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FRISBY HOMES

CLIMATE RESILIENCE PLAN

FOR DEVELOPMENT OF STUDENT VILLAGE, CORK ROAD, CO. WATERFORD

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Introduction

Frisby Homes has prepared this Climate Resilience Plan (CRP) for a proposed student development on a site located at the intersection of the Cork Road and Ballybeg Drive, Waterford. The proposed development will consist of the construction of a student accommodation buildings, retail/cafe unit, hard and soft landscaping along with resident amenities.

Frisby Homes has established experience in residential and commercial construction. Frisby Homes is also currently involved in the operation and management of close to 100 student bed spaces in Waterford, and therefore is well positioned to understand the sustainability requirements in both the construction and operation of such a scheme.

The purpose of this report is to ensure that the new Student Accommodation development is a sustainable development from initial design through to construction and operation.

In Ireland, where climate change is leading to increased rainfall, sea-level rise, and the potential for more extreme weather events, climate resilience planning at the design and planning stage of developments is essential to protect infrastructure, communities, and the environment from future climate-related impacts. It also aligns with the country's climate action and adaptation goals outlined in national policies and strategies.

Development Description

Location, Size and Scale of the Development

The proposed development consists of a Large-Scale Residential Development (LRD) for a student accommodation development on a site fronting on to the Cork Road, Kilbarry Road and Ballybeg Drive at Kilbarry, Cork Road, Waterford. The proposed development will consist of the construction of 85 no. student accommodation apartments (ranging in size from 5-bed apartments to 8-bed apartments) comprising a total of 582 no. bed spaces in 4 no. blocks ranging in height from 4-6 storeys, with student amenity facilities including 1 no. retail/cafe unit, communal areas, laundry room, reception, student and staff facilities, storage, sub/switch room, bin and general stores and plant rooms. The development also includes the provision of landscaping and amenity areas including a central courtyard space, the provision of a set down area, 1 no. vehicular access point onto Ballybeg Drive, car and bicycle parking, footpaths, road improvements to Lacken Road (including a pedestrian crossing) and all associated ancillary development including pedestrian/cyclist facilities, lighting, drainage, landscaping, boundary treatments and plant including PV solar at roof level.

Figures 1 & 2 outline the site location in the context of Waterford, along with an overview of the scheme extracted from the architectural Design Statement prepared by Fewer Harrington & Partners.

Figure 1 – Site Location – Waterford

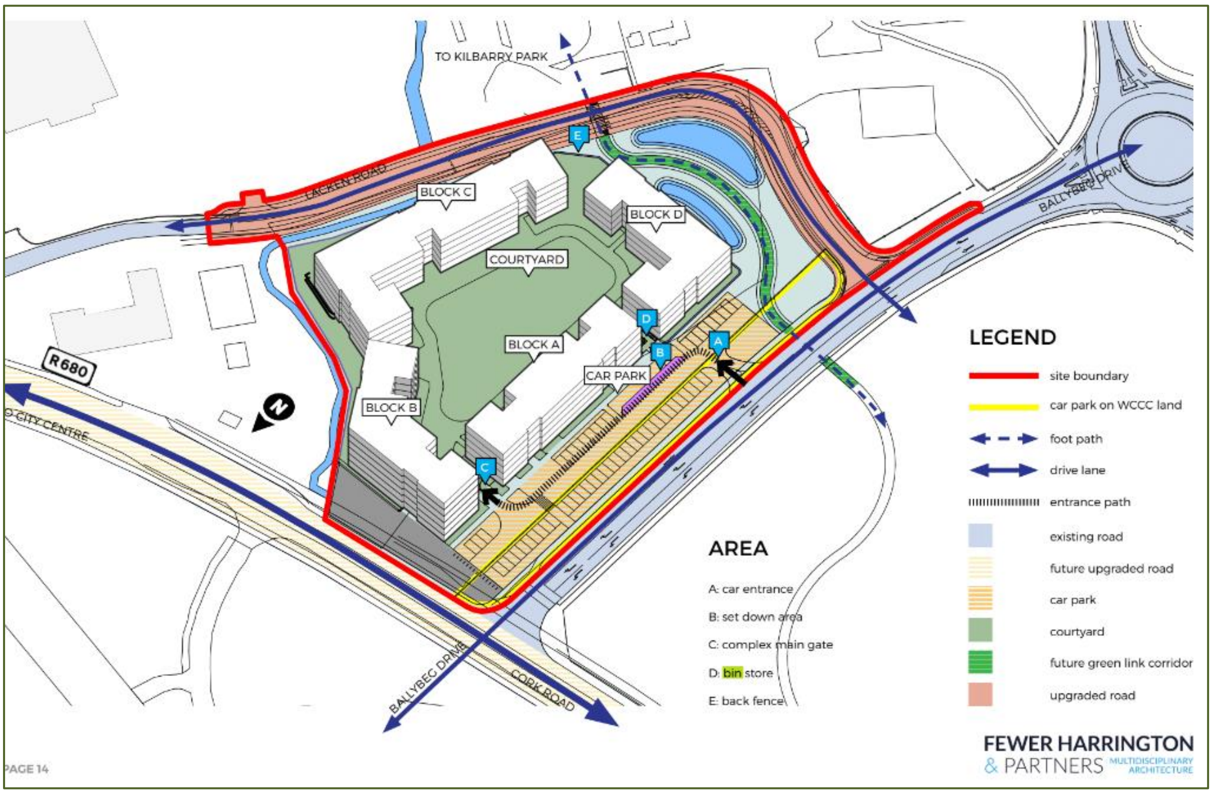


Figure 2 - Development Overview (FHP Architects)

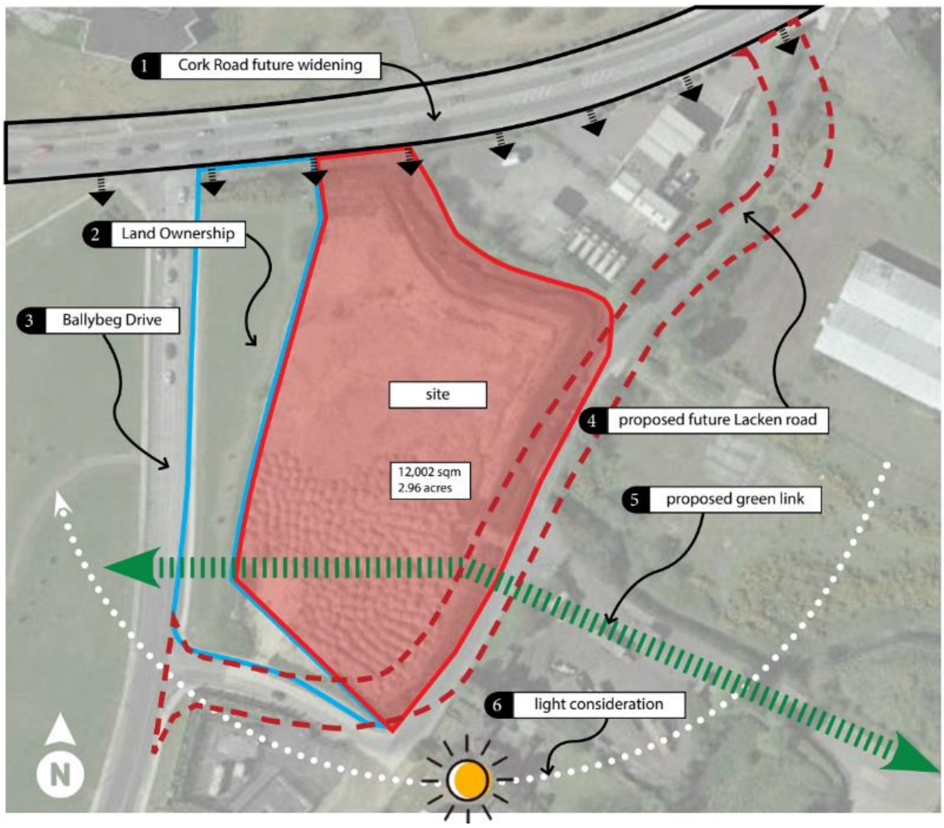
Site Selection

As outlined by Fewer Harrington and Partners in the design statement, the site area, consisting of 1.99 hectares, is located within the University District of the Kilbarry/Ballybeg neighbourhood in Waterford Metropolitan area. It is c. 3 kilometres southwest of Waterford city centre.

The area is bound to the north by the Cork Road (R680), to the west by Ballybeg Drive, to the south and east by the future upgraded Lacken Road. This is further outlined in their site analysis and constraints section in figure 3 prepared by FHP.

A variety of different uses have been considered for this site over the years. Given its proximity to WIT and now to the newly established SETU, student accommodation was always the most logical.

SITE ANALYSE & CONSTRAINTS



1 The northern expanse of the site is earmarked for the future widening of Cork Road. This delineation plays a pivotal role in establishing the building block's boundary, ensuring a comfortable separation of 14 meters from the existing road edge.

2 The land ownship of this area belongs WCCC.

3 The primary traffic influx originates from Ballybeg Drive, indicating that the western section of the site is most suited for the establishment of a car park and the main entrance.

4 The existing single-lane road will be upgraded and widened. A segment of this road traverses through the site, forming an integral part of the project's development plan.

5 The forthcoming greenlink, alongside its associated green infrastructure, must be integrated into the develop ment.

6 The masterplan must account for the duration of natural light hours to optimise both energy efficiency and the overall well-being of occupants.

Figure 3 - Site Constraints and Analysis - Source FHP Architectural Design Statement

The design of the building layout and windows has been meticulously planned to strike a harmonious balance between optimizing natural light, preventing overheating, and facilitating natural ventilation. The building's orientation takes full advantage of the sun's path, with strategically placed windows and openings that allow for ample daylight penetration into interior spaces throughout the day. To mitigate overheating during warmer seasons, the design incorporates shading devices and high-performance glazing that minimize solar heat gain while still permitting the entry of diffused natural light. Furthermore, operable windows are strategically positioned to encourage cross-ventilation, promoting the circulation of fresh air, and maintaining a comfortable indoor environment year-round. This thoughtful integration of design elements not only enhances occupant comfort but also significantly reduces the reliance on artificial lighting and mechanical cooling systems, contributing to both energy efficiency and a sustainable, pleasant living or working environment.

Energy Efficiency & Sustainability

Reducing Energy Consumptions – Building Fabric

In this student accommodation scheme, the design prioritized ample natural light and an inviting atmosphere, incorporating large, energy-efficient windows and proper building orientation. Mechanical and natural ventilation systems were designed to complement the envelope, while avoiding large running costs.

While the construction works will incur an initial investment, the lifetime running cost of the units must be considered to reduce water, fuel, and electrical energy consumption. To that end methods were explored to further improve the building's energy rating and reduce carbon emissions. This includes decreasing the thermal conductivity (heat losses) of the building fabric, taking advantage of passive solar gain to reduce the heating demand in the space and increase day lighting to reduce artificial lighting. Natural ventilation may be employed or if deemed as a requirement mechanical ventilation and heat recovery techniques will be employed to recover energy in the exhausted air.

It is proposed that this development will achieve LEED or BREEAM qualification on completion which will ensure the above is realised.

Air Permeability

One of the most significant heat loss factors in any building is through controlled and uncontrolled ventilation through the introduction of ambient/outside air into the heated space. The dwellings are to be constructed with a high degree of air tightness to a possible value of 2.5 m3/m2/hr. with a permeability test conducted post construction to demonstrate this level.

Air testing will be carried out in accordance with BS EN 13829:2001 'Determination of air permeability of buildings, fan pressurization method' & CIBSE TM23: 200 'Testing buildings for air leakage.'

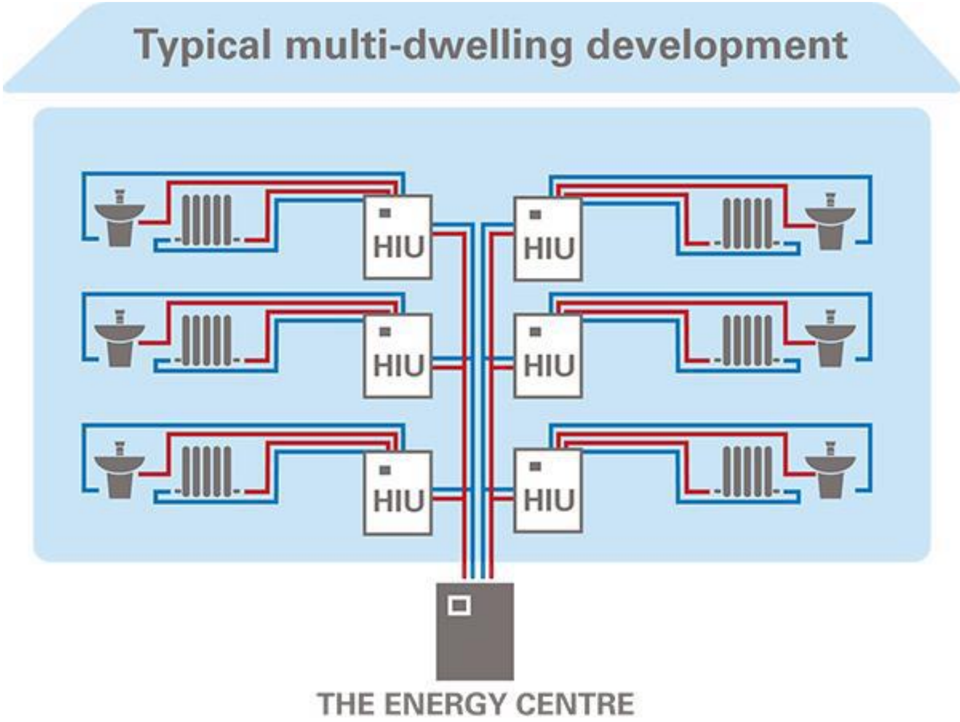
Low Carbon & Renewable Energy Solutions

The building services design plays a pivotal role in determining a building's energy consumption and, by extension, its carbon intensity. This design encompasses various systems which have been selected based on a variety of factors such as the number of units, space available for plant and access to surrounding utilities. The proposed solution includes a centralised "district heating system" located in phase 1, utilising a combination of Combined heat & power (CHP), high efficiency gas boilers and roof mounted heat pumps to supply the heating centre.

The heating centre will be located a ground floor in phase 1, with pipework emanating from here and distributed to the bedroom clusters. The scheme will also utilize solar panels mounted on the roof, and possibly heat recovery ventilation as outlined in the following page.

The below points outline how this approach will work for this specific student accommodation scheme:

1. **Combined Heat and Power (CHP) System:** The CHP system is a highly efficient way to generate both electricity and useful heat from a single energy source. To minimize carbon intensity, the CHP system will be appropriately sized and maintained for optimal efficiency. Use it as a primary source for electricity and heat, maximizing its utilization throughout the year.



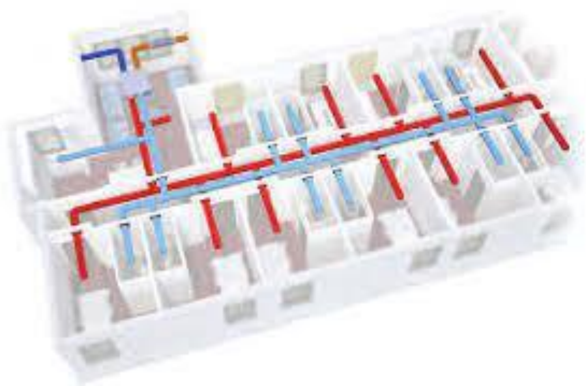
2. **Heat Interface Unit**: Each bedroom cluster will contain a Heat Interface Unit (HIU). The HIU consists of a prefabricated assembly of components that form the interface between the district heating network and each bedroom cluster's heating system and hot water system. Each HUI will contain a plate heat exchanger for the production of hot water and a central heating (radiators) heat exchanger together with control valves and a heat meter. The heat meters can sit on a data collection network for energy monitoring and billing should it be required. The proposed heat emitters in the bedroom clusters will be wall mounted radiators. Heating options for communal areas will include radiators, underfloor heating or warm air heating as required.

3. **Heat Pumps:** Heat pumps are energy-efficient systems for heating and cooling. To minimize energy consumption and carbon emissions, employ heat pumps that use renewable energy sources, such as ground-source (geothermal) or air-source heat pumps. Proper sizing and insulation are crucial to their efficiency. Implement smart controls to regulate temperatures

effectively.

4. **Solar Energy:** Solar panels will be mounted on the roof and generate clean electricity from sunlight. The scheme will maximize the use of solar energy by installing an appropriately sized solar photovoltaic (PV) system on the roof of each block. Regular maintenance will ensure to keep the panels operating at peak efficiency.

5. **Mechanical Ventilation:** with heat recovery will likely be used to ventilate each cluster, the bedrooms, bathrooms and living area. Stale humid air will be extracted from en-suites, bathrooms, kitchen, to a heat recovery unit. Fresh air will be drawn in from outside via intake grille and then passed through the heat exchanger. The fresh, tempered air will then be supplied via ductwork to the habitable rooms.



6. **Energy Storage:** In the future there may be further options to optimize the use of renewable energy, by integrating energy storage systems, such as batteries. These can store excess electricity generated during sunny days for use during periods of low sunlight or high energy demand.
7. **Smart Controls and Monitoring:** Implementation of advanced control systems that can coordinate the operation of the CHP, heat pumps, and solar panels for maximum efficiency will be explored at construction stage. This can provide real-time monitoring which in turn allows for data-driven decisions and ensures the systems operate optimally.
8. **Lifecycle Assessment:** At the time of construction, the team will consider the environmental impact of materials and technologies used in the building and energy systems. Opting for sustainable and low-impact options to reduce the overall carbon footprint.
9. **Occupant Engagement:** It will also be the responsibility of the operation management

company to educate building occupants about energy-efficient practices and encourage responsible energy consumption.

By thoughtfully integrating CHP, heat pumps, and solar energy into the building's design and operation, while still adhering to the principles of energy efficiency and sustainability, this scheme can effectively minimize energy consumption and carbon intensity, contributing to a greener and more environmentally friendly building.

Water Services

Mains potable water and non-potable water will be provided to each bedroom cluster. Mains potable will be provided at the kitchen sink in each cluster. Non-potable water will be provided to WC's, showers, wash hand basins and mechanical plant from roof mounted for 30 water storage tanks.
Water conservation is also a crucial aspect of sustainable design and can be achieved through several strategies:

1. **Low-Flow Fixtures**: Install low-flow faucets, showerheads, and toilets to reduce water usage for personal hygiene and domestic purposes. These fixtures significantly decrease water consumption while maintaining functionality.
2. **Rainwater Harvesting**: Implement a rainwater harvesting system to collect and store rainwater for non-potable uses, such as landscape irrigation and toilet flushing. This reduces the demand on the municipal water supply.
3. **Greywater Recycling**: Incorporate a greywater recycling system that treats and reuses water from sinks, showers, and washing machines for flushing toilets or irrigating gardens. This sustainable practice minimizes freshwater usage.
4. **Efficient Landscaping**: Design the landscaping with drought-resistant native plants that require less water for maintenance. Utilize efficient irrigation systems, such as drip irrigation, and install rain sensors to avoid unnecessary watering during wet periods.
5. **Education and Awareness**: Educate residents and occupants about water conservation practices through informational campaigns and guidelines. Encourage responsible water usage and leak reporting.
6. **Leak Detection**: Install automated leak detection systems to promptly identify and address water leaks, preventing unnecessary wastage.
7. **Water-Efficient Appliances**: Specify water-efficient appliances, such as dishwashers and washing machines, in the design of the units. Look for appliances with the WaterSense label, indicating superior water efficiency.
8. **Community Involvement**: Promote a sense of community responsibility by involving residents in water conservation efforts and encouraging them to share ideas and best practices.

By incorporating these water conservation measures into this scheme, it will not only reduce water consumption but also contribute to environmental sustainability, lower utility costs for residents, and promote a responsible and eco-conscious living environment.

Mains Electrical Supply

A new ESB Networks substation will be incorporated into phase 1. The sub-station will be fed from the existing ESB MV infrastructure in the area, exact details to be confirmed by ESB Networks.

The sub-station will provide supply to LV switch room containing the Main Distribution Board for all phases. Each phase will contain a local Sub-Distribution, which will in turn supply a consumer unit located in each bedroom cluster. The local sub-distribution board will contain individual electrical meters for each bedroom cluster. The electrical meters can sit on a data collection network for energy monitoring and billing should it be required.

Green Infrastructure and Biodiversity

Biodiversity, Softscape Strategy & SUDs

A biodiversity plan and landscape plan can significantly support the climate by enhancing ecosystem resilience and mitigating the impacts of climate change. Biodiverse ecosystems, rich in various plant and animal species, are better equipped to adapt to changing climatic conditions. They provide critical ecosystem services, such as carbon sequestration, pollination, and water purification, which contribute to climate stability. Additionally, biodiverse habitats, like forests and wetlands, act as natural carbon sinks, absorbing and storing carbon dioxide from the atmosphere, thus helping to mitigate greenhouse gas emissions. In essence, a robust biodiversity plan fosters healthier ecosystems that play a vital role in climate change mitigation and adaptation efforts, reinforcing the interconnectedness of biodiversity and a stable climate.

Cunnane Stratton Reynolds Landscape Architects (CSR) in conjunction with Russell Environmental have developed a planting schedule and landscape design which will support this biodiverse ecosystem both within the central courtyard and along the proposed green link corridor to the Kilbarry Nature Park. This is further outlined in the Landscape Design Rational prepared by CSR.

A sustainable urban drainage (SUDS) system has also been incorporated with ponds as opposed to underground water tanks which are a more sustainable approach to managing surface water while also supporting biodiversity. This is outlined in detail in the engineering report prepared by Malone O'Regan Engineers with an extract below;

The surface water from the development will be collected in a surface water sewer consisting of pipe sizes 225mm diameter pipes. It is proposed to provide two bio retention ponds to act as attenuation tanks. These ponds will be located in an area at the south side of the site.

Flood Risks

Flood risk zones play a central role in climate resilience planning as they are often at the forefront of climate change impacts. Climate change can lead to more frequent and severe flooding events due to increased rainfall and rising sea levels. Identifying and effectively managing flood risk zones is crucial for building climate resilience. This involves implementing measures such as improved flood defenses, resilient infrastructure, sustainable land use planning, and early warning systems. By addressing flood risk zones proactively, communities and regions can better adapt to the changing climate, reduce vulnerabilities, and protect lives and property from the escalating threat of floods.

Following initial studies of the floor maps for Waterford it was found that the site is adjacent to a flood zone due to the small river located nearby.

IE Consulting were therefore appointed to carry out a flood risk assessment, the results of which can be found in their separate report.

Traffic

Traffic and transport systems are closely linked to climate resilience as they influence both greenhouse gas emissions and a community's ability to adapt to climate change. Sustainable transportation options like public transit, cycling lanes, and pedestrian-friendly infrastructure can reduce the carbon footprint of commuting and decrease traffic-related emissions. Additionally, climate-resilient transport planning considers factors like extreme weather events, rising sea levels, and changing road conditions, ensuring that critical transportation networks remain functional during climate-related disruptions. By prioritizing resilient and eco-friendly transport solutions, communities can mitigate climate impacts, reduce emissions, and enhance overall climate resilience.

This student accommodation has the benefit of being situated a 5-minute walk from the SETU campus which will promote less car trips and more sustainable means of transport such as walking and cycling to college each day.

Coakley Consulting Engineers were appointed to prepare a Traffic & Transport Assessment, DMURs Compliance Statement, DMURs quality Audit and Road Safety Audit.

As outlined in the report, the overarching guidelines, and principles of DMURS have been incorporated within the development and the design has placed greater importance on the movements of vulnerable road users throughout the development. The site layout has also been designed with the principles of safety, connectivity, permeability, accessibility, security, and sustainability. Further detail is included in the CCE reports.

Overall, the scheme will promote sustainable means of transport for cycling and walking while also having sufficient access to sustainable public transport.

Construction Methods

Embodied Carbon

Considering whole-life embodied carbon throughout the development of this student accommodation scheme involves assessing and minimizing the carbon emissions associated with the building's construction, operation, and eventual end-of-life. This can be achieved by:

1. **Material Selection**: Opting for construction materials with low embodied carbon, such as recycled or locally sourced materials. Assess the carbon footprint of materials throughout their lifecycle, including extraction, production, transportation, and disposal. Modular and offsite construction will also play a key role in delivering this project. Modular or prefabricated construction methods, which often lead to less material waste and reduced onsite construction time, thus lowering embodied carbon.
2. **Design Efficiency**: Design the building for longevity and adaptability to reduce the need for frequent renovations or demolitions. Prioritize energy-efficient designs to decrease operational carbon emissions over time.
3. **Carbon Accounting**: Conduct a comprehensive carbon assessment of the entire project, from construction to demolition. This includes considering the carbon footprint of construction equipment, transportation, and energy use during construction.
4. **Sustainable Practices**: Implement sustainable construction practices like minimizing waste, recycling materials, and reducing energy consumption during construction.
5. **Renewable Energy**: Integrate renewable energy sources into the building's design to offset

operational carbon emissions, such as solar panels for electricity generation or heat pumps for efficient heating and cooling.

6. **Adaptive Reuse**: If feasible, consider adaptive reuse of existing structures to reduce the carbon impact associated with new construction.
7. **Lifecycle Assessment**: Continuously assess and monitor the building's carbon performance throughout its lifecycle, adjusting as necessary to achieve carbon reduction goals.

By considering whole-life embodied carbon at every stage of development, from initial design and material selection to construction and operation, the student accommodation scheme can significantly reduce its overall carbon footprint, contributing to a more sustainable and climate-resilient built environment.

Ground Conditions

The soil on site consists of approximately 2-3m of made-up ground with sub soil from nearby sites. This is good quality fill which was brought in under waste permit. In advance of construction, it will be necessary to carry out the following;

1. **Soil Quality**: Analyse soil quality and composition to determine its bearing capacity and suitability for construction. Understand how the soil properties might change due to climate impacts, such as increased moisture or erosion will be crucial.
2. **Erosion Control**: Implementing erosion control measures to safeguard against soil erosion and sedimentation, which can result from heavy rainfall or flooding.

Given the nature and location of the site, it is anticipated that this scheme will require piling. CFA Piles will be the most appropriate solution given the minimal vibration caused in a built-up area such as this. Further detailed site investigations will be required post planning grant and in advance of commencing the detailed design.

Conclusion

In conclusion, this climate resilience plan for the student accommodation scheme in Waterford embodies best practices in sustainable and climate-resilient design and development. Through careful consideration of factors like water conservation, embodied carbon reduction, and material selection, this plan demonstrates a holistic and forward-thinking approach to addressing the challenges posed by climate change. By integrating renewable energy sources, sustainable construction methods, and adaptive design strategies, this project not only aims to reduce its environmental impact but also prioritize the well-being and comfort of its occupants. The scheme when completed will have a strong commitment to minimizing carbon emissions, conserving resources, and enhancing overall resilience.