more dwellings; or …."

H6: CHANGE OF USE OR REDEVELOPMENT TO RESIDENTIAL USE

"Change of use of redundant premises or redevelopment of redundant previously developed land for residential use will be permitted where: i. There is no overriding need to retain the existing use of the land or premises and no overriding alternative local land use requirement; ii. The resulting residential accommodation and amenity will be satisfactory;…"

EN6: ECOLOGICAL NETWORKS AND FEATURES OF IMPORTANCE FOR BIODIVERSITY

"Development will only be permitted if it does not cause unacceptable harm to: i. Landscape features of importance for wild flora and fauna, including wildlife corridors and 'stepping stones' which enable the dispersal and functioning of protected and priority species; ii. Networks of importance for landscape or nature conservation."

EN7: PRIORITY HABITATS AND SPECIES

"Development proposals that would have a significant adverse effect on the continued viability of habitats and species which are legally protected or which are identified as priorities in the UK or Local Biodiversity Action Plan will only be permitted where:

i. The need for development outweighs the nature conservation importance of the site;

ii. The developer demonstrates that there is no satisfactory alternative location for the development which avoids nature conservation impacts; and

iii. Effective mitigation measures are provided by the developer."

EN8: TREES, WOODLANDS AND HEDGEROWS

"Development will not be permitted that would cause unacceptable harm to trees, woodlands and hedgerows of significant public amenity, natural or cultural heritage value, or that contribute significantly to mitigating the effects of climate change."

EN10: WATER SENSITIVE DESIGN

"Development should apply water sensitive urban design solutions (the process of integrating water cycle management with the built environment through planning and urban design)."

EN11: PROTECTION OF WATER RESOURCES

"Development will not be permitted that would cause unacceptable harm to the quality or quantity of underground, surface or coastal waters."

EN12: RENEWABLE ENERGY AND LOW CARBON TECHNOLOGIES

"Development proposals are required to maximise the potential for renewable energy.

The Council will encourage developers of major and strategic sites to incorporate schemes which generate energy from renewable and low carbon technologies. This includes opportunities to minimise carbon emissions associated with the heating, cooling and power systems for new development. An independent energy assessment investigating the financial viability and technical feasibility of incorporating such schemes will be required to support applications."

EN13: AIR, NOISE, LIGHT POLLUTION AND LAND CONTAMINATION

"Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation, landscape or built heritage importance because of air, noise, light pollution or the presence of unacceptable levels of land contamination."

EN14: FLOOD RISK

"Development will not be permitted:

i. Within tidal or fluvial flood plains unless it can be demonstrated that the site is justified in line with national guidance and an appropriate detailed technical assessment has been undertaken to ensure that the development is designed to alleviate the threat and consequences of flooding over its lifetime;

ii. Where it would increase the risk of flooding from fluvial and/or tidal flooding or from additional run-off from the development in any location;

iii. Where it would hinder future maintenance or improvement schemes of flood defences and watercourses;

iv. Where it would cause adverse effects on the integrity of tidal or fluvial defences;

v. Where ground floor bedrooms are proposed in areas at high risk of flooding."

T1: WALKING AND CYCLING

"To enable people to access employment, essential services and community facilities by walking and cycling the Council will support developments which incorporate:

i. High quality, sustainable design which makes a positive contribution to the distinctiveness of communities and places;"

T5: MANAGING TRANSPORT IMPACTS

"Where necessary, safe and convenient provision will be sought in conjunction with development for:

i. Pedestrians, including people with prams and/or young children;

ii. Disabled people with mobility impairments and particular access needs;

iii. Cyclists;."

T6: IMPACT ON TRANSPORT NETWORKS AND SERVICES

"Development will not be permitted which would cause unacceptable harm to the safe and efficient operation of the highway, public transport and other movement networks including pedestrian and cycle routes, public rights of way and bridle routes."

C1: COMMUNITY FACILITIES

"Proposals for new and improved community facilities, health and religious facilities will be encouraged, subject to the following criteria being satisfied: i. The facility would be readily accessible to the local community it is intended to serve by public transport, walking and cycling;.."

C5: PROVISION FOR OPEN SPACE, OUTDOOR RECREATION, CHILDREN'S PLAY AND SPORT

"Provision for open space, outdoor recreation, children's play and sport will be sought in conjunction with all new residential developments."

C6: HEALTH

"Priority in new developments will be given to reducing health inequalities and encouraging healthy lifestyles…"

W2: PROVISION FOR WASTE MANAGEMENT FACILITIES IN DEVELOPMENT

"Where appropriate, provision will be sought in all new development for facilities for the storage, recycling and other management of waste."

2.2.3. Planning Policy Wales[5]

Chapter 3 Strategic and Spatial Choices

"3.7 Good design promotes environmental sustainability and contributes to the achievement of the well-being goals. Developments should seek to maximise energy efficiency and the efficient use of other resources (including land), maximise sustainable movement, minimise the use of non-renewable resources, encourage decarbonisation and prevent the generation of waste and pollution."

"3.19 The built and natural environment is a key determinant of health and well-being."

"3.23 Green infrastructure can be an effective means of enhancing health and well-being, through linking dwellings, workplaces and community facilities and providing high quality, accessible green spaces."

"3.31 The Environment (Wales) Act 2016 sets a legal target of reducing greenhouse gas emissions in Wales by at least 80% in 2050."

"3.34 The Environment (Wales) Act 2016 introduces the Sustainable Management of Natural Resources14 (SNMR) and sets out a framework to achieve this as part of decision-making. The objective of the SMNR is to maintain and enhance the resilience of ecosystems and the benefits they provide."

"3.51 Higher densities should be encouraged in urban centres and near major public transport nodes or interchanges, to generate a critical mass of people to support services such as public transport, local shops and schools."

"3.55 Previously developed (also referred to as brownfield) land should, wherever possible, be used in preference to greenfield sites where it is suitable for development."

"3.61 Adequate and efficient infrastructure, including services such as education and health facilities along with transport, water supply, sewers, sustainable waste management, electricity and gas (the utilities) and telecommunications, is crucial for economic, social and environmental sustainability."

Chapter 4 Active and Social Places

"4.0.3 This theme aims to ensure new development is located and designed in a way which minimises the need to travel, reduces dependency on the private car and enables sustainable access to employment, local services and community facilities."

"4.1.5 Development plans provide the main means for achieving integration between land use and transport planning."

"4.1.12 It is Welsh Government policy to require the use of a sustainable transport hierarchy in relation to new development, which prioritises walking, cycling and public transport ahead of private motor vehicles."

"4.1.31 Planning authorities must support active travel by ensuring new development is fully accessible by walking and cycling. The aim should be to create walkable neighbourhoods, where a range of facilities are within walking distance

of most residents, and the streets are safe, comfortable and enjoyable to walk and cycle."

"4.1.41 To encourage the use of Ultra Low Emission Vehicles (ULEVs), the planning system should encourage and support the provision of ULEV charging points as part of new development."

"4.1.47 The development plan must include appropriate traffic management policies."

"4.1.50 Car parking provision is a major influence on how people choose to travel and the pattern of development. Where and how cars are parked can in turn be a major factor in the quality of a place."

"4.1.57 Planning applications for developments, including changes of use, falling into the categories identified in TAN 18: Transport must be accompanied by a Transport Assessment."

"4.2.11 The supply of land to meet the housing requirement proposed in a development plan must be deliverable."

Chapter 5 Productive and Enterprising Places

"Affordable, secure electronic communications infrastructure is essential to people and businesses."

"5.3.1 The provision of sustainable transport infrastructure is essential in order to build prosperity, tackle the climate emergency, reduce airborne pollution and to improve the social, economic, environmental and cultural well-being of Wales."

"5.3.12 Development plans should include all proposals for new roads and major improvements to the primary road network over the plan period, and set out the broad policy on priorities for minor improvements."

"5.4.4 Wherever possible, planning authorities should encourage and support developments which generate economic prosperity and regeneration."

"5.4.15 Whilst employment and residential uses can be compatible planning authorities should have regard to the proximity and compatibility of proposed dwellings to existing industrial and commercial uses to ensure that both residential amenity and economic development opportunities are not unduly compromised."

"5.7.2 Overall power demand is expected to increase as a result of growing electrification of transport and heat. In order to ensure future demand can be met, significant investment will be needed in energy generation, transmission and

distribution infrastructure. The system will need to integrate renewable generation with storage and other flexibility services, in order to minimise the need for new generation and grid system reinforcement. Collectively we will need to concentrate on reducing emissions from fossil fuel sources, whilst driving further renewable generation which delivers value to Wales."

"5.7.7 The benefits of renewable and low carbon energy, as part of the overall commitment to tackle the climate emergency and increase energy security, is of paramount importance. The continued extraction of fossil fuels will hinder progress towards achieving overall commitments to tackling climate change…"

"5.7.10 Planning authorities should plan positively for grid infrastructure. Development plans should facilitate the grid infrastructure required to support the renewable and low carbon energy potential for the area, particularly areas identified for such development."

"5.7.13 Welsh Government planning policy recognises an energy hierarchy. …."

"5.7.14 The Welsh Government has set targets for the generation of renewable energy:

for Wales to generate 70% of its electricity consumption from renewable energy by 2030;…"

"5.8.1 The planning system should support new development that has very high energy performance, supports decarbonisation, tackles the causes of the climate emergency, and adapts to the current and future effects of climate change through the incorporation of effective mitigation and adaptation measures."

"5.8.3 Sustainable building design principles should be integral to the design of new development."

"5.9.2 To assist in the achievement of energy and decarbonisation targets, local and regional authorities must take an active, leadership approach at the local and/ or regional level by setting out their vision for decarbonisation and energy for their areas."

"5.11.4 Promoting the most appropriate material available should prevent the depletion of non-renewable resources and prevent waste arising."

"5.13.1 The planning system has an important role to play in facilitating sustainable waste management by providing a framework for decision making which recognises the social, economic and environmental benefits that can be realised from the management of waste as a resource to meet the needs of society and businesses, whilst at the same time:

- *minimising adverse environmental impacts and avoiding risks to human health;."*

"5.13.12 For all wastes, suitable locations for sustainable waste management development should be identified in development plans."

Chapter 6 Distinctive and Natural Places

"6.0.2 The special and unique characteristics and intrinsic qualities of the natural and built environment must be protected in their own right, for historic, scenic, aesthetic and nature conservation reasons."

"6.0.3 …Environmental components of places, such as clean air, access to open spaces and water quality, are linked to the quality of the built and natural environment."

"6.2.4 …The planning system must maximise its contribution to the protection and provision of green infrastructure assets and networks as part of meeting society's wider social and economic objectives and the needs of local communities."

"6.2.11 The quality of the built environment should be enhanced by integrating green infrastructure into development through appropriate site selection and use of creative design."

"6.2.12 A green infrastructure statement should be submitted with all planning applications."

"6.4.5 Planning authorities must seek to maintain and enhance biodiversity in the exercise of their functions. This means development should not cause any significant loss of habitats or populations of species."

"6.4.11 Planning authorities must follow a step- wise approach to maintain and enhance biodiversity, build resilient ecological networks and deliver net benefits for biodiversity by ensuring that any adverse environmental effects are firstly avoided, then minimized, mitigated, and as a last resort compensated for"

"6.6.5 The Welsh Government aims to secure the provision of water services whilst minimising adverse impacts on the environment, amenity, health and communities, in light of the consequences of climate change."

"6.6.8 New development should be located and implemented with sustainable provision of water services in mind, using design approaches and techniques which improve water efficiency…"

"6.6.15 Drainage authorities should plan strategically for sewerage and drainage systems in the same way as for water supply services"

"6.6.17 New developments152 of more than one dwelling or where the area covered by construction work equals or exceeds 100 square metres also require approval from the SuDS Approval Body (SAB) before construction can commence."

"6.6.27 Planning authorities should be aware of the risk of surface water flooding, usually caused by heavy rainfall, and ensure developments are designed and planned to minimise potential impacts."

"6.7.2 National air quality objectives are not 'safe' levels of air pollution156. Rather they represent a pragmatic threshold above which government considers the health risks associated with air pollution are unacceptable."

"6.7.4 The planning system should maximise its contribution to achieving the well-being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution alongside action to tackle high pollution hotspots."

2.3. Emerging Local Development Scheme

2.3.1. Cardiff Replacement Local Development Plan (RLDP) 2021 to 2036[6]

Cardiff is in the process of replacing the current Local Development Plan (LDP), with the expected timeline shared on their website, indicating the targeted deadlines for the submission, consultation and examination, leading to its adoption. Once adopted, the Replacement LDP will provide a policy framework for assessing planning applications, but its content will continue to be monitored and reviewed to ensure the Plan remains relevant and is working as intended.

2.4. Overheating Policy

2.4.1. Overheating: Approved Document O

In effect since 23 November 2022, the document supports Part O of Schedule 1 to the Building Regulations 2010, for use in Wales. The guidance covers new residential building under three categories: Dwelling, Institutional and other. The guidance includes the residential sections of mixed-use buildings and any corridors serving the residential units.

Part O provides requirements as the following:

1. Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to limit unwanted solar gains in summer and provide an adequate means to remove heat from the indoor environment.

2. In meeting the obligations in paragraph (1):

a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and

b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.

Compliance with Part O can be demonstrated using the Simplified Method or the Dynamic thermal modelling method. When dynamic thermal modelling is applied, a number of CIBSE's TM59 limits apply, including the limits on operable temperature, set-points to openable windows, openable window schedules, night-time temperature limits and safety guidance on floor level windows.

2.5. Industry Overheating Risk Guidance

2.5.1. CIBSE Guide A Thermal Comfort

Operative Temperature

The principal metric for thermal comfort in CIBSE Guide A Table 1.5 is operative temperature and is an expression of the temperature you experience or feel. For normal office conditions the operative temperature (to) can be expressed as a function of air temperature (ta), radiant temperature (tr) and air speed (v) as per the following formula:

$$t_o = \frac{t_a\sqrt{(10v)} + t_r}{1+\sqrt{(10v)}}$$

Predicted Mean Vote and Percentage People Dissatisfied

Predicted Mean Vote (PMV) and Percentage People Dissatisfied (PPD) are thermal comfort metrics calculated according to the methodology set out in ISO7730 (Ergonomics of the thermal environment).

PMV combines the influences of air temperature, mean radiant temperature, air speed and humidity with that of clothing and activity level into a 7-point thermal sensation scale ranging from -3 (Cold) to +3 (Hot) with zero being neutral/comfortable.

PPD reflects that people have different tolerances/preferences to their thermal environment and it will not normally be possible to satisfy everyone at the same time. Results will be scattered around the predicted mean value (i.e., PMV) and PPD looks at the probability that a person selected at random (from a hypothetical large group) is likely to be dissatisfied.

BREEAM and BCO (2014) now also refer to Predicted Mean Vote (PMV) and Percentage People Dissatisfied (PPD), these also need to be reported. Currently (under BREEAM 2014) there are no limits/criteria set for PMV/PPD but CIBSE Guide A, ISO 7730 and TM52 typically use a PMV±0.5 and PPD=<10% and therefore it is recommended that these values are targeted as sensible limits.

The BCO (2014) states: "An objective measure for thermal comfort can be defined in terms of minimum Percentage of People Dissatisfied (PPD) using ISO 7730. A predicted mean vote (PMV) of ±0.5 and PPD of no more than 10% should be achieved, and meeting these limits will ensure that occupants will remain comfortable even in more testing areas e.g., adjacent to a highly glazed facade."

2.5.2. CIBSE Guide TM59

In June 2017, CIBSE released a new guidance document TM59 entitled 'Design Methodology for the Assessment of Overheating Risk in Homes.'

The first criterion (Criterion A) relates to hours of exceedance, requiring that the operative temperature t_{max} is not exceeded by 1Kelvin for more than 3% of occupied hours during a typical non-heating season (1st May – 30th September). The second criterion (Criterion B) is derived from CIBSE Guide A and limits the number of hours exceeding 26°C in bedrooms at night.

TM59 incorporates input parameters for assessing overheating, including prescribed occupancy profiles, internal gains, and window-opening profiles. It requires overheating risk assessments to be based on 24-hour occupancy and urges designers to carry out noise and pollution assessments before assuming a building will be naturally ventilated.

The following TM59 assessment criteria are applied:

Table 2.1 Assessment criteria for naturally ventilated buildings.

	Assessment Criteria	Acceptable Deviation
Criterion A	Living rooms, kitchens, and bedrooms: Frequency of occupied hours when ΔT ≥ 1 Kelvin (K)	3% of occupied hours during May- September
Criterion B	Bedrooms only: Frequency of occupied hours when operative temperature ≥ 26 ◦C	1% of annual hours from 10 pm to 7am

ΔT is the difference between the operative temperature and the maximum acceptable operative temperature, therefore:

ΔT= Operative temperature – maximum acceptable comfortable temperature

Further mitigation measures: The baseline results are then assessed with additional mitigation measures that require operational occupant intervention or manual/ automatic control, namely internal Venetian blinds and MVHR purge ventilation.

Thermal modelling is carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling.

3. Energy & Carbon

3.1. Energy

This Energy and Sustainability statement is designed to align with the Cardiff Council objectives “To create sustainable neighbourhoods that form part of a sustainable city.” And “To deliver economic and social needs in a coordinated way that respects Cardiff’s environment and responds to the challenges of climate change.” As set in the current and replacement Cardiff local plans.

This chapter provides a summary of the expected process to be undertaken for the energy assessment, following the Planning Policy Wales (PPW) energy hierarchy, shown in **Figure 3.1**. Following the hierarchy should maximise the energy savings on site and maximise energy reduction and the associated carbon emissions. The Energy Hierarchy comprises of five parts and should be followed in order of priority.

Firstly, a development should be designed to reduce energy demand, this includes consideration of passive and active reduction measures. Secondly, it should consider approaches and technologies to efficiently utilise energy within the Proposed Development. It should then consider the implementation of low carbon and renewable technologies on-site. Smart energy technologies for monitoring and control should also be promoted to influence sustainable behaviours of occupants. The last two tiers of the energy hierarchy are accomplished through strategic system design and the selection of low-carbon energy sources throughout the Proposed Development, building upon the progress made in stages 1-3.

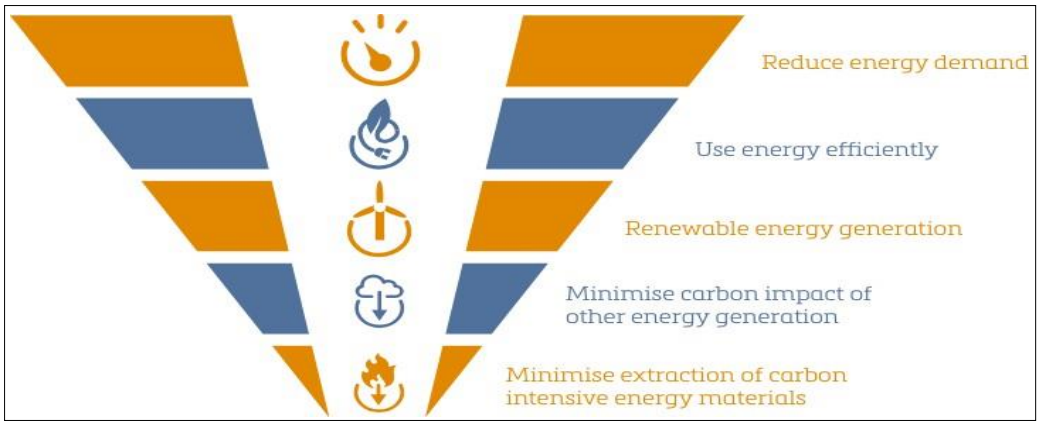

Figure 3.1 Planning Policy Wales Energy Hierarchy

3.2. Reduce Energy Demand (Passive Design Measures)

The first stage of the energy hierarchy assessment methodology is to incorporate high levels of passive and energy efficient design measures to reduce the development's energy consumption and associated CO2 emissions.Early-stage passive design considerations are as following:

- Pushing building beyond Part L 2021 fabric performance; and,
- Consideration for mixed mode systems and understanding air flow across the Proposed Development.

3.2.1. Building Fabric

A fabric first approach aims to drive thermal envelope performance values to go beyond the Part L:2022 Minimum standards. The following table building fabric targets, provides Part L notional values, and the proposed target that are recommended to align with the client and council vision and promote best practices and align with the target for ENE 01 Excellent for BREEAM and achieving beyond 10% better than Part L.

Table 3.1 Proposed Building Fabric Performance

Building Fabric	Part L 2022 Notional Value (Dwellings)	Part L 2022 Notional Value (Buildings other than dwellings)	Proposed target values
External Wall ($W/m^2 \cdot K$)	0.18	0.22	0.15
Corridor Wall ($W/m^2 \cdot K$)	-	-	0.18
Party Wall ($W/m^2 \cdot K$)	0.0	-	0.0
Roof ($W/m^2 \cdot K$)	0.11	0.22	0.11
Floor ($W/m^2 \cdot K$)	0.13	0.22	0.13
Glazing U-Value ($W/m^2 \cdot K$)	1.2	1.6	1.0 (Triple glazing)
Solid door ($W/m^2 \cdot K$)	1.0	1.9	1.0
Air Tightness $m^3/h \cdot m^2$@50Pa	5	5	3
Window g-value		0.4	0.6

The table below provides some indicative thermal bridges figures. We are aiming to use approved construction details, but pursuing the Psi values, to be low as possible to improve the overall performance of the building.

Table 3.2 Proposed thermal bridging.

Thermal Bridge	Proposed Psi-Value (W/mK)
E1: Steel lintel with perforated base plate	1.0
E3: Sill	0.1
E4: Jamb	0.1
E5: Ground floor (Normal)	0.32
E7: Party floor between dwellings (in blocks of flats)	0.28
E9: Balcony within a dwelling, wall insulation continuous*	0.15
E16: Corner (normal)	0.18
E18: Party wall between dwellings	0.24
E20: Exposed floor (normal)	0.32
E21: Exposed floor (inverted)	0.32
P2: Intermediate floor within a dwelling	0
P3: Intermediate floor between dwellings (in blocks of flats)	0

*This is an externally supported balcony (the balcony slab is not a continuation of the floor slab) where the wall insulation is continuous and not bridged by the balcony slab or its supports

Further assessment will be required as the design progresses, mostly focusing on construction make-ups to achieve the desired U-values.

3.3. Use Energy Efficiently

The Proposed Development is expected to aim to maximise building services performance, through energy efficient systems. The proposed masterplan will be an all-electric system, which optimises energy efficiency. The design will be maximising opportunities for natural ventilation.

When outdoor conditions are acceptable, openable windows are recommended to allow for natural ventilation during the day, as well as the night-time to make use of the night-time cooling.

This choice of system aligns with the UK's decarbonisation strategy and benefits from a decarbonising grid. Over time the grid is set to decarbonise and therefore

the Proposed Development will also reduce in operational carbon emissions associated with electricity use.

Table 3.3 Proposed Residential Buildings Services

Element	Proposed system for dwelling
Lighting	100% low energy lighting (LED), with Efficacy= 80lm/W
Space Heating Terminal	Underfloor heating preferred, radiators to be considered.
Space heating and DHW heating central plant	Connect to the district heat network, with the carbon factor to be confirmed by the network provider. Air source heat pumps will serve as a contingency plan if the heat network is not completed.
Cooling	Natural ventilation with no active/mechanical cooling,
Ventilation	Mechanical ventilation (MVHR) with heat recovery and openable windows in line with Part F.
Ventilation Controls	User-controlled boost mode will be available to increase ventilation rates, mitigating overheating risks during hotter periods and optimizing thermal controls within apartments. Flat rate charging, no time or thermostatic control of room temperature
Heating Controls	Charging system linked to use of community heating, programmer and Thermostatic Radiator Valves.

3.3.1. Heating Infrastructure & Heat Network Connection

Cardiff is identified as a District heat network priority area by The National Plan 2040, shown in **Figure 3.2**. Based on Policy 16 of The National Plan 2040, designs of developments in priority areas are required to identify opportunities for district heating and positively plan their implementation in new development designs.

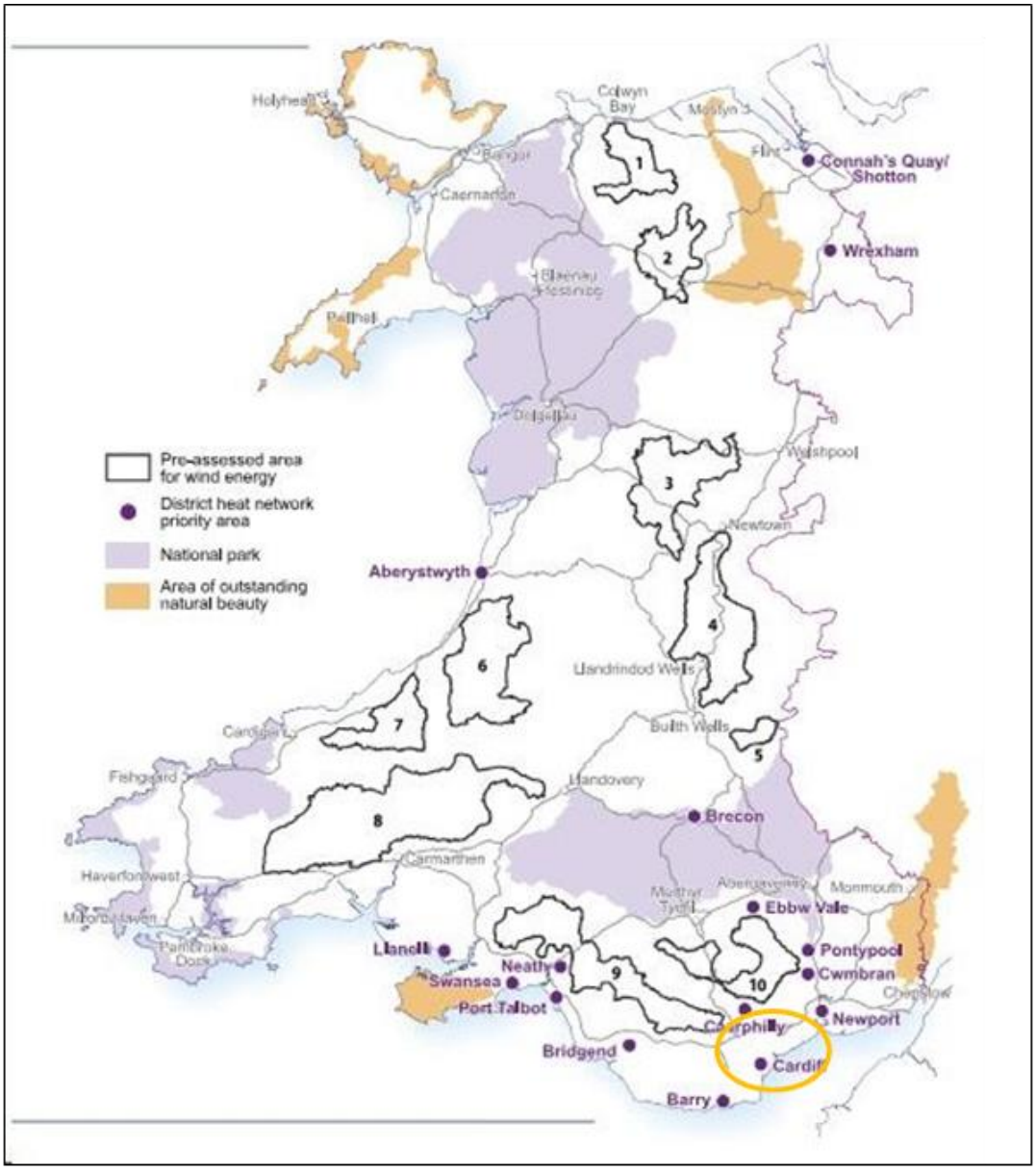

Figure 3.2 Priority Areas for District Heating Networks in Wales, assigned by the Welsh Government

The Cardiff Major Projects team have issued an Expression of Interest (EOI) dated 2/2/24, via the BHIVE platform to gauge the appetite of potential district heating operators who could potentially develop the scheme. Two delivery models for the district heating are currently being considered:

- Deliver in partnership with private sector but against a JV management role whereby the Council provides the funding, operator provides the management of delivery and operation; and,

- Joint venture whereby Cardiff council provides the site for energy centre, initial load requirement of existing sporting infrastructure and anticipated load of the wider proposed development(s). It will be for the private sector to deliver the solution and operate as an investment. This potentially would likely be set against a long-term lease.

The EOI contained the following preliminary information regarding Plot 1.

Table 3.4 Proposed Unit Mix & Heat Loads

	1 Bed 2P (50m²)	2 Bed 3P (65m²)	2 Bed 4P (75m²)	3 Bed 5P (90m²)
Plot 1	25 No	25 No	25 No	
Heating	2.3 kW	2.9 kW	3.4 kW	4.1 kW
Cooling	-	-	-	-
HWS	0.20 l/s	0.25 l/s	0.30 l/s	0.35 l/s

Table 3.5 Proposed Heat Demand and Heat on Dates

	Indicative construction completion dates	Suggested Heat on date	Diversified Heating Peak	Diversified Cooling Peak
Plot 1	24/09/2026	24/06/2026	352 kW	240 kW *

* Current design is not based on mechanical cooling

It is currently envisaged that the district heat network operator will require hydraulic separation between the block and the district heating system. A heat substation room will be provided to house their plate heat exchangers, etc. A separate heating plant room will be provided for the building's circulation pumps and pressurisation unit (owned and operated by the plot).

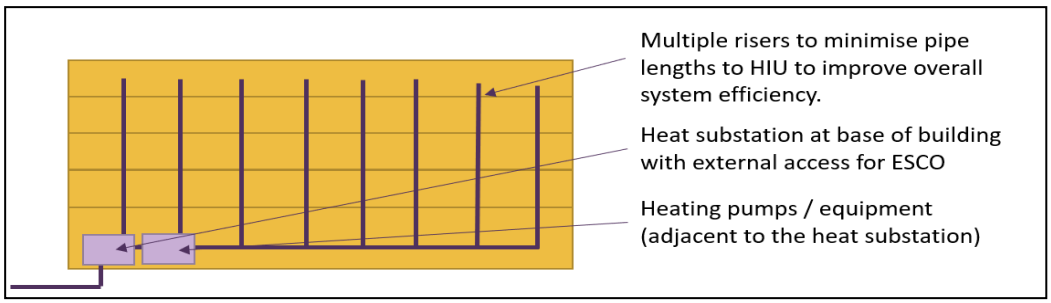

Figure 3.3 Proposed Simplified Schematic Showing Heating Strategy

The heating system will be designed to meet the recommendations set out in CIBSE CP1. This will be developed during the next design stage.

An underfloor heating system will be designed to deliver heat to the various dwellings. Underfloor heating system is preferred to radiators as it outperforms in terms of occupant comfort and operation conditions.

Table 3.6 Comparison of Radiators & Underfloor Heating

	Radiators	Underfloor heating
Comfort	Despite their name most of the heat is via convection which can create cold spots and drafts	Creates very even temperatures giving rise to high levels of comfort
Speed of response	Quick to heat up. It is obvious to the users that the radiators are hot and heating up the apartment.	Slower to heat up than radiators.
Usability	Radiators are generally easier to understand in terms of controls and operations	Works well but users need to get used to slower speed of response.
Design	Wall space must be found for the radiators which can impact on furniture layouts	Frees up wall space but can limit options for floor finishes
Safety	Temperature needs to be limited (to 43°C) where accessible by vulnerable people	No issues
Suitability with heat pumps	Lower temperatures of the district heating system require larger radiators	Ideal solution as underfloor heating requires low flow temperatures, increasing the efficiency of the heat pumps

Quality	Often considered a cheap and cheerful solution	This solution is often considered a higher quality solution
Installation	Easy and quick to install	Needs to be co-ordinated with flooring installation
Efficiency	Less efficient than under floor heating as requires flow temperatures >50°C. (Lower flow temperatures are possible but larger radiators tend to be problematic)	Works at lower temperatures (circa 35°) increasing efficiency
Life expectancy	10 – 20 years	50 + years
CAPEX Cost	Lower	Higher

3.3.2. Fuel Types & Carbon Factors

In 2022, the Welsh Government adopted Approved Document Part L: 2022. This Approved Document has been followed for the purpose of this assessment. The Proposed Development emissions calculations will be based on carbon factors contained within Approved Document Part L: 2022, shown in Table 3.7. Gas will not be consumed on site but has been displayed for the purpose of comparison, demonstrating that electric-led systems are a more attractive option from a carbon perspective. Moreover, it is anticipated that the grid is decarbonising over time as more renewables are introduced in the UK energy sector and generation.

Table 3.7 Carbon Factors

Fuel type	Part L:2022 Adopted carbon factors ($kgCO_2/kWh$)
Natural Gas	0.210
Grid electricity	0.136 (annual average)

3.4. Renewable Energy Generation

Low carbon and renewable energy technology options for generation of on-site clean energy are to be considered and evaluated as the project progresses. A number of the variables affecting suitability were considered, such as:

- Environmental Constraints (e.g., suitability of geology for Ground Source Heat Pumps);
- Infrastructure Constraints (e.g., impacts on aviation from wind turbines, transport infrastructure).

3.4.1. Renewable Technology Feasibility

A feasibility assessment has been carried out assessing the potential and suitability of a number of renewable technologies. Table 3.8 sets out the complete list of potential low and zero and renewable technologies along with their concluding viability for this Proposed Development.

Table 3.8 Review of Low Carbon and Renewable Technologies

Technology	Feasible	Notes
Photovoltaics	Yes	Photovoltaic (PV) panels convert the suns energy into electricity. As the Proposed Development is solely electricity serviced, offsetting imported energy from the grid will benefit the scheme. Desirable as it is suitable for mounting above green / blue roofs.
Combined Heat and Power	Yes	A Combined Heat and Power (CHP) plant combines heat and power production in a single efficient process. However, its feasibility relies on the heating demand of a scheme consolidating numerous intermittent loads into a substantial base load. Yet, changes in Building Regulations Part L ('Part L 2021') and the decarbonization of the electrical grid diminish the carbon savings from CHP. Additionally, its use of fossil fuels, such as gas, renders it non-compliant with the new Building Regulations.
Solar Thermal	No	Solar thermal panels convert sunlight into hot water, primarily pre- heating domestic hot water systems. While they excel in summer, their ability to meet demand weakens during months of limited sunlight and high hot water usage. Additionally, solar thermal systems are incompatible with district heating. Thus, utilizing roof space for photovoltaic panels (PV) is preferred over solar thermal due to its year-

Technology	Feasible	Notes
		round effectiveness and compatibility with various heating systems.
Bio-fuel Heating	No	Several environmental concerns exist regarding biofuel use in buildings, encompassing issues like fuel transportation/storage, potential air quality impact, flue structure requirements, plant space/storage, and maintenance needs. However, the biofuel market has not matured enough to address these concerns, rendering it nonviable for this development due to associated environmental issues.
Air Source Heat Pump	Yes	Air source heat pumps (ASHP) extract heat from the ambient air. Heat pumps will serve as a secondary option for the district network and can function as the primary heat source in the temporary energy centre if required until the heating network is operational, or the heat network does not materialize.
Wind power	No	There is considerable evidence of urban wind turbines failing to perform to manufacturer's output estimates in urban settings. Significant planning and integration issues also exist and consequently wind turbines are not viable.
Biomass	No	Biomass burners produces heat from combusting wood. There are currently a number of environmental concerns regarding the use of biofuel in buildings. These include, fuel transportation / storage issues, potential air quality impact and resulting flue structure, plant space / storage requirements & maintenance requirements. Moreover, biomass is not compatible with the preferred heating network.
Hydro power	No	Hydropower harnesses the energy from water movement or waves to generate electricity, making it a renewable energy source with minimal greenhouse gas emissions. However, due to Cardiff Bay's non-tidal nature, the feasibility of implementing hydropower in the area is limited.

Following the preliminary feasibility, the strategy is proposed to include:

- Photovoltaic panels on any available roof space. A balance between ecology, plant and photovoltaic panels needs to be developed during RIBA stage 3 of the project.
- District Heating is preferred as the primary source of heating in the building.
- Air Source Heat Pumps are recommended to support the heating and cooling requirements as a back up to the district heating network.

All commercially available Low and Zero Carbon options have been reviewed with respect to the Proposed Development. These technologies have been considered within the constraints of the prevailing environmental conditions, building operation, loads, integration within the concept building services, viability, architectural design, capital and maintenance costs with associated payback and overall effective carbon dioxide reduction.

The Proposed Development will include feasible renewable energy technology to reduce the Proposed Development's CO_2 emissions once passive design and active energy efficiency measures have been considered.

3.5. Residential Modelling

3.5.1. Methodology

The Standard Assessment Procedure 10.2 (SAP) is the UK government's methodology for assessing the energy performance of residential buildings.

SAP utilizes a notional building as a reference point for comparison when assessing the energy performance of homes. The notional building represents a hypothetical structure that meets specific energy efficiency standards set by building regulations. SAP compares the energy performance of the assessed home with that of the notional building to determine if it meets the required standards. This comparison helps identify areas for improvement and ensures compliance with energy efficiency regulations. that is measured by comparing the DER (Dwelling Emission Rate) against the Target Emission Rate(TER), the Dwelling Fabric Energy Efficiency (DFEE) against the Target Fabric Energy Efficiency (TFEE) and the Dwelling Primary Energy Rate (DPER) against the Target Primary Energy Rate (TPER) to quantify the energy efficiency and environmental impact of residential buildings.

A sample of 3 representative flats were modelled to extrapolate the energy and fabric performance using the Elmhurst SAP software. the models include fabric, MEP and renewable parameters.

SAP carbon factors have been used for this energy strategy and following best practice, detailed in the SAP generated Building Regulations Wales Part L (BRWL) Compliance Reports, found in **Appendix A**.

3.5.2. PV Module Configuration

It is proposed to install the PV panels above a green roof. **Figure 3.4** illustrates the planned arrangement of PV panels on the upper roof, demonstrating that 232 panels (each measuring 1.6 x 0.9 meters) can be accommodated. The peak output of the 334m² PV array would be approximately 58 kW, generating around 58,000 kWh of green electricity per year. Panel selection will be refined in the next design stages in collaboration with green/blue suppliers.

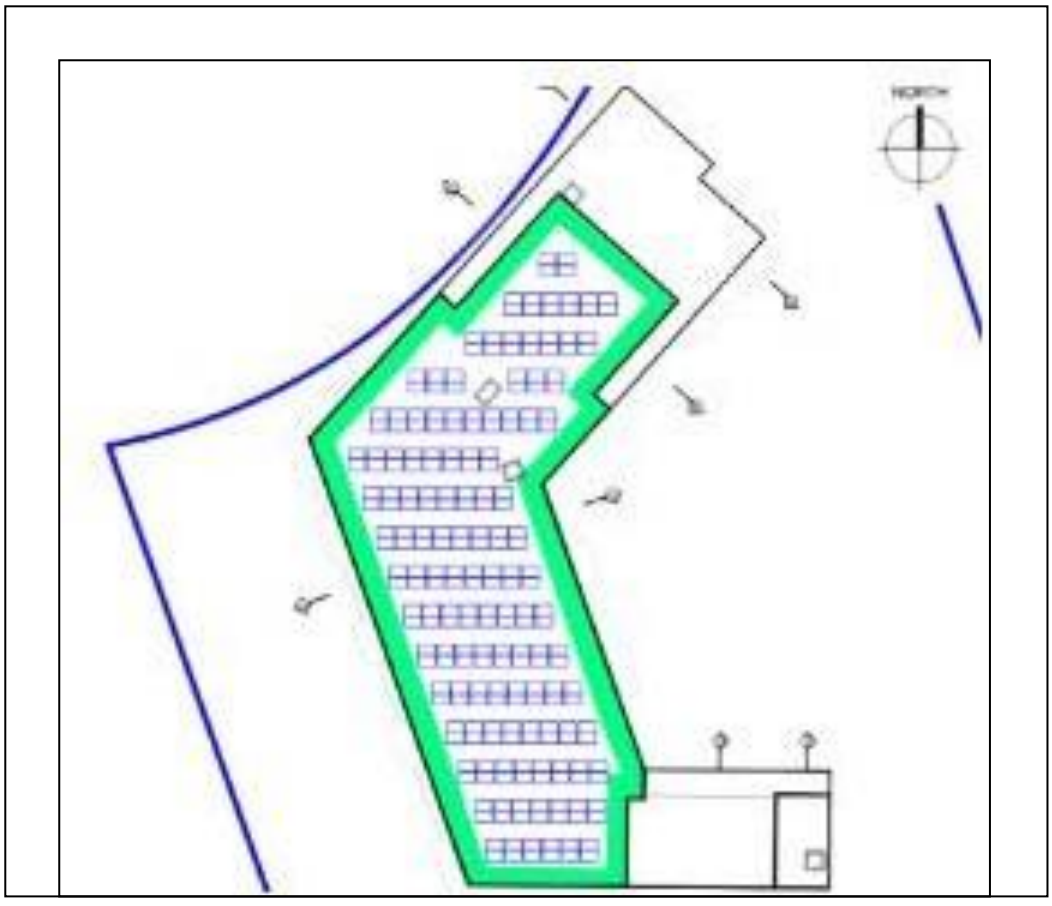

Figure 3.4 Proposed layout of PV panels on the roof

3.5.3. Results

Compliance with regulations is achieved for each sampled dwelling type individually, as well as on a block level, which accounts for the overall residential area of the plot. Sampled flats are shown in **Figure 3.5**.

Figure 3.5 Sampled Dwelling for Residential Compliance

Dwellings on the plot are evaluated under two heating scenarios: connection to an external heat network with consumption-based charging, or connection to a communal ASHP within the development. The performance of each scenario, in terms of carbon emissions and savings, is as follows:

Table 3.9 Dwelling and Target carbon, fabric and primary energy, Connected to a Heat Network

	PV contribution (kWp) per flat	Flats total	DER $kgCO_2$ / m^2 /yr	TER $kgCO_2$ / m^2 /yr	DPER kWh/m^2/yr	TPER kWh/m^2/yr
Flat Type_1	0.642	47	2.43	13.87	25.36	74.00

Flat Type_2	0.929	18	1.40	8.98	14.60	47.34
Flat Type_3	0.926	12	1.60	9.69	16.66	51.04
Block Compliance	-	-	1.97	11.66	20.59	61.92

Table 3.10 Dwelling and Target carbon, fabric and primary energy, Connected to communal ASHP

	PV contribution (kWp) per flat	Flats total	DER $kgCO_2$ / m^2 /yr	TER $kgCO_2$ / m^2 /yr	DPER $kWh/m^2/yr$	TPER $kWh/m^2/yr$
Flat Type_1	0.642	47	4.37	13.87	45.91	74.00
Flat Type_2	0.929	18	2.57	8.98	27.21	47.34
Flat Type_3	0.926	12	2.96	9.69	31.10	51.04
Block Compliance	-	-	3.58	11.66	37.68	61.92

3.6. Non-residential Modelling

3.6.1. Methodology

Evaluation of non-residential buildings, or non-residential parts of mixed-use buildings, was completed using TAS involves a comprehensive analysis of energy performance and building fabric.

EDSL TAS's dynamic simulation is used to assess factors such as heating, cooling, lighting, and ventilation to optimize building performance.

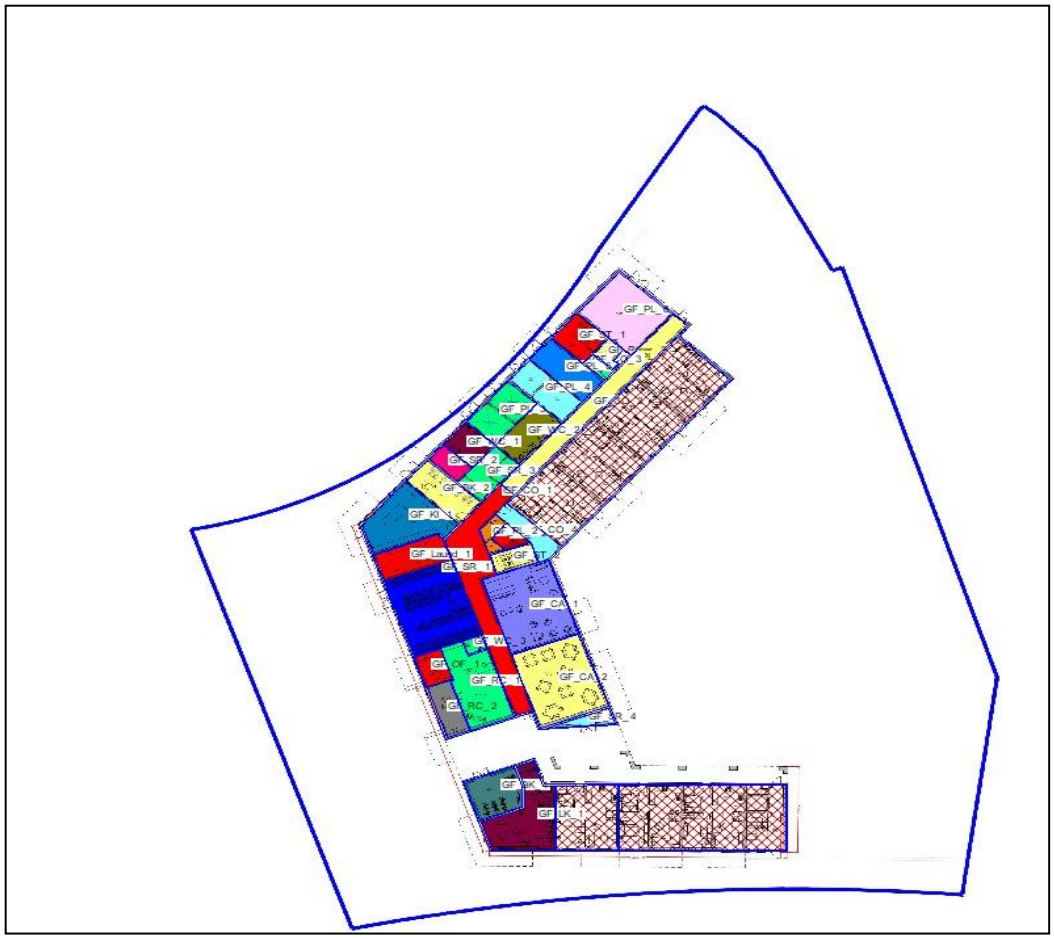

Figure 3.6 Non-residential zones on ground flood level zoned in TAS

The ground floor areas show in **Figure 3.6** are modelled with the parameters set out in Table 3.11.

Table 3.11 Modelled Parameters

Element	Proposed System for Dwelling
Lighting	100% low energy lighting (LED), with Efficacy= 100lm/W.
Space Heating Terminal	Underfloor heating preferred in occupied areas, radiators to be considered.
Space heating and DHW heating central plant	Connect to the district heat network, with the carbon factor to be confirmed by the network provider. Air source heat pumps will serve as a contingency

	plan if the heat network is not completed.
Cooling	No active/mechanical cooling, natural ventilation
Ventilation	Mechanical ventilation (MVHR) with heat recovery and openable windows in line with Part F. Specific Fan Power in the range of 2 W/l/s. Air changes set per zone types based on the Non- Domestic EPC Conventions for England & Wales Issue 8. Natural ventilation in corridors, storage areas and stairs.

3.6.2. Results

The performance the non-residential area in terms of carbon emissions and savings is detailed in **Appendix B**, and summarised below in Table 3.12.

Table 3.12 Summary of Results

	BER $kgCO_2/m^2/yr$	TER $kgCO_2/m^2/yr$	BPER $kWh/m^2/yr$	TPER $kWh/m^2/yr$
Non-residential areas	18.00	16.79	193.99	169.25

Despite the non-residential portion of the Proposed Development not complying on an individual basis (i.e., apartment by apartment), overall compliance is achieved on a block-by-block level.

4. Climate Change

4.1. Flood Risk

A Flood Consequence Assessment (FCA) has been prepared by Hilson Moran, in accordance with the standing advice and requirements of the Lead Local Flood Authority (LLFA), Cardiff City Council and Natural Resource Wales (NRW).

The process follows the Local Technical Guidance (TAN) and the National Planning Policy Framework (NPPF). Considerations were made for the assessment to be appropriate to the nature and scale of the residential development in Cardiff.

The assessment investigated all potential risks of current or future flooding to the site, considered the impact the development may have elsewhere with regards to flooding, and considered design proposals to mitigate any potential risk of flooding determined to be present.

The FCA has identified that the site may have the potential risk from fluvial sources (Rivers and Sea), due to the close proximity to the bay and the River Taff. However, the bay benefits from local flood defences, and the area is officially designated as a TAN15 Defended Zone. A TAN15 Defended Zone are region where there is known flood risk management infrastructure that provides a minimum standard protection for both the 1 in 100 (plus climate change) for rivers and a 1 in 200 (plus climate change) minimum protection from the sea. The Flood modelling Provided by the NRW highlighted that on the 1 in 100 rivers, plus 1 in 200 coastal with regional climate change (T200) demonstrated that the flood level expected within the site will be 8.62m AOD. For the Proposed Development to be fit for development on flood risk grounds, the site will require to be flood-free during a 1 in 100 river flooding and the 1 in 200 seas, plus climate change as well as satisfying conditions set within Section 11 of the TAN 15 “Acceptability of flood consequences” (refer to Table 4.1).

Table 4.1 Acceptability for flood consequence feasibility

Conditions for TAN15 Defended Zones	Justifications
Its location meets the definition of previously developed land; AND	Currently, the site is used as a carpark and classified as a brownfield site, therefore it meets the definition of a previously developed land.
The potential consequences of a flooding event for a particular type of	Information regarding the potential sources of flooding has been identified

development have been considered and found to be acceptable in accordance with the criteria contained in section 11 of the TAN (Acceptability of flood consequences).	within FCA. Flood risk resilience measures and finishing floor levels should be set above the 1% AEP for rivers and 0.5 AEP for Sea, along with additional climate change factors, this is identified as 8.62m AOD.

It is intended that site-wide, the ground levels will be above 8.62m AOD. Plot 1 will have sleeping accommodation on the ground floor of the building therefore as a precautionary measurement, the finishing floor levels of the building will be set to 8.92m AOD. This will provide a 300mm additional freeboard for the ground floor sleeping accommodations. Therefore, this development will comply fully with the TAN15 in terms of flood risk.

The surface water drainage at Plot 1 will be undertaken by AKTII and it is intended that the surface water will be positively drained from the development and into the bay. Refer to AKT II's Drainage Statement for further information.

AKT II are in consultation with the Cardiff Council sustainable advisory board (SAB) and have proposed a suite of sustainable drainage approaches for the development taking into consideration the underlying ground conditions which are effectively impermeable and may contain contaminants.

The drainage strategy has been prepared based upon the requirements of the Sustainable Drainage systems standards for Wales 2018 – Standard S1 and S2 and the surface water runoff destinations Priority level 1 (collect and re-use) and priority level 3 (discharge to a surface water body)

The drainage strategy will also refer to and adhere to the requirements of Planning Policy Wales Technical Advice note 15 (TAN15) and the Sustainable drainage (SuDS) statutory guidance document 2019.

Rainwater quantity control is not required as confirmed by Cardiff Council SAB board and free discharge (unrestricted flow) is acceptable into the River Ely and the Cardiff Bay as these are tidal water bodies.

Rainwater quality will be managed by the implementation of green roof catchments, permeable paved pedestrian areas, permeable paved parking and vehicular access areas.

Landscaped areas will provide swales and green / blue corridors to convey and cleanse collected rainwater prior to discharge to the River Ely.

4.2. Thermal Comfort & Overheating Prevention

The design of the Proposed Development should consider the changing climate and potential increase of temperatures. It should prioritise a design that complies with Approved Document L and Approved Document O of the Building Regulations.

4.2.1. Overheating Evaluation Methodology

The overheating risk analysis has been undertaken for the Proposed Development in line with the assumptions made in the energy assessment.

Residential spaces were assessed using CIBSE TM 59. An overheating risk was carried out and determined that the g-value should not exceed 0.6 for all dwellings. Table 4.2 summarises the main assumptions used in the overheating analysis.

Table 4.2 Overheating Analysis Assumptions

	Proposed Redevelopment
Design Stage	3
Assessment methodology	Dynamic thermal modelling in line with CIBSE TM 59 and Building Regulations Part O
Dynamic overheating analysis software	EDSL TAS v9.5.5
CIBSE current Weather file	DSY1 for 2020s, high emissions, 50% percentile scenario
CIBSE future weather file	DSY2 - 1995 DSY3 - 1976
Internal gains	TM59 Design Criteria
Occupancy profiles	Bedroom – 24 hours Living room/ kitchen – 9 am – 10 pm
Ventilation strategy	MVHR

4.2.2. Overheating Design

The early-stage analysis has encouraged the design to integrate the following measures:

- Glazing – high performance glazing with a g value of 0.6.

- Window opening restricted to 100mm for safety.

4.2.3. Results

Based on the work undertaken to date and the results of the analysis, it is considered that dwellings will be able to meet Part O following the completion of the detailed design.

4.2.3.1. Flat Type 1 (1 Bed)

Table 4.3 Category I - Vulnerable Residents, Flat Type 1

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms	Result
Flat1_BD_02_1	Bedroom	3672	110	45	3285	32	4	Pass
Flat1_LK1_02_1	Living Room / Kitchen	1989	59	17	N/A	N/A	N/A	Pass

Table 4.4 Category II – Typical Conditions, Flat Type 1

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms	Result
Flat1_BD_02_1	Bedroom	3672	110	9	3285	32	4	Pass
Flat1_LK1_02_1	Living Room / Kitchen	1989	59	3	N/A	N/A	N/A	Pass

4.2.3.2. Flat Type 2 (2 Bed)

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Table 4.5 Category I - Vulnerable Residents, Flat Type 2

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms	Result
Flat2_BD_02_1	Bedroom	3672	110	65	3285	32	4	Pass
Flat2_BD_02_2	Bedroom	3672	110	73	3285	32	4	Pass
Flat2_LK2_02_1	Living Room / Kitchen	1989	59	20	N/A	N/A	N/A	Pass

Table 4.6 Category II – Typical Conditions, Flat Type 2

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms	Result
Flat2_BD_02_1	Bedroom	3672	110	23	3285	32	4	Pass
Flat2_BD_02_2	Bedroom	3672	110	27	3285	32	4	Pass
Flat2_LK2_02_1	Living Room / Kitchen	1989	59	3	N/A	N/A	N/A	Pass

4.2.3.3. Flat Type 3 (2 Bed)

Table 4.7 Category I - Vulnerable Residents, Flat Type 3

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms	Result
Flat3_BD_02_1	Bedroom	3672	110	38	3285	32	0	Pass
Flat3_BD_02_2	Bedroom	3672	110	10	3285	32	1	Pass
Flat3_LK2_02_1	Living Room / Kitchen	1989	59	9	N/A	N/A	N/A	Pass

Table 4.8 Category II – Typical Conditions, Flat Type 3

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms	Result
Flat3_BD_02_1	Bedroom	3672	110	11	3285	32	0	Pass
Flat3_BD_02_2	Bedroom	3672	110	0	3285	32	1	Pass

Zone Name	Room Use	Occupied Summer Hours	Max. Exceedable Hours	Criterion 1: #Hours Exceeding Comfort Range	Annual Night Occupied Hours for Bedroom	Max Exceedable Night Hours	Criterion 2: Number of Night Hours Exceeding 26 °C for Bedrooms	Result
Flat3_LK 2_02_ 1	Living Room / Kitchen	1989	59	0	N/A	N/A	N/ A	Pass

5. Social Value

The Proposed Development focuses on enhancing social value and promoting well-being, prioritising community enrichment. This includes facilitating pedestrian and cyclist movement, efficient transport access, and promoting community well-being. Additionally, the design will incorporate features to enhance access to local amenities, bus routes, cycling paths, and other facilities. The Proposed Development will offer a mix of uses, including residential, co-living, office, hotel, leisure, retail, and amenities, fostering new employment and business opportunities. With a community- centric approach, the proposed development ensures access to open spaces, footpaths, and community green spaces for all residents.

An added social value to the Proposed Development is delivered through affordable housing, to meet the housing needs of the community. Affordable dwellings are to be built to the same high- quality as privately owned housing.

The Proposed Development plan illustrated in **Figure 5.1** shows the land uses around Plot 1 and green spaces proposed.

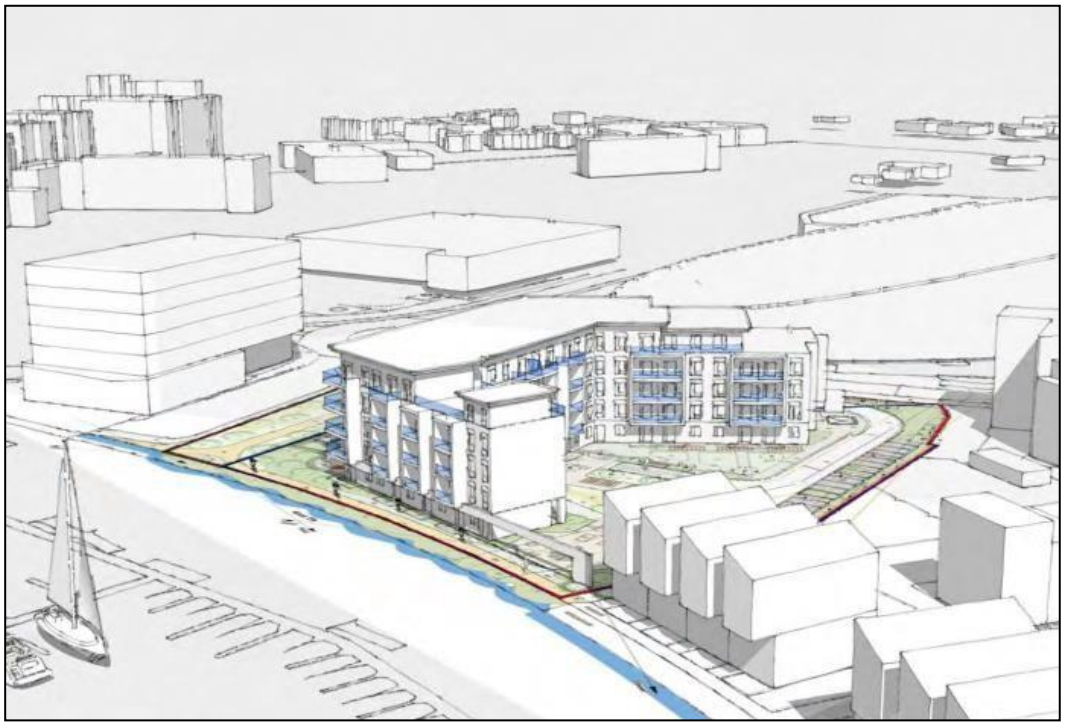

Figure 5.1 Illustrative Diagram of Proposed Green Spaces and Wellbeing Areas

5.1. Wellbeing

The Proposed Development prioritizes well-being by fostering active and healthy lifestyles through pedestrian areas, cycle paths, and leisure facilities. Adjacent to the yacht club, which shares these values, the Proposed Development creates a cohesive community centred on well-being. On-site green and blue features are intentionally designed to enhance the mental and physical well-being of residents and visitors alike. Additionally, efforts to improve air quality further contribute to the overall well-being of the community.

The Proposed Development has been designed with community in mind, with the aim to foster social value at Building 1 withing the Cardiff Peninsula. A focus on social value has been considered by proposing the following design ideas:

- Promoting health & wellbeing in design.
- Improved air quality.
- Meeting local housing needs with 20% affordable housing.
- Large public space provisions, including children play areas and fitness trails.
- Community focused landscapes.
- Green open spaces and retention of trees.
- Walking and cycling is promoted to influence healthy lifestyles.
- Cycle parking is proposed to be incorporated into the site in line with the local standards for residential units.
- Lighting elements and configuration design for safety and security.
- House and flat size diversity, including 1,2 and 3 bed dwellings.
- Incorporation of edible landscape as a social hub.

A key measure of focus is post-occupancy evaluation, but numerus supporting metrics will drive the design to create healthy spaces for people to enjoy, including indoor air quality, daylight levels, thermal comfort, internal ambient noise level, measures to increase safety and security. Moreover, the Proposed Development and its facilities will aim to promote healthy lifestyles through promotion of walking, cycling and aims to connect occupants and visitors with nature through the provision of green landscaping.

6. Transport & Emissions

6.1. Embodied Carbon

The industry is moving towards the use of Life Cycle Assessment (LCA), in order to understand the environmental impacts from construction products and materials is used to appraise a range of different design options with the aim of improving the construction product related environmental performance of the building. The results of the LCA, with its stages detailed in **Figure 6.1**, are presented in an environmental product declaration (EPD) in order to provide the causes for assessing buildings and identify those which cause less stress to the environment.

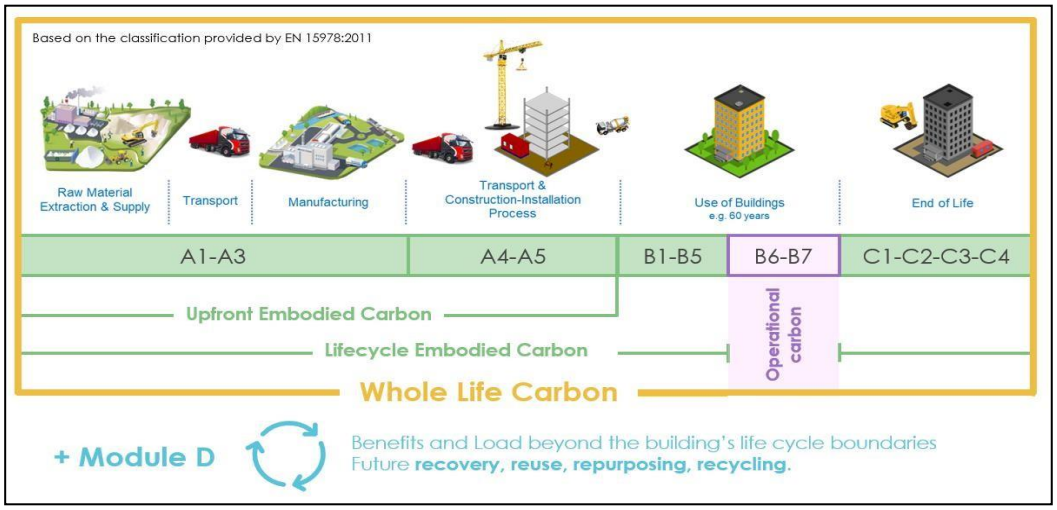

Figure 6.1 Whole Life Carbon

Materials used should be responsibly sourced in accordance with any national and local policy such as the UK Government's Timber Procurement Policy. Where appropriate local suppliers should be used in order to reduce emissions relating to the transportation of materials and equipment to and from site.

The Proposed Development could use, at an early design stage, the LCA tool to identify what are the most sustainable materials suitable for the Proposed Development. It is recommended that an embodied carbon study should be commissioned to determine actual savings.

The proposals have been designed to be in-keeping with the local area whilst also delivering contemporary sustainable design solutions which effectively integrate into the existing fabric of the area. External materials and streetscape palettes will incorporate materials considered to be sympathetic to the local character and the appearance of the surrounding area.

The Proposed Development will aim to incorporate the following measures in regards to embodied carbon and the carbon footprint of the Proposed Development:

- Assess whole life carbon and disclosed for all construction projects to drive carbon reductions.
- Measure and offset embodied carbon impact at practical completion.

6.2. Transport

The Proposed Development will be designed to support and promote walking, cycling and use of public transport, as these are integral to creating a sustainable development. The Proposed Development aims to contribute towards sustainable transport and aligned with the Sustainable Transport Hierarchy for Planning in the PPW, illustrated in **Figure 6.2**.

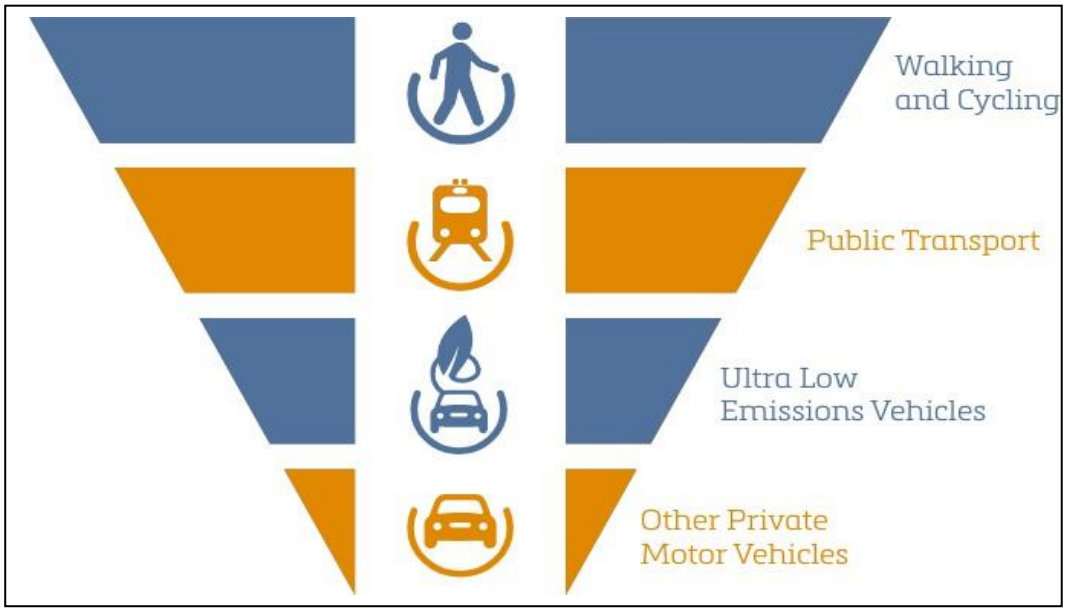

Figure 6.2 Planning Policy Wales Sustainable Transport Hierarchy for Planning

Sustainable modes of transport will be promoted through the Proposed Development by incorporating infrastructure that will aim to reduce vehicle use and encourage walking and cycling, as well as access to public transportation. EV charging points will be provided as a way to support the electrification of transport and reduce the associated emissions associated with these.

In addition, cycle stands will be provided on-site, as detailed below, to encourage and enable cycling. The provision exceeds the expected requirements and aims to

influence habitants and visitors to adopt sustainable and healthy modes of transport.

A Framework Travel Plan (FTP) is recommended to enable continued monitoring of the Proposed Development, by securing measures to promote sustainable modes of travel, supported by incentives which will be made available to residents to increase their awareness of different travel choices.

Various measures are recommended to be employed in regard to sustainable transportation in the Proposed Development, this includes the following:

- Design to accommodate the needs of pedestrians, cyclist with connections to public transport, and provide appropriate infrastructure to reduce travel by car and promote the use of sustainable travel modes.
- Dedicated pedestrian walkways, foot paths and cycle links, to connect to the interconnected network within and beyond the Proposed Development.
- Connectivity to surrounding footpath networks, natural sites and Right of Way trails.
- Electric vehicle charging points.
- Cycle parking is proposed to be incorporated into the site, ensuring that it will be provided in secure locations which are well-lit and convenient to the associated buildings.

6.2.1. Electric Vehicle Charging Infrastructure

The Proposed Development aims to support the reduction of Greenhouse Gases (GHG) associated with transport. It aims to shift away from fossil-fuelled vehicles and electrification of transport by introducing EV charging points on-site. This provision is in line with local requirements and Part S of the Building Regulation. The provision of EV charging points includes 20% active spaces with the rest passive.

EV charging points will be provided at the site in line with the latest SCC standards, which are for one charging socket to be provided per residential unit. This will encourage the uptake of sustainable vehicles by providing comfort and convenience, as there will always be a charging point available to keep their vehicle charged.

The uptake of EV by future users of the Proposed Development will help to reduce the GHG emissions associated with transport.

The electrical load associated with this infrastructure is to be considered and reflecting within a Utilities Statement, which should be read in conjunction with this section.

6.3. Air Quality

The air quality assessment addresses the potential air quality impacts during both the construction and operational stages of the Proposed Development. The assessment undertaken was done so in line with the relevant policy and guidance, and where necessary outlines the required mitigation measures to minimise impacts.

For the construction phase a qualitative assessment of construction phase impacts has been carried out. A medium risk of dust soiling during demolition, earthworks, construction, and trackout activities was identified. With regards to human health during a low risk was identified during demolition, but a medium Risk during earthworks, construction trackout activities. Through good site practice, the implementation of suitable mitigation measures as summarised in Section 6 of the supporting air quality assessment, the impact of dust and PM10 releases will be minimised. The residual effect of the construction phase on air quality is therefore not significant.

During the operational phase, the Proposed Development will lead to a net reduction in car trips, as such a detailed assessment was scoped out. However, a review of local monitoring data was undertaken to identify any localised trends in air quality, the findings of the assessment are set out below:

- Local monitoring data for NO_2, PM_{10} and $PM_{2.5}$ in the vicinity of the Application Site indicated compliance with the relevant annual and hourly AQS objectives;
- The trend analysis undertaken for NO_2 identified statistically significant downward trends at diffusion tube locations 147, 148 and 149 in the vicinity of the Application Site; and,
- The trend analysis undertaken for PM_{10} did not demonstrate statistically significant trends. However, PM_{10} concentrations remained below the relative objectives throughout the monitoring period.

Based on the findings of the assessment site specific mitigation to protect existing receptors and future users of the Proposed Development from poor air quality is not required. Furthermore, given the net reduction associated with the Proposed Development it is reasonable to conclude that there is potential for improved local air quality in the vicinity of the Application Site.

7. Environmental Sustainability

7.1. Waste Management

Waste arising from the construction and operation of the Proposed Development will be meticulously managed in adherence to the PPW waste hierarchy, shown in Figure 7.1. This approach aims to minimize the volume of materials destined for landfill and mitigate the adverse environmental impacts associated with such disposal methods. The waste management steps, prioritized in order of preference, serve as a structured framework for sustainable waste management practices throughout the Proposed Development's lifecycle.

The waste management hierarchy steps, shown in order of preference, are as follows:

- Prevention and Reuse – Through good design and procurement mechanisms.
- Preparation for Reuse – To provide design features to the Project to use materials in their current state and form, this can occur either on or off site.
- Recycling – By using waste materials found on site and recovering them into an alternative form that can be used for construction purposes.
- Other Recovery – Energy recovery from biodegradable or combustible materials.
- Disposal – The least preferred option where the waste stream would be subject to a final disposal route, such as landfill.

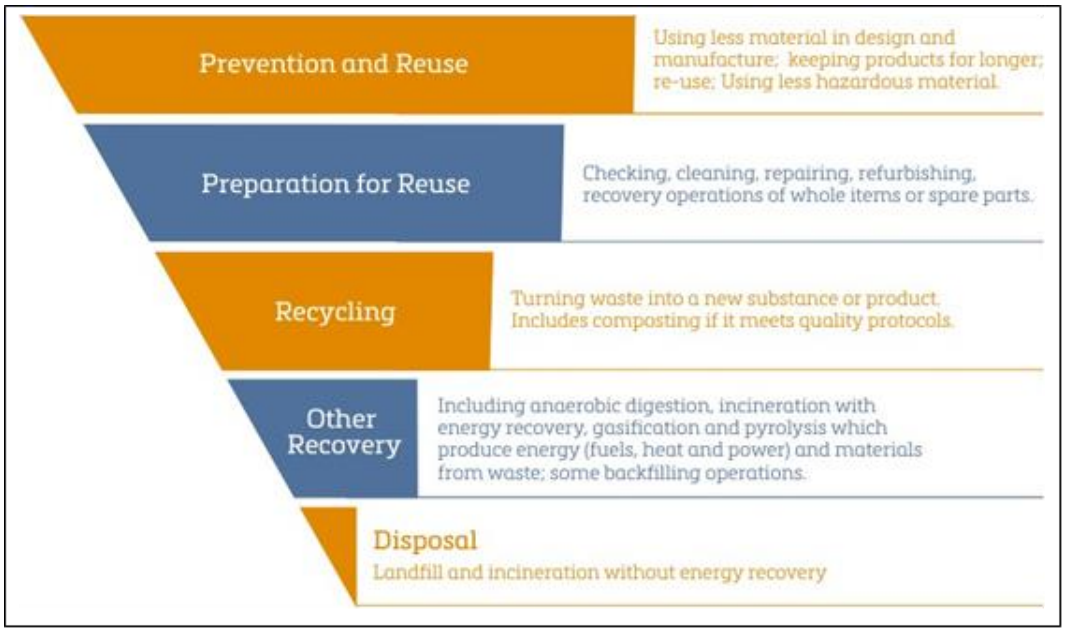

Figure 7.1 Planning Policy Wales Waste Hierarchy

In accordance with the above objective, the Proposed Development should adhere to sustainable waste management principles with the objective of reducing and recycling materials either on or off site as far as practicable.

7.1.1. Servicing & Maintenance Strategy

The following sets out the servicing and maintenance strategy for Plot 1:

- Refuse and servicing vehicles will utilise the internal road network to access both the residential and college elements for the scheme.
- Waste will be stored and collected from the main building.
- Communal waste stores are proposed for Plot 1.
- Refuse collection vehicles will access and load within the required distances of all waste stores.
- Delivery and servicing trips associated with Plot 1.

7.1.2. Construction Waste

During the construction process and the occupation of the Proposed Development, the waste strategy should follow the principles of the waste hierarchy – "eliminate, reduce, reuse and recycle" – to reduce waste sent to landfill and to allow that the environmental, social and economic risks from waste are reduced and, where possible, turned into opportunities.

The principal contractor/s will be charged with responsibility for the management and coordination of all waste streams during each stage of the construction phase.

The contractors will be required to produce a resource management plan (RMP) this will highlight the commitments and targets the design team must deliver, to ensure waste arisings are reduced and that site activities are compliant with legislative requirements. This will ensure waste is reduced and managed in accordance with the 'waste hierarchy'. The waste hierarchy underpins all waste management policy in the UK.

The preparation of a RMP is still considered important to ensure that building materials are managed efficiently; waste is disposed of legally, fly tipping is reduced; and materials reuse, recovery and recycling is increased.

An Outline Construction Environmental Management Plan (CEMP) which lays out good on-site waste minimisation and legal compliance management has been produced for this site. The CEMP has been developed as a working document and will be updated with further detail upon the appointment of a Principal Contractor/s. The CEMP(s) will allow the Principal Contractor/s to use a toolbox of

information to manage and implement a wide set of environmental requirements including waste legal compliance.

The Resource Management Plan (RMP) will form part of the detailed CEMP developed by the Principal Contractor/s and will cover the non-hazardous waste related to on-site construction and dedicated off-site manufacture or fabrication generated by the buildings design and construction.

Potential construction waste generation can also be designed-out through good design practices or via off-site fabrication. In addition, the use of materials with some form of recycled content would help reduce the net waste generation in the project.

7.2. Water

The Proposed Development in Cardiff is mindful of the need to be more water efficient and limit their water demand. Water consumption can be reduced through installing water efficient features in dwellings and incorporating green infrastructure which can survive on precipitation alone.

7.2.1. Construction Phase

During the construction phase of the Proposed Development measures should be incorporated to reduce the demand for water on site in line with the recommended Waste & Resource Action Program (WRAP) water efficiency construction measures. These will likely include:

- Collecting and storing rainwater on site for use instead of mains water;
- Using water efficient equipment on site; and
- Preventing problems arising that may need water use to control e.g., minimise dust emissions to reduce the need for dampening down surfaces.

7.2.2. Operational Phase

The specification of low water consuming fittings will be fitted within the dwellings with information explaining the benefits of reducing the water use available.

The Proposed Development will be designed to reduce mains water usage following to Building Regulations Part G requirements. This involves the potential water consumption by residents living in new dwellings should not exceed 125 litres per person per day.

The potable water demand in the Proposed Development will be minimised through best practice water-efficient sanitaryware and water-saving equipment,

as well as best practice landscape irrigation. The following water-related measures have been adopted within the Proposed Development:

- Water efficient fittings, such as:
  - Flow restrictors to reduce the flow rate of kitchen sink and bathroom basin taps;
  - Low-flow showers;
  - Small capacity baths;
  - Dual-flush toilets with appropriate controls;
  - Water efficient appliances such as dishwashers and washing machines (where provided);
  - Leak detection systems to notify facilities teams of any leaks;
  - Installation of solenoid valves to automatically turn of the water when the area is not occupied;
- Pulsed water meters to allow users to actively monitor consumption;
- Integration of SUDs features including:
  - Permeable paved parking areas and selected pedestrian areas to improve water quality, reduce the peak flow rates of rainwater and to minimise excavations;
  - Bio-retention areas and filter drains will be used, where possible within the landscaping to improve water quality.
  - Blue and green roofs will be used to reduce the peak flow rates of rainwater and to provide habitat and biodiversity.
- The discharge of surface water will be directly to a water body in accordance with Standard S1 priority level 3of the Sustainable drainage systems standards for Wales (SDSSW); and
- Water (rain) harvesting, where possible, and/or for re-use purposes In accordance with Standard S1 priority level 1 of the SDSSW

Measures will be incorporated to reduce external water consumption. The water strategy will focus on demand reduction in the first instance, followed by consideration of any water collection and reuse.

The following measures will be considered and incorporated if appropriate:

- Garden landscape planting focusing on species requiring reduced irrigation;
- Bio-retention areas in the front of gardens of the properties; and
- Rainwater harvesting using water butts for private garden irrigation.
- Any soft landscaping should include either drought-resistant species or those which can survive on precipitation alone so as to reduce irrigation needs.

7.3. Biodiversity, Blue & Green Infrastructure

To achieve a net gain in biodiversity and create high-quality green spaces, the emphasis lies in maximizing on-site biodiversity through adherence to Natural Resources Wales' biodiversity metric and safeguarding ecological features. Progress towards this goal is gauged by monitoring the percentage of biodiversity net gain realized by the Proposed Development. The Proposed Development endeavours to attain this objective by implementing enhanced ecological strategies.

Given that the Proposed Development site lacks natural green spaces in its vicinity, it is recommended to prioritize ecological enhancements on-site. Various measures have been proposed to ensure the preservation, protection, and enrichment of ecology and biodiversity within the site. It's noteworthy that promoting enhanced ecology and increasing greenery on-site not only contributes to biodiversity but also brings about health and wellbeing benefits for occupants and visitors alike. These measures include:

- Retention of trees, where;
- Selection of smaller plant species to have less watering;
- Provision of open green spaces;
- Native tree, UK grown planting, and meadow planting which require less transport;
- More species variety of plants, climate change friendly species, which will have greater resilience, more resilient to the future;
- Huge variety of species across the site with no linked species for reduction of disease transfer;
- Green infrastructure across site;
- Blue infrastructure through provision of SuDS (the landscape design will include drainage and/or sustainable rain gardens at source through streets using site topography);
- Use UK or European sourced for street furniture and utilize timber that does not come from tropic hardwood i.e., Nordic pine;
- Landscape with low maintenance regime in many areas using native, drought tolerant species capable of withstanding long periods without additional water;
- Biodiversity net gain (Defra metric calculation tool).

It is recommended that the proposed landscape scheme comprises largely native or non-native species listed within the Royal Horticultural Society (RHS) plant for pollinators list.

The Proposed Development will include the creation of multiple habitats including:

- Ornamental and introduced shrub beds comprising largely native or non-native species listed within RHS plants for pollinators list.
- Amenity grassland.
- Species rich neutral grassland.
- A Sustainable Urban Drainage Feature (SuDS).
- A biodiverse green roof located on top of buildings in Plot 1.
- Mixed species native scrub.
- Small trees to be planted throughout the Site.
- Single species native hedge.

The created habitats on Site will primarily be of benefit to bats, birds and invertebrates. Species planted will include native or non-native plants of benefit to wildlife as recommended by RHS, which will attract a variety of invertebrates to the Site, in turn providing foraging opportunities for bat species. The tree planting on Site, as well as scrub, hedge and introduced shrub planting will provide additional nesting opportunities for common and widespread birds. Overall, the habitat creation on Site will provide greater connectivity between the Site and valuable habitats in the wider area, providing additional opportunities for bats and birds in the wider area.

Best practice construction measures include:

- Fencing off habitats of ecological value to prevent encroachment of the works activities and to prevent run off directly into waterbodies.
- Secure storage and safe disposal of any materials and substances to prevent accidental contamination of habitats.
- Prevention or reduction of dust spread through timing of works or damping down.
- Control of surface water runoff, including from damping down, preventing contamination of waterbodies.
- Protection of off-site nearby trees in line with BS 5837:2012: Trees in relation to design, demolition and construction, to ensure they are not damaged as a result of any proposed work such as root compaction.
- It is advised that a suitable document such as a Construction Environmental Management Plan (CEMP) should be produced to outline the necessary best practice construction methods.

On a local level, the step-wise approach outlined in Error! Reference source not found. is the means of demonstrating the steps which have been taken towards securing a net benefit for biodiversity, based on the (Diversity, Extent, Condition,

Connectivity and other Aspect of ecosystem resilience (DECCA) framework adopted by the Welsh Government.

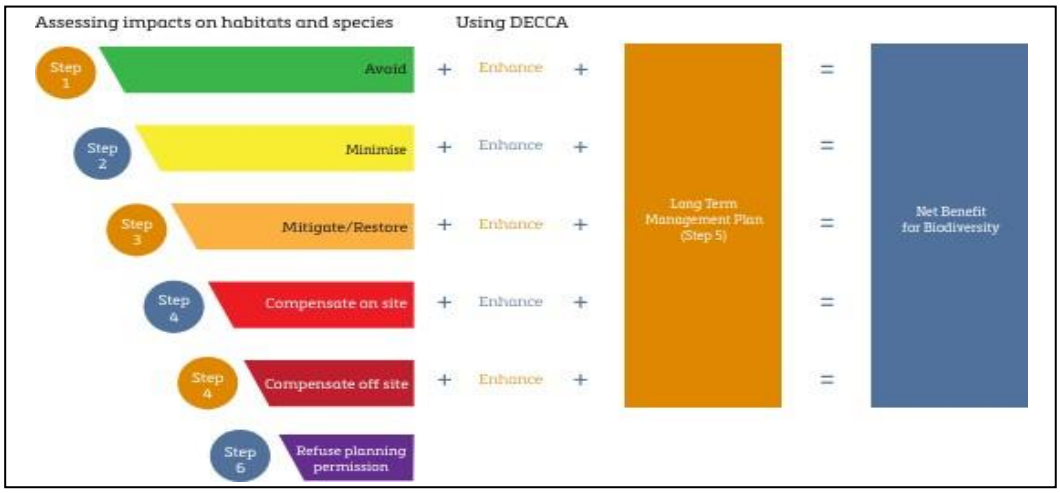

Figure 7.2 Summary of the Step-Wise Approach Adopted to Assess Impacts on Habitats and Species

8. Conclusion

Hilson Moran has been appointed by Orion Land & Leisure Ltd to prepare an Energy & Sustainability Statement to support a detailed planning application on Plot 1 of Cardiff Peninsula.

The Proposed Development will focus on mitigating key sustainability issues around the environment, mitigating the risk of climate change, adapting to the effects of climate change, prioritising a design that promotes thermal comfort and optimises the use of resource, through material, waste mitigation and water efficiency. It also considers for environmental issues around pollution, biodiversity and prioritising wellbeing of future users. The design team aims to collaborate with contractors and experts across disciplines with the commitment of maximising sustainability onsite, at both the construction and operational stages.

Energy and Carbon

The energy and carbon strategy outlined for Plot 1 aligns closely with the sustainability objectives set forth by the Cardiff City Council. The approach is designed to create a sustainable neighbourhood within the city, while also addressing the challenges posed by climate change. By adhering to the Planning Policy Wales energy hierarchy, Plot 1 aims to maximize energy savings and minimize carbon emissions through a comprehensive process.

The strategy for Plot 1 begins with a focus on reducing energy demand through passive design measures, including pushing building performance beyond standard fabric requirements. This involves considerations such as exceeding Part L 2021 fabric performance standards and implementing mixed-mode systems for optimal air flow.

Furthermore, the strategy emphasizes the efficient utilization of energy within the building, with a particular emphasis on fully electrically powered systems to align with new regulations. Heating systems, for instance, are designed to be fully electric, with underfloor heating preferred for its efficiency and occupant comfort.

Additionally, Plot 1 is planned to be connected to a district heating network, in line with Cardiff's status as a priority area for such infrastructure. This connection not only reduces reliance on fossil fuels but also ensures alignment with the city's decarbonization strategy. ASHP are to be installed as a substitute to the heat network if the scheme is not completed.

Moreover, renewable energy generation is a key aspect of the strategy for Plot 1. Feasibility assessments suggest the incorporation of photovoltaic panels on

available roof space, complemented by air source heat pumps to support heating and cooling requirements.

The energy performance of Plot 1 is assessed using the Standard Assessment Procedure (SAP), ensuring compliance with energy efficiency regulations and providing a benchmark for improvement. Overall, the strategy for Plot 1 aims to not only meet but exceed sustainability targets, contributing positively to Cardiff's vision of a sustainable city.

Climate Change

The Climate Change section of the report for Plot 1 underscores proactive measures taken to address flood risk and ensure thermal comfort amidst changing climatic conditions.

Regarding flood risk, a comprehensive assessment conducted by Hilson Moran adheres to Environment Agency guidelines and reveals that the site is at low risk from all potential flooding sources. This assessment informs design proposals aimed at mitigating any identified flood risks.

For thermal comfort and overheating prevention, the Proposed Development prioritizes compliance with Building Regulations and utilizes dynamic thermal modelling to assess potential overheating risks. Early-stage analysis suggests incorporating high-performance glazing and ventilation strategies to mitigate overheating concerns.

Social Value

the Social Value section underscores Plot 1's integral role within a Proposed Development prioritizing community enrichment and well-being. Emphasizing pedestrian and cyclist movement, efficient transport access, and access to local amenities, the design fosters a vibrant, inclusive community.

The Proposed Development's mix of uses, including residential, office, hotel, leisure, and retail spaces, not only creates new opportunities for employment and business but also enhances the overall liability of the area. Moreover, a commitment to affordable housing ensures inclusivity and accessibility for all residents.

In terms of well-being, Plot 1 prioritizes active and healthy lifestyles through the integration of pedestrian areas, cycle paths, and leisure facilities. On-site green and blue features contribute to mental and physical well-being, while efforts to improve air quality further enhance community health.

Environmental Sustainability

The Environmental Sustainability section underscores Plot 1's commitment to minimizing its environmental footprint throughout its lifecycle.

Regarding Waste Management, the Proposed Development adheres to sustainable practices outlined in the PPW waste hierarchy, prioritizing prevention, reuse, recycling, and other forms of recovery over disposal. Measures include meticulous management of waste streams during construction and operation, with a focus on reducing landfill-bound waste and maximizing resource efficiency.

Water conservation measures are integral to the Proposed Development's sustainability efforts. During construction, rainwater collection and water-efficient equipment are prioritized, while operational strategies include the use of low-water-consuming fittings and sustainable urban drainage systems (SuDS) to minimize mains water usage and promote water reuse.

Biodiversity, Blue, and Green Infrastructure initiatives aim to achieve a net gain in biodiversity and enhance ecological features on-site. Strategies include habitat creation, native planting, and measures to safeguard ecological resources during construction. By prioritizing ecological enhancements, the Proposed Development not only contributes to biodiversity but also fosters health and well-being benefits for occupants and visitors.

Appendix A – Modelled Results

Flat Type 1

Building Regulations Wales Part L (BRWL) Compliance Report

Approved Document L1 2021 Edition, Wales assessed by Array SAP 10 program, Array

Date: Fri 17 May 2024 15:39:46

Project Information			
Assessed By	Siabrag Fadil	Building Type	Flat, Semi-detached
OCDEA Registration	EES/027991	Assessment Date	2024-05-17

Dwelling Details			
Assessment Type	As designed	Total Floor Area	54 m^2
Site Reference	flat type_1	Plot Reference	OH match
Address			

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Heat network	
Target carbon dioxide emission rate	*13.87 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	2.43 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*74.0 kWh_{pe}/m^2*	
Dwelling primary energy	25.36 kWh_{pe}/m^2	OK
1c Minimum energy efficiency rating and dwelling energy efficiency rating		
Minimum energy efficiency rating	*81*	
Dwelling energy efficiency rating	85	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m²K]***	**Dwelling average U-Value [W/m²K]**	**Element with highest individual U-Value**	
External walls	*0.27*	0.15	Walls (1) (0.15)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	N/A
Curtain walls	*1.4*	0	N/A	N/A
Floors	*0.15*	0.13	Exposed Floor (0.13)	OK
Roofs	*0.13*	N/A	N/A	N/A
Windows, doors, and roof windows	*1.4*	1	W1 (1)	OK
Rooflights	*2.2*	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	12.21	0.15
Party wall: Party Wall (1)	41.24	0 (!)
Party wall: Party Wall (2)	17.84	0 (!)
Upper floor: Exposed Floor , Exposed Floor	54.09	0.13

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
W1, Opening Type 1	2.57	South West	0.96	1 (!)
L 1, Louvre Type 1	1.13	South West	0.81	1 (!)
W2, Opening Type 2	1.35	South West	0.84	1 (!)
L 2, Louvre Type 2	0.57	South West	0.78	1 (!)

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - **Main Dwelling**: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E1: Steel lintel with perforated steel base plate	SAP table default	1	
External wall	E4: Jamb	SAP table default	0.1	
External wall	E7: Party floor between dwellings	SAP table default	0.28	

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Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
	(in blocks of flats)			
External wall	E9: Balcony between dwellings - wall insulation continuous	SAP table default	0.15	
External wall	E3: Sill	SAP table default	0.1	
External wall	E20: Exposed floor (normal)	SAP table default	0.32	
External wall	E21: Exposed floor (inverted)	SAP table default	0.32	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (f)	

3 Air permeability (better than typically expected values are flagged with a subsequent (f))		
Maximum permitted air permeability at 50Pa	8 m³/hm²	
Dwelling air permeability at 50Pa	5 m³/hm², Design value (f)	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat network - Heat network	
Efficiency	
Emitter type	
Flow temperature	
System type	
Manufacturer	
Model	
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinderstore - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Charging system linked to use of heating, programmer, and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: N/A	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/l/s	
Specific fan power	0.6 W/l/s	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	91%	OK
Manufacturer/Model	AXCO MVHR1.C90	
Commissioning		

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9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.642 kWp
Orientation	South
Pitch	30°
Overshading	None or very little
Manufacturer	
MCS certificate	

10 Heat networks	
Network name: Array	
Service provision	Space and water heating
Status	New heat network
Carbon dioxide emission factor for delivered heat	0.033 kgCO$_2$/kWh
Primary energy factor for delivered heat	0.356 kWh$_{PE}$/kWh

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BRWL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BRWL Compliance Report.

Signed:		Assessor ID:	
Name:		Date:	

b. Client Declaration

N/A

Flat Type 2

Building Regulations Wales Part L (BRWL) Compliance Report

Approved Document L1 2021 Edition, Wales assessed by Array SAP 10 program, Array

Date: Fri 17 May 2024 15:40:52

Project Information			
Assessed By	Stabrag Fadil	Building Type	Flat, Semi-detached
OCDEA Registration	EES/027991	Assessment Date	2024-05-17

Dwelling Details			
Assessment Type	As designed	Total Floor Area	78 m^2
Site Reference	flat type_2	Plot Reference	OH match
Address			

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Heat network	
Target carbon dioxide emission rate	*8.98 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	1.4 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*47.34 kWh_{PE}/m^2*	
Dwelling primary energy	14.8 kWh_{PE}/m^2	OK
1c Minimum energy efficiency rating and dwelling energy efficiency rating		
Minimum energy efficiency rating	*81*	
Dwelling energy efficiency rating	89	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m²K]***	**Dwelling average U-Value [W/m²K]**	**Element with highest individual U-Value**	
External walls	*0.21*	0.15	Walls (1) (0.15)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	N/A
Curtain walls	*1.4*	0	N/A	N/A
Floors	*0.15*	N/A	N/A	N/A
Roofs	*0.13*	N/A	N/A	N/A
Windows, doors, and roof windows	*1.4*	1	W1 (1)	OK
Rooflights	*2.2*	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m²]**	**U-Value [W/m²K]**
Exposed wall: Walls (1)	17.03	0.15
Party wall: Party Wall (1)	41.24	0 (!)
Party wall: Party Wall (2)	26.04	0 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m²]**	**Orientation**	**Frame factor**	**U-Value [W/m²K]**
W1, Opening Type 1	2.81	South West	0.88	1 (!)
L 1, Louvre Type 1	1.13	South West	0.81	1 (!)
W2, Opening Type 2	1.36	South West	0.85	1 (!)
L 2, Louvre Type 2	0.57	South West	0.78	1 (!)
W3, Opening Type 3	1.89	South West	0.85	1 (!)
L 3, Louvre Type 3	1.25	South West	0.83	1 (!)

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1 - **Main Dwelling:** Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	**Junction detail**	**Source**	**Psi value [W/mK]**	**Drawing / reference**
External wall	E1: Steel lintel with perforated steel base plate	SAP table default	1	

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Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	SAP table default	0.1	
External wall	E7: Party floor between dwellings (in blocks of flats)	SAP table default	0.28	
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (f)	
External wall	E18: Party wall between dwellings	SAP table default	0.24	
External wall	E9: Balcony between dwellings - wall insulation continuous	SAP table default	0.15	

3 Air permeability (better than typically expected values are flagged with a subsequent (f))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	3 m^3/hm^2, Design value, (f)	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat network - Heat network	
Efficiency	
Emitter type	
Flow temperature	
System type	
Manufacturer	
Model	
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls		
Main heating 1 - type: Charging system linked to use of heating, programmer, and TRVs		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.62 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	AXCO MVHR C90	
Commissioning		

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.929 kWp
Orientation	South
Pitch	30°
Overshading	None or very little
Manufacturer	
MCS certificate	

10 Heat networks	
Network name: Array	
Service provision	Space and water heating
Status	New heat network
Carbon dioxide emission factor for delivered heat	0.033 kgCO_2/kWh
Primary energy factor for delivered heat	0.354 kWh$_{PE}$/kWh

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BRWL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BRWL Compliance Report.

Signed:		Assessor ID:	
Name:		Date:	

b. Client Declaration

N/A

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Flat Type 3

Building Regulations Wales Part L (BRWL) Compliance Report

Approved Document L1 2021 Edition, Wales assessed by Array SAP 10 program, Array

Date: Fri 17 May 2024 15:41:28

Project Information			
Assessed By	Stabrag Fadil	Building Type	Flat, Semi-detached
OCDEA Registration	EES/027991	Assessment Date	2024-05-17

Dwelling Details			
Assessment Type	As designed	Total Floor Area	78 m^2
Site Reference	flat type_3	Plot Reference	OH match
Address			

Client Details	
Name	Client
Company	Company
Address	Address, Town, AA11 1AA

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate		
Fuel for main heating system	Heat network	
Target carbon dioxide emission rate	*9.69 $kgCO_2/m^2$*	
Dwelling carbon dioxide emission rate	1.6 $kgCO_2/m^2$	OK
1b Target primary energy rate and dwelling primary energy		
Target primary energy	*51.04 kWh_{PE}/m^2*	
Dwelling primary energy	16.66 kWh_{PE}/m^2	OK
1c Minimum energy efficiency rating and dwelling energy efficiency rating		
Minimum energy efficiency rating	*81*	
Dwelling energy efficiency rating	88	OK

2a Fabric U-values				
Element	***Maximum permitted average U-Value [W/m^2K]***	**Dwelling average U-Value [W/m^2K]**	**Element with highest individual U-Value**	
External walls	*0.21*	0.15	Walls (1) (0.15)	OK
Party walls	*0.2*	0	Party Wall (1) (0)	**N/A**
Curtain walls	*1.4*	0	N/A	**N/A**
Floors	*0.15*	N/A	N/A	**N/A**
Roofs	*0.13*	N/A	N/A	**N/A**
Windows, doors, and roof windows	*1.4*	1	W2 (1)	OK
Rooflights	*2.2*	N/A	N/A	**N/A**

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	**Net area [m^2]**	**U-Value [W/m^2K]**
Exposed wall: Walls (1)	26.11	0.15
Party wall: Party Wall (1)	41.29	0 (!)
Party wall: Party Wall (2)	11.34	0 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	**Area [m^2]**	**Orientation**	**Frame factor**	**U-Value [W/m^2K]**
W2, Opening Type 1	2.81	South West	0.85	1 (!)
L 3, Louvre Type 1	1.13	South West	0.83	1 (!)
W1, Opening Type 3	1.89	South West	0.88	1 (!)
L 1, Louvre Type 3	1.25	South West	0.81	1 (!)
W4, Opening Type 3	1.89	South West	0.88	1 (!)
L 4, Louvre Type 3	1.25	South West	0.81	1 (!)
W3, Opening Type 1	2.81	South West	0.85	1 (!)
L 2, Louvre Type 1	1.13	South West	0.83	1 (!)

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))
Building part **1 - Main Dwelling**: Thermal bridging calculated from linear thermal transmittances for each junction

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Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E1: Steel lintel with perforated steel base plate	SAP table default	1	
External wall	E4: Jamb	SAP table default	0.1	
External wall	E7: Party floor between dwellings (in blocks of flats)	SAP table default	0.28	
External wall	E9: Balcony between dwellings - wall insulation continuous	SAP table default	0.15	
Party wall	P3: Intermediate floor between dwellings (in blocks of flats)	SAP table default	0 (!)	
External wall	E18: Party wall between dwellings	SAP table default	0.24	
External wall	E16: Corner (normal)	SAP table default	0.18	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))		
Maximum permitted air permeability at 50Pa	*8 m^3/hm^2*	
Dwelling air permeability at 50Pa	3 m^3/hm^2, Design value (!)	OK
Air permeability test certificate reference		

4 Space heating	
Main heating system 1: Heat network - Heat network	
Efficiency	
Emitter type	
Flow temperature	
System type	
Manufacturer	
Model	
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water	
Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls	
Main heating 1 - type: Charging system linked to use of heating, programmer, and TRVs	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: N/A	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	*75 lm/W*	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	*1.5 W/(l/s)*	
Specific fan power	0.62 W/(l/s)	OK
Minimum permitted heat recovery efficiency	*73%*	
Heat recovery efficiency	90%	OK
Manufacturer/Model	AXCO MVHR C90	
Commissioning		

9 Local generation	
Technology type: **Photovoltaic system (1)**	
Peak power	0.926 kWp
Orientation	South
Pitch	30°
Overshading	None or very little
Manufacturer	
MCS certificate	

10 Heat networks	
Network name: Array	
Service provision	Space and water heating
Status	New heat network
Carbon dioxide emission factor for delivered heat	0.033 $kgCO_2/kWh$
Primary energy factor for delivered heat	0.355 kWh_{pe}/kWh

11 Supporting documentary evidence
N/A

12 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BRWL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BRWL Compliance Report.

Signed:		Assessor ID:	
Name:		Date:	

b. Client Declaration

N/A

Date generated: 2024-05-17 15:41:28

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Appendix B

BRUKL Output Document

Compliance with Wales Building Regulations Part L 2022

Llywodraeth Cymru
Welsh Government

Project name

Cardiff Bay Penensula

As designed

Date: Fri May 17 18:31:21 2024

Administrative information

Building Details

Address: Cardiff,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

BRUKL compliance module version: v6.1.e.0

Certifier details

Name:

Telephone number:

Address: , ,

The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with Wales Building Regulations Part L 2022

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	16.79	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	18	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	169.25	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	193.99	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.15	0.15	External Wall
Floors	0.22	0.13	0.13	Exposed Floor
Pitched roofs	0.2	0.11	0.11	Roof
Flat roofs	0.2	-	-	No flat roofs in project
Windows**	1.6	1.06	0.93	W1b
Roof windows	1.8	-	-	No roof windows in project
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors	1.8	0.36	0.79	W2a_louvre
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for roof windows.

** Automatic U-value check by the tool does not apply to glazed doors whose limiting standard is similar to that for personnel doors. Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- extract only_WC (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	-	0.3	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- Mech Vent_Occu Spaces (7 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	-	2	0.85
Standard value	2.5*	N/A	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

3- Circulation & Stairs

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

1- District heating network

	Emission factor [$kgCO_2/kWh$]	Primary energy factor [kWh_{PE}/kWh]
This building	0.19	0.85
Standard value	0.35	1.45

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF_KI_ 1	-	-	-	-	2	-	-	-	-	-	N/A
GF_CA_ 1	-	-	-	-	2	-	-	-	-	-	N/A
GF_LK_ 1	-	-	-	-	2	-	-	-	-	-	N/A
GF_OF_ 1	-	-	-	-	2	-	-	-	-	-	N/A
GF_RC_ 1	-	-	-	-	2	-	-	-	-	-	N/A
GF_WC_ 1	-	-	-	-	0.3	-	-	-	-	-	N/A
GF_WC_ 2	-	-	-	-	0.3	-	-	-	-	-	N/A
GF_WC_ 3	-	-	-	-	0.3	-	-	-	-	-	N/A
GF_RC_ 2	-	-	-	-	2	-	-	-	-	-	N/A
GF_CA_ 2	-	-	-	-	2	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF_CO_ 1	100	-	-
GF_KI_ 1	100	-	-
GF_CA_ 1	100	100	-
GF_LK_ 1	100	-	-
GF_BK_ 1	100	-	-
GF_CO_ 2	100	-	-
GF_OF_ 1	100	-	-
GF_RC_ 1	100	100	-
GF_WC_ 1	100	-	-
GF_WC_ 2	100	-	-
GF_WC_ 3	100	-	-
GF_RC_ 2	100	100	-
GF_CA_ 2	100	100	-
GF_SR_ 1	100	-	-
GF_SR_ 2	100	-	-
GF_PL_ 2	100	-	-
GF_PL_ 3	100	-	-
GF_PL_ 4	100	-	-
GF_PL_ 5	100	-	-
GF_PL_ 6	100	-	-
GF_SR_ 3	100	-	-
GF_CO_ 3	100	-	-
GF_PL_ 7	100	-	-
GF_CO_ 4	100	-	-
GF_ST_ 1	100	-	-
GF_ST_ 2	100	-	-
GF_Laund_ 1	100	-	-
GF_BK_ 2	100	-	-
GF_SR_ 4	100	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF_CA_ 1	NO (-23%)	NO
GF_LK_ 1	NO (-49%)	NO
GF_OF_ 1	NO (-26%)	NO
GF_RC_ 1	N/A	N/A
GF_RC_ 2	YES (+43%)	NO
GF_CA_ 2	NO (-35%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	942	942
External area [m^2]	1548	1548
Weather	CAR	CAR
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	353	574
Average U-value [W/m^2K]	0.23	0.37
Alpha value* [%]	31.01	16.01

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
42	**Retail/Financial and Professional Services**
	Restaurants and Cafes/Drinking Establishments/Takeaways
12	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
6	**Residential Spaces**
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
40	**General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	1.92	8.72
Cooling	0	0
Auxiliary	5.19	3.39
Lighting	9.02	6.69
Hot water	116.21	116.2
Equipment*	74.37	74.37
TOTAL**	**132.34**	**135**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	17.75
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*17.75*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	16.34	33.05
Primary energy [kWh_{PE}/m^2]	193.99	169.25
Total emissions [kg/m^2]	18	16.79

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] District heating, [HFT] District Heating, [CFT] Electricity										
	Actual	53	0	6.6	0	9.5	2.25	0	2.5	0
	Notional	118.9	0	33	0	12.3	1	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] District Heating, [CFT] Electricity										
	Actual	18.8	0	2.3	0	12.3	2.25	0	2.5	0
	Notional	32.8	0	9.1	0	6.8	1	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] District Heating, [CFT] Electricity										
	Actual	23.2	0	2.9	0	1.7	2.25	0	2.5	0
	Notional	51.3	0	14.3	0	1.7	1	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	First surface with maximum value
Walls	0.2	0.15	External Wall
Floors	0.2	0.13	Exposed Floor
Roofs	0.15	-	No flat roofs in project
Windows and roof windows	1.5	0.8	W2c_Bottom
Personnel doors	1.5	0.14	GF_Door_2
Vehicle access & similar large doors	1.5	-	No vehicle access or similar large doors in project
High usage entrance doors	1.5	-	No high usage entrance doors in project

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

References

[1] Climate Change Act 2008: http://www.legislation.gov.uk/ukpga/2008/27/contents
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[3] Future Wales: The National Plan 2040: https://www.gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf
[4] Cardiff Local Development plan 2006-2026: https://www.cardiffldp.co.uk/wp-content/uploads/Final-Adopted-Local-Development-Plan-English.pdf
[5] Planning Policy Wales - Edition 12: https://www.gov.wales/sites/default/files/publications/2024-02/planning-policy-wales-edition-12_1.pdf
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