Part of the Contollo Group

Energy Statement

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Birtles House, Unit 1
Market Place, Civic Centre,
Wythenshawe, Manchester,
M22 5RE
Plot C2 – Apartment Block
PA1802

Client
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1.0 Executive Summary

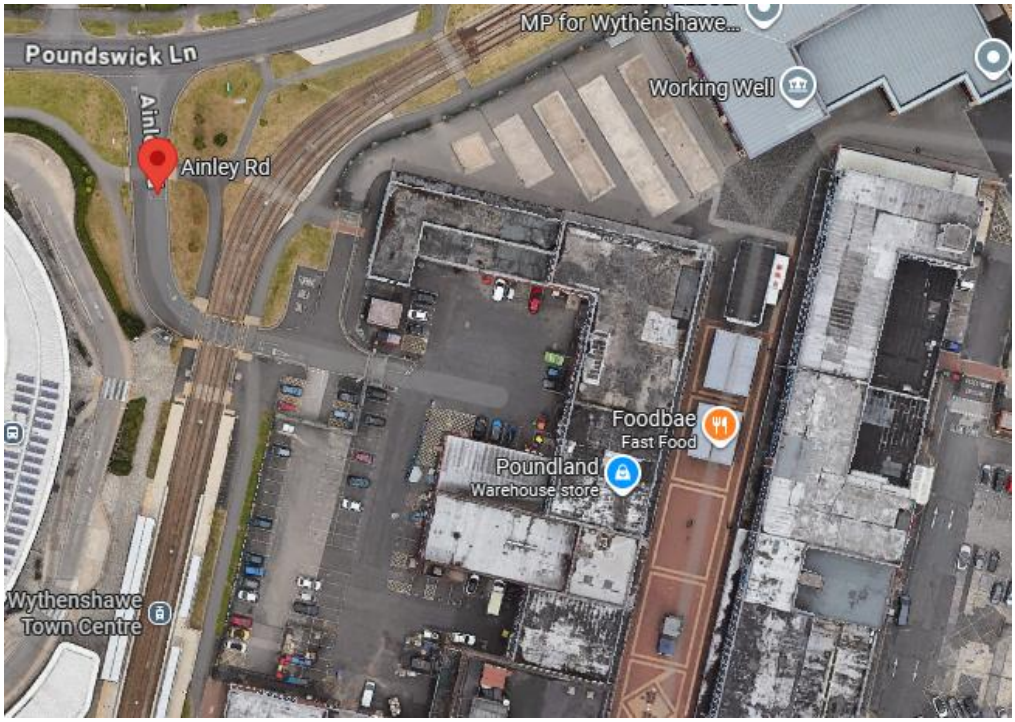
This Energy report has been prepared on behalf of Muse and Wythenshawe Community Housing Group. This report is to support the planning application for Birtles House, Unit 1 Market Place, Civic Centre, Wythenshawe, Manchester, M22 5RE.

The report shall demonstrate compliance with local, national policies and frameworks. The regional and local policies have been considered in particular GMCA places for everyone.

The proposed development complies with the requirements of the Building Regulations Approved Document L2.

The statement details how through the sustainable fabric first design incorporating the energy hierarchy the planning policies are met.

The development Apartments achieves **a 64.66 % DER < TER** over the latest version of Part L Building Regulations baseline for the typical apartment., The carbon improvement is 64.7% This substantially exceeds the compliance requirements.



1.1 Introduction

The site is located at Birtles House, Unit 1 Market Place, Civic Centre, Wythenshawe, Manchester, M22 5RE. The scheme is known as Plot C2.

The scheme comprises of the demolition of existing retail and office building, landscape buffer between site and tram line, erection of 81 no. affordable apartments (Use Class C3) and workplace / retail units (Use Class E) as follows:-

Apartments

- 26 x 1B2P
- 55 x 2B3P

Workplace / Retail

- Retail A NIA 92sqm
- Retail B NIA 88sqm
- Workplace / Retail C 88sqm

The project is the first phase of a wider development for the regeneration of Wythenshawe Civic Centre, through targeting realistic and deliverable interventions in the short term, seeks to promote the Civic Centre as a vibrant and diverse centre which acts as a focal point for retail, leisure and wider services where people want to spend time. This in turn will assist the regeneration and rejuvenation of the local area.

` Greater Manchester has committed to achieving carbon neutrality by 2038. The region launched its Five-Year Environment Plan, which includes an accompanying carbon budget. Greater Manchester highlights that transforming infrastructure, homes, and buildings to be part of a smarter local energy system is a key to Carbon neutrality. Recognising the need to translate the strategic vision to an implementable plan of action, Greater Manchester combined authority (GMCA) have produced a Local Area Energy Plan (LAEP).

The LAEP included the transformation needed across each district, identifies the first steps to progress, and provides a robust plan to engage businesses and citizens. The technologies and future trends considered and assessed for meeting Greater Manchester's carbon neutrality targets included: thermal insulation, heat pumps, district heating, electric resistive heating, hydrogen boilers, solar photovoltaics, wind turbines, electric vehicles, demand flexibility, and energy storage.

This scheme shall follow the principles of the Manchester's LAEP which encompasses places for everyone adopted in 2024. The MEP design has taken a fabric first approach.

The design intention is to develop a fabric fist approach under the "mean" "lean" "green" philosophy. Fabric improvements have been issued to the design team and an preliminary target set as an add on to the base design.

This shall be further developed as we progress the design when achievable levels of fabric improvements have been agreed.

2.0 Planning

The following section covers national, regional and local policies.

2.1 Planning Policies and National Guidance

The Local Planning Authority (LPA) is Manchester Borough Council.

The GMCA Core Strategy 2025-2035 is a key component to achieving the requirements of the planning authority.

https://www.greatermanchester-ca.gov.uk/what-we-do/planning-and-housing/strategic-planning/places-for-everyone/net-zero-design-guidance/

The National Planning Policy Framework (NPPF)

The NPPF emphasises that the planning system must proactively steer development toward sustainable outcomes.

It outlines three interdependent and mutually reinforcing objectives for achieving sustainable development:

Economic: Support a strong, responsive, and competitive economy by ensuring that land is available in the right locations and at the right time to foster growth, innovation, and productivity. This also includes planning for the necessary infrastructure.

Social: Create strong, healthy, and inclusive communities by delivering a sufficient supply and variety of homes to meet both current and future needs. This involves promoting well-designed, safe places with accessible services that support community wellbeing.

Environmental: Protect and enhance the natural, built, and historic environment. This includes improving biodiversity, using natural resources wisely, reducing pollution and waste, and promoting a low-carbon future to address climate change.

These objectives are not standalone; they must be pursued together, as they support and strengthen one another. The planning system should aim to achieve net gains across all three pillars.

To deliver truly sustainable development, economic, social, and environmental benefits must be considered together and from the outset, both in plan-making and in individual decisions, balancing aspirations with viability and cost.

The development has embraced these core principles throughout its planning and design process, ensuring that sustainability is embedded in every decision.

Climate Change Action 2008

All new developments must support the zero-carbon target, demonstrate net positive energy contributions where possible, integrate with city-wide carbon monitoring systems, and support community energy initiatives

Building Regulations Part L

The landlord areas within this building are currently complying with Part L2 with an actual building emissions rate (BER) demonstrating reduction in carbon emissions in comparison with the notional building target emissions rate (TER).

National Policies

Policy	Key Requirements / Details	How the Development Meets This Policy
Climate Change Action 2008	This legal framework states that Development must contribute to national net zero by 2050 target, support statutory carbon budgets, and demonstrate long-term carbon reduction trajectory.	The scheme adopts an all-electric design, removing reliance on fossil fuels and supporting the national Net Zero 2050 target. Use of a high-efficiency Air Source Heat Pump (ASHP HW unit) and an MVHR system with a low air test significantly reduces operational carbon emissions, demonstrating a clear long-term decarbonisation pathway.
Net Zero Strategy 2021	Requirements include building decarbonisation measures, renewable energy deployment, energy efficiency improvements, and transition to low carbon heating systems.	The design delivers enhanced fabric performance with low U-values that minimize energy demand by **64.66 % DER < TER** The inclusion of ASHP HW and Vent Axia MVHR technologies provide low-carbon heating and ventilation, promoting renewable energy use and improving overall energy efficiency in line with policy requirements.

Regional Policies

Places for Everyone is a long-term plan of nine Greater Manchester districts (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) for jobs, new homes, and sustainable growth. It has been published by the GMCA on behalf of the nine districts.

The plan is a joint development plan of the nine districts which will determine the kind of development that takes place in their boroughs, maximising the use of brownfield land and urban spaces while protecting Green Belt land from the risk of unplanned development.

It will also ensure all new developments are sustainably integrated into Greater Manchester's transport network or supported by new infrastructure.

Policy	Description	Key Requirements / Details	How the Development Meets This Policy
Greater Manchester 5 Year Environmental Plan	Regional Environmental strategy and carbon targets	Development must contribute to carbon neutrality by 2030 and 50% reduction in emissions by 2030 through enhanced building energy efficiency and renewable energy deployment	All-electric conversion with ASHP HW units (hot water), Vent Axia MVHR Mechanical ventilation recovery, and fabric (low U-values) reduces operational emissions. Combined measures deliver a reduction in operational carbon emissions relative to

			the baseline, supporting GMCA's decarbonisation targets.
Truly Affordable Net Zero (TANZ) Homes Task Force	Initiative to deliver net zero affordable housing	Requires the delivery of 30,000 net zero social rented home by 2038, with all new social housing achieving carbon neutral performance using enhanced design and construction techniques, and efficient energy systems.	The design applies net-zero ready measures (improved fabric, ASHP HW units, MVHR) consistent with Measured energy savings = **64.66 % DER < TER**.
Greater Manchester Local Energy Market (GM LEM)	Framework for local energy systems and trading	Development should support local energy generation, enable energy storage systems to facilitate community energy projects, and integrate with smart energy networks.	Measured energy savings = **64.66 % DER < TER**

Local Policies

Local policies from Manchester City Council provide the most detailed and site-specific requirements for energy sustainability in residential development. These policies reflect Manchester's position as a climate leadership city and establish enhanced performance standards that support the delivery of the city's zero carbon ambitions by 2038.

Policy	Description	Key Requirements / Details	How the Development Meets This Policy
JP-P-1: Sustainable Places	Sustainable development policy	Requirements include, demonstrating sustainable design Space heating house < 20 kWh/m2/yr Space heating flat < 15 kWh/m2/yr	C2 scheme demonstrates energy efficiency through enhanced building fabric, MVHR, and responsible material selection to reduce embodied carbon. Construction methods will prioritise durability and reduced waste, while operational efficiency will exceed Building Regulations requirements. Collectively, these measures ensure the development meets the intent of JP-P-1 by promoting energy-efficient, low-carbon, and sustainable construction practices.
JP-S 2: Carbon and Energy	Strategic policy on carbon reduction and energy efficiency	All developments must be carbon neutral by 2038, exceeding Building Regulations energy performance standards, maximise renewable energy generation, connect to heat networks where viable, and demonstrate whole-life carbon assessment	C2 development follows a fabric-first design approach to significantly reduce energy demand and operational carbon emissions. The building fabric achieves high insulation levels and airtightness, with optimised glazing to balance daylight and heat gains. Mechanical ventilation with heat recovery (MVHR) is included to minimise heat loss while ensuring good indoor air quality. Heating and hot water will be provided through efficient ASHP which provides a sustainable solution tyo low carbon delivery of hot water. contributing to Greater Manchester's 2038 net zero objective. PV has been set out to achieve 40% of the building footprint at roof level.
JP-S 3: Heat and Energy Networks	District heating and energy infrastructure policy	Development must connect to existing heat networks where available, enable future connection to planned networks, provide infrastructure for heat network development and support community heating schemes	The development supports the aims of JP-S3 by promoting low-carbon, energy-efficient heating infrastructure. Although the site is not currently within a designated heat network zone and shown as 'potential heat network zone' the design will allow for future connection to a district or communal heat network should one become available in Wythenshawe Town Centre.

Policy	Description	Key Requirements / Details	How the Development Meets This Policy
Core Strategy Policy EN 4: Reducing CO_2 Emissions	Strategic policy for carbon reductions in development	Reducing CO_2 Emissions	The development reduces carbon emissions through a fabric first approach
Core Strategy Policy EN 6: Target Framework for CO_2 reductions	Specific targets and implementation framework	Developments must achieve 31% reduction in CO_2 from baseline standards.	The proposal contributes to Manchester's CO_2 reduction targets by adopting efficient building fabric first approach.
Core Strategy EN8: Adaptation to Climate Change	Ensuring the development is adaptable	Developments must ensure resilience to overheating, water stress and energy supply risks.	The design has been developed with water saving devices and been tyestyed with Thermal modelling tyo ensure its resilient to climate change.

Manchester's Climate Change Framework establishes the city commitment to carbon neutrality.

Zero Carbon City 2038

The development demonstrates that it substantially exceeds the requirements set out in the policy.

Carbon Budget Framework

The proposal demonstrates that the development will exceed the targets set within the framework.

3.0 Energy & Sustainability Strategy

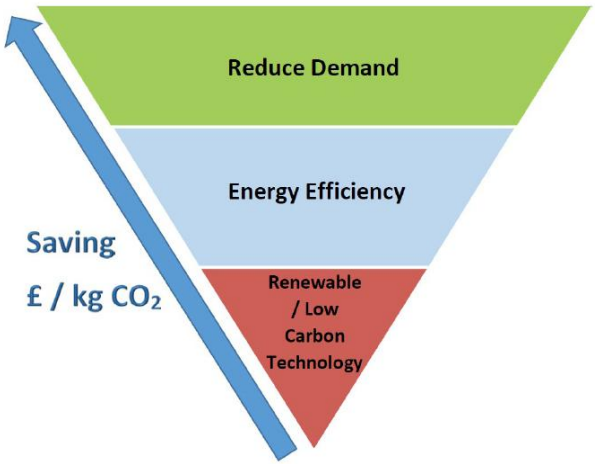
Low or Zero Carbon (LZC)
By adopting the Be Lean 'fabric first' approach along with energy efficiency features and suitable low or zero carbon system allowed the scheme to achieve required carbon dioxide reduction compliance with Part L, therefore renewables were adopted within the design philosophy. At this stage the advised source of low or zero carbon energy is photovoltaics.

3.1 Introduction

A sustainable building will be delivered through the utilisation of a holistic approach, which considers, plans and monitors the use of natural resources. The strategy for achieving this is outlined as follows:

The Low Carbon Design Hierarchy
The strategy for reducing carbon dioxide (CO_2) emissions and energy consumption within the proposed development at Wythenshawe will be to embrace a lean, mean and green approach as defined below.

- Lean – the use of advanced building modelling software and passive construction techniques.
- Mean – Incorporation of high-efficiency systems and effective controls throughout the design.
- Green – Incorporation of renewable energy sources where possible



3.1.1 Lean – Building Passive Measures

The following passive measures are to be included within the design of the development, to reduce energy use and the associated CO_2 emissions.

- Improved building fabric parameters over those required by Building Regulations Part L
- Windows with high thermal insulation
- Improved air permeability
- Maximisation of daylight
- Optimise glazing solar energy transmittance

Enhanced Insulation to The Building Envelope
Limiting heat losses across the entire building envelope will future proof the energy efficiency of the development over its whole life. To achieve this, the fabric thermal U-Value requirements as detailed within Approved Document L of the Building Regulations will be improved upon.

The table below shows the limiting U-values required to meet Building Regulations compared to the targeted values which exceed the Building Regulations requirements.

The targeted values as noted will be confirmed during the detailed design stage of the building in conjunction with finalisation of the energy efficiency measures included to meet the CO2 emission rates required by Building Regulations.

Building Element	Building Regulations Limiting Value ($W/m^2.K$)	Proposed Construction Value ($W/m^2.K$)
Roof	0.16	0.1 - 37% improvement
37External Wall	0.26	0.15 -40% improvement
Ground/Exposed Floor	0.18	0.1- 45 % improvement
External Windows	1.6	1.0 -37.5% improvement
Glazed Doors incl. frame	1.6	1.6

Engineered Facade Design
For the development, the glazed proportion of the building façades and the glazing location will be designed to maximise the use of natural daylight to offset demand for artificial lighting.

Building Element	AD L Solar G Value	Target Solar G Value
Glazed Units	0.48	0.4

Reduced Air Permeability
The extension at the development will be constructed to improved building airtightness criteria beyond the level required to comply with Building Regulations.

Building Regulations Document	Maximum allowable air permeability ($m^3/m^2.hr$ at 50 Pa)	Targeted air permeability ($m^3/m^2.hr$ at 50 Pa)
Approved Document L	8.0	4.0

3.1.2 Mean – High-Efficiency Systems, Plant and Controls

High-efficiency systems, plant, controls if and equipment where required will be incorporated as follows:

Optimised Plant Controls

Control of heating and cooling plant will be optimised, and weather compensated to ensure plant operates as close to demand as possible and not at full capacity.

Variable Speed Drives

Variable speed drives shall be installed where possible on circulation pumps and ventilation fans to allow the speed of the respective motors to be amended by the automatic controls to suit changing load of the building. This will ensure energy usage matches demand requirements.

Energy Efficient LED Lighting

Internal lighting within the areas covered by Part L2 analysis will incorporate energy-efficient LED lighting where practicable.

Lighting controls will be provided to limit energy use.

Automatic presence detection will be included in appropriate areas. This form of control will ensure lights are automatically switched off during periods of non-occupancy.

External lighting will be designed to incorporate energy efficient luminaires and an automatic lighting control system utilising daylight sensors and time clock control to ensure energy-efficient operation of the lighting.

High Efficiency Heat Pumps

Electric panel heaters have been considered for majority of the zones within the building under analysis. Having said that, those areas that will utilise comfort cooling within the building shall utilise a high efficiency air source heat pump.

High Efficiency Water Heaters

Domestic hot water demand for the zones under landlord area will be provided by instantaneous at the point of use electric hot water system.

Heat Recovery on Ventilation Systems

All non-residential zones are modelled as natural ventilated areas. Only exception was Parcel room, where extract fan has been utilised.

3.1.3 Green – Renewable Technologies

The design of the building as detailed above place emphasis on passive energy saving by careful design of the building and the building services. The thermal modelling undertaken based on the TACE M&E design strategy demonstrates that the passive design measures in conjunction with solar photovoltaics will meet the CO_2 requirement for Building Regulation Part L2 2021 compliance.

In line with Places for Everyone 40% of the building area at ground floor will have photovoltaic panels located on the roof.

3.4 District Heat Network

A District Heat Network (DHN) utilises heat energy generated from a centralised energy centre and distributes it to buildings through a network of pipes.

This system comprises several key components:

- **Heat Energy Source/Energy Centre**: This is where heat is generated, typically from sources like power stations, energy from waste plants, geothermal energy, or Combined Heat and Power (CHP) units. Increasingly, renewable sources such as heat pumps, solar thermal panels, and solar photovoltaics (PV) are also integrated into modern DHN systems.
- **Primary Pipeline Network**: This network distributes the generated heat from the energy centre to various buildings and facilities connected to the DHN.
- **Heat Exchanger Substations**: Located within or near buildings, these substations transfer the heat from the DHN to the building's internal heating and hot water systems.
- **Secondary Piped Network**: This network circulates hot water throughout the building, providing both heating and domestic hot water to occupants.

District heat networks are recognised as sustainable technologies because they often utilise waste heat and renewable energy sources. This approach significantly reduces reliance on fossil fuels and lowers carbon emissions, contributing to environmental sustainability goals.

The versatility of DHN systems allows them to supply both heating and hot water services to buildings efficiently. By centralising heat production and distribution, DHNs optimise energy use and reduce operational costs for connected buildings. They play a crucial role in urban planning and sustainable development by promoting energy efficiency, reducing environmental impact, and enhancing the resilience of heating systems to fluctuations in energy supply and demand.

District Heat Network (DHN) - Summary

A heat network is being considered for the Wythenshawe area under a wider master plan to include potentially include Manchester airport and Wythenshawe hospital.

The report on viability is being developed to address:-

- 2025 UK Infrastructure Strategy: government mission to make the UK a “clean energy superpower”
- Reducing reliance on gas and improving resilience of supply
- Minimising spikes in price due to external conflict
- Overarching National Policy Statement for energy 2025: States that reducing total demand for energy is a key element of the government’s strategy for meeting its energy objectives, and increasing contribution of decentralised and smaller-scale energy infrastructure is a part of that.
- NESO A clean power plan for Great Britain by 2030: key priority is unlocking flexibility of demand and supply.
- Net Zero Accelerator: investigating the investment required for Wythenshawe to become a Net Zero neighbourhood, and identifying funding streams to cover what the market cannot viably deliver – one stream is on Energy Generation & Storage

District heating has not been considered viable at this stage due to the timeframes of the viability report and commissioning the network – It is not proposed to be incorporated into scheme at this design stage.

3.5 Heat Pumps

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Heat pumps are versatile systems that harness thermal energy from renewable sources such as air, earth, or water. Depending on the specific heat source utilized, they are categorized as air source heat pumps (ASHPs), ground source heat pumps (GSHPs), or water source heat pumps (WSHPs).

ASHPs extract heat from ambient air, GSHPs from the ground, and WSHPs from water bodies. Once extracted, the thermal energy is upgraded to a higher and more useful temperature suitable for heating spaces or providing hot water. This process typically results in heat pumps supplying more energy than they consume, with efficiency ratios often ranging from 2.5 to a maximum of 5 times greater output compared to input energy.

The operation of heat pumps primarily relies on electrical input, converting the renewable thermal energy into usable heat without directly burning fossil fuels. This characteristic makes heat pumps a sustainable alternative for heating applications, significantly reducing dependency on traditional heating systems powered by fossil fuels. As a result, the adoption of heat pumps contributes to lower greenhouse gas emissions and supports efforts to mitigate climate change.

By utilising heat pumps, buildings can achieve enhanced energy efficiency and environmental sustainability. These systems play a pivotal role in reducing carbon footprints and promoting cleaner energy practices in residential, commercial, and industrial settings. The versatility and efficiency of heat pumps make them a viable choice for achieving energy savings, reducing operational costs, and advancing towards a greener future.

3.5.1 Air Source Heat Pump (ASHP)

Air source heat pumps (ASHPs) utilise ambient air to extract heat, even in temperatures as low as minus 15°C, making them effective in diverse climates.

For space heating, ASHPs typically distribute heat through underfloor water-based heating systems or fan coil units, both of which can be installed internally to optimize efficiency. Moreover, ASHPs often feature a reversible cycle, enabling them to provide cooling as well. In this mode, the refrigerant absorbs heat from inside the building, evaporates into a gas, and expels the heat outdoors through air-cooled condensers, thereby cooling the indoor space.

ASHPs offer significant advantages in energy efficiency and versatility, making them a preferred choice for sustainable heating and cooling solutions in residential, commercial, and industrial settings. Their ability to operate effectively in cold climates and provide both heating and cooling capabilities underscores their importance in modern HVAC systems, contributing to reduced energy consumption, lower carbon emissions, and enhanced comfort levels year-round.

Air Source Heat Pump (ASHP) - Summary

Appropriateness of Technology to the Site/System Viability: Air source heat pumps (ASHPs) provide efficient heating and, in some cases, comfort cooling at relatively low capital costs. This makes them a viable option for installation, especially when compared to the

complexity and cost associated with district heat networks. ASHPs offer flexibility in deployment, making them suitable for a wide range of building types and locations.

Lifetime and Payback

- **Lifetime**: Estimated at 15 to 20 years.
- **Payback**: Typically, no immediate payback due to the initial investment costs, but significant operational savings over the system's lifetime.

Land Use: ASHP systems typically require external condensers for heat exchange, which should be considered in site planning and design to optimize space utilization and functionality.

Noise: Noise attenuation requirements for ASHPs should be thoroughly reviewed by an acoustic consultant during the design phase. Proper attenuation measures must be incorporated into the installation to ensure compliance with noise regulations and minimize any potential noise disturbance to surroundings.

Carbon Savings: ASHPs contribute to carbon savings by utilizing electricity, which has a lower carbon intensity compared to traditional gas heating systems. Grid electricity typically emits approximately 0.136 kg CO2/kWh, while gas emits about 0.210 kg CO2/kWh. This reduction in carbon emissions supports environmental sustainability goals and helps mitigate climate change impacts.

In conclusion, air source heat pumps offer a sustainable and energy-efficient solution for heating and cooling needs in various building applications. Their viability is enhanced by their efficiency, manageable capital costs, and environmental benefits compared to alternative heating technologies. Proper consideration of installation logistics, noise control measures, and carbon emissions further ensures their effectiveness in contributing to green building practices and reducing overall operational costs over their operational lifespan.

ASHP considered viable – to be considered further.

3.5.2 Ground Source Heat Pumps (GSHP)

Ground source heat pumps (GSHPs) efficiently provide space heating and hot water by extracting heat from the ground through a closed collector pipework system containing water mixed with antifreeze.

The earth maintains a consistent temperature approximately 9 - 12°C at a depth of one metre below ground level throughout the year, varying slightly based on geographical location and soil composition.

GSHPs demonstrate high efficiency, with the capability of extracting 3 to 4 kW of energy from the ground for every 1 kW of electrical energy consumed by the heat pump.

A typical GSHP installation includes essential components such as a heat pump unit, a ground collector (either in the form of boreholes or a horizontal array), a manifold to distribute the collected heat, circulation pumps for energy movement within the system, automatic and manual valves for system control, an expansion vessel, a buffer tank to store extracted energy, a hot water cylinder for heating domestic hot water, and an integrated control system to manage operations effectively.

Due to the nature of ground-source heat, which provides heat at a lower temperature compared to conventional heating systems, GSHPs are particularly suitable for underfloor heating applications. This method ensures efficient heat distribution throughout the living space, enhancing comfort and minimizing energy consumption.

Ground source heat pumps represent a sustainable heating solution that leverages the earth's stable temperature to significantly reduce carbon emissions and operational costs compared to traditional heating systems. Their versatility and efficiency make GSHPs a valuable option for residential, commercial, and industrial buildings seeking to achieve energy efficiency and environmental sustainability goals.

Ground Source Heat Pump (GSHP) - Summary
Appropriateness of Technology to the Site/System Viability: When considering the viability of air source heat pumps (ASHPs) versus ground source heat pumps (GSHPs), ASHPs generally involve significantly lower installation costs. This cost-effectiveness makes ASHPs a more preferable option for many projects compared to GSHPs. Therefore, GSHPs are not further considered for this site.

Lifetime and Payback

- **Lifetime**: Estimated at 20 years.
- **Payback**: Not calculated due to the system being deemed non-viable for implementation.

Land Use: GSHP systems typically require minimal land when using geothermal bore holes, but these tend to be expensive and are subject to the existence of suitable ground conditions. Horizontal array configurations would require more external space for installation, depending on site-specific considerations.

Noise: GSHPs generally do not pose noise issues, ensuring minimal disturbance to surrounding environments.

Carbon Savings: The calculation of carbon savings is not applicable in this context as the GSHP system is considered non-viable. However, ASHPs typically contribute to reducing carbon emissions by utilizing efficient heat transfer mechanisms and lower carbon electricity sources.
In summary, GSHPs can offer a sustainable solution for heating and cooling needs in various building applications but the costs or land take associated with their installation are significantly higher than an equivalent ASHP. On a town centre site the use of GSHP is therefore not considered to be viable.

GSHP not considered viable – not proposed to be incorporated into scheme.

3.6 Biomass Heating

Biomass, also known as biofuel or bioenergy, derives from organic matter sourced directly from plants or indirectly from various industrial, commercial, domestic, or agricultural products such as logs, wood chips, or pellets.

For optimal safety and cost-efficiency, biomass boilers should be sized to meet a base load, with gas or oil boilers serving as both top up (to deal with peak loads0 and backup sources. Achieving the desired output requires biomass boilers to operate continuously over extended periods.

Heat storage provisions enhance biomass boiler efficiency by enabling sustained operation at lower temperatures, ensuring a more sustainable energy use.

Biomass is generally considered a 'carbon-neutral' energy source because the carbon dioxide emitted during energy generation is offset by the carbon absorbed during plant growth. However, sustainability can be affected by factors such as fertilizer use, and carbon emissions from harvesting and transportation.

The cost of biomass fuel varies based on availability and quantity purchased, influencing overall operational expenses.

Access to the plant room and storage area is crucial for handling biomass fuel deliveries, which should match transportation methods for efficiency.

Flue arrangements for biomass boilers are more complex compared to gas or oil boilers, requiring regular access for ash removal.

Adequate fuel storage capacity is essential to bridge gaps between deliveries, depending on boiler size, fuel supply reliability, and fuel type. For instance, logs and wood chips require more storage space compared to pellets for equivalent heat output.

Biomass Boilers - Summary
Appropriateness of Technology to the Site/System Viability: While biomass boilers could potentially heat the development, it's important to note that despite biomass being considered carbon neutral, there are other particulates and emissions associated with burning biomass. As a result, air source heat pumps (ASHPs) are generally preferred over biomass heating solutions for environmental reasons, leading to biomass heating not being further considered for this site.

Lifetime and Payback:

- **Lifetime**: Estimated at 15 to 20 years.
- **Payback**: Not calculated as the system is not deemed economically viable for implementation.

Land Use: Biomass boiler plants and their associated fuel storage can be accommodated either Internally or externally depending on the available space at the site but tend to be space hungry. This flexibility allows for strategic placement to optimize operational efficiency and convenience.

Noise: Potential noise issues may arise during biomass fuel delivery, which could impact surrounding areas. However, this consideration is not further explored as the biomass heating system is not considered viable for implementation.

Carbon Savings: The calculation of carbon savings is not applicable in this context due to the system being considered non-viable for implementation. However, biomass heating typically offers carbon savings by utilizing renewable organic materials, contributing to lower overall carbon emissions compared to fossil fuel-based heating systems.

In summary, while biomass boilers have the potential to provide heating solutions, their viability at this site is overshadowed by environmental and practical considerations. ASHPs

are favoured due to their lower environmental impact and operational benefits, illustrating the importance of selecting sustainable heating technologies aligned with site-specific needs and environmental goals.

Biomass not considered viable – not proposed to be incorporated into scheme.

3.7 Combined Heat and Power (CHP)

Combined heat and power (CHP) systems operate on the principle of using a gas or oil-fired engine to drive a generator that produces electricity. The heat generated from the engine block, oil cooler, and exhaust is captured and utilised as a heat source within the building. While CHP is not classified as a sustainable energy source, it is highly energy efficient. It optimises energy usage by capturing waste heat from electricity production, thereby reducing CO_2 emissions.

Typically, CHP systems produce around 2 units of heat for every 1 unit of electricity generated, although this efficiency ratio can vary among different manufacturers of CHP units.

To maintain operational efficiency, there must be a consistent demand for the heat produced throughout the year. CHP plants are typically sized to supply no less than 45% of the annual total heating demand for optimal performance.

In residential developments, micro-CHP systems can be implemented to meet heating, and electricity needs efficiently on a smaller scale.

3.8 Wind Power

Wind power harnesses the natural energy of wind and converts it into electricity through wind turbines.

Wind turbines come in various sizes and capacities, ranging from small-scale units generating a few hundred Watts for applications like battery charging systems, to larger turbines with capacities of 2-3 Megawatts connected to the National Grid. The actual output depends on wind conditions, typically averaging around 30% of the turbine's rated capacity in a good wind site.

Most small turbines generate direct current (DC) electricity, requiring an inverter to convert it into alternating current (AC) suitable for household use.

There are two main types of wind turbine systems:

- **Off-Grid Systems**: These systems include batteries to store excess energy generated by the turbine. An additional controller ensures the batteries remain within optimal charging levels. When batteries are fully charged, the controller redirects surplus electricity to power other appliances such as space and water heaters.
- **Grid-Connected Systems**: These systems do not incorporate batteries. Instead, they use a controller and inverter to regulate the electricity output to meet grid standards. Excess electricity can be exported back to the grid via an export meter, allowing users to sell surplus energy to electricity suppliers.

Wind energy output is sensitive to slight variations in wind speed, which increases with height. Therefore, comprehensive knowledge of local wind resources is essential to maximize turbine efficiency.

Summary of Appropriateness of Wind Power Technology at Development
Wind turbines could potentially generate electricity for onsite consumption, reducing grid reliance. However, analysis of wind speed data from the NOABL wind map indicates that wind speeds at Manchester Wythenshawe areas, fall below the minimum required annual threshold for viability.

Consequently, the installation of wind turbines is not considered feasible at this location.

Further Considerations:
Lifetime and Payback: Estimated lifetime of the system is 20 years; however, payback calculations are irrelevant due to the non-viable status.

Land Use: Potential placement of turbines could impact natural areas within the development, though this concern is academic given the lack of viability.

Noise: Requirements for noise attenuation were to be reviewed but are unnecessary given the non-viable status.

Carbon Savings: Calculations are not applicable as the system is deemed non-viable.
This summary clarifies that despite potential benefits, such as local electricity generation, the insufficient wind speeds render wind power unsuitable for implementation at Wythenshawe.

Wind power not considered viable – not proposed to be incorporated into scheme.

3.9 Photovoltaic (PV) and Battery Storage

3.9.1 Photovoltaics (PV)

Photovoltaics (PV) harness solar energy to generate electricity, suitable for powering household appliances, computers, and lighting.

Key Points:

- PV panels convert solar energy into DC electricity. To use this DC current for plant and equipment, DC motors are required, or an inverter and related equipment can convert it into AC for building or grid use.
- Multiple PV modules can be interconnected to achieve the desired electrical output.
- South-facing PV panels, angled at 35°, typically produce about 150 kWh/yr/m² of DC electrical energy or 110 kWh/yr/m² of AC electrical energy. East or West-facing panels yield approximately 80% of the output of South-facing panels.
- PV systems are versatile and can be integrated into various structures such as sloped roofs, flat roofs, facades, atria, and shading devices. They can be mounted using frames or integrated into building materials, like PV roof tiles replacing standard tiles.

This summary provides an overview of how PV technology functions, its applications, and the output variations based on panel orientation and integration method.

Summary of Photovoltaic Panels

Photovoltaic (PV) technology is highly suitable for the site, capable of seamless integration with other Low and Zero Carbon (LZC) technologies. It operates independently of building services strategy but benefits from fixed building services for optimal performance.

PV panels are typically installed on roofs at a 15-45° incline, facing south for maximum efficiency. Structural considerations may necessitate adjustments for increased load and wind resistance. Noise is not a concern, and PV systems contribute to significant carbon savings compared to grid electricity, which emits 0.136 kg CO2/kWh. The lifetime of PV panels is approximately 25 years, with payback calculations pending at the next design stage. Although subject to final roof layout arrangements, it is currently envisaged that there will be a maximum of approximately 210, 220 and 300 panels located on the roofs of Blocks 01a, 01b and 01c with a maximum kWp output in the order of 85, 90 and 125 for each block respectively in the Plot 01 development.

This summary encapsulates the appropriateness, operational details, and environmental benefits of photovoltaic panels effectively.

Photovoltaics considered viable - to be incorporated into scheme design.

3.9.2 Battery Storage

Battery storage systems facilitate the release of stored electricity as needed; a process known as 'load shifting'. Ideally, these systems can shift surplus summer generation to winter months through battery storage, though daily discharge cycles are beneficial for battery longevity. This enables capturing excess daytime load for use in the evenings.

Main Factors Impacting Electrical Consumption Data:

1. **Seasonal Variation**: Fluctuations in electricity demand due to seasonal changes.
2. **Daily Usage Patterns**: Consumption trends influenced by daily routines and peak periods.
3. **Renewable Energy Integration**: Integration of renewable sources affecting demand-supply dynamics.
4. **Grid Stability**: Factors influencing grid reliability and operational efficiency.

Summary of Battery Storage Technology

Battery storage is not considered viable at the site due to insufficient energy production from solar PV to meet peak building load demands and therefore battery charging potential is limited. The lifetime of battery storage systems varies widely, typically ranging from 10 to 15 years for lithium-ion batteries. Payback calculations are not calculated as the option is not considered viable. The space required for storage units and associated equipment depends on the capacity needed. Battery storage systems operate quietly and offer carbon savings depending on their usage, as they produce no emissions during operation.

Battery storage not considered viable – not proposed to be incorporated into scheme.

3.10 Solar Thermal Water Heating

Solar thermal technology harnesses solar heat to provide domestic hot water. It operates by heating a water or water/glycol mixture through a solar absorbing panel, typically located on the roof. The heated fluid passes through a heat exchanger to heat water stored in a cylinder.

Key Considerations:

- Viability depends on the hot water demand and size of the storage vessel.
- Applications focus on generating low-grade hot water, usually between 30°C – 50°C, depending on location.
- Two main options: flat plate (approximately 30% efficient) and evacuated tube systems (approximately 40% efficient).
- Evacuated solar heat pipe collectors produce higher-grade heat energy (50°C – 70°C in summer) using refrigerant as a transfer medium.
- Continuous operation is crucial to prevent collector damage from prolonged stagnation.
- Performance correlates directly with panel orientation and inclination; optimal conditions are achieved with south-facing panels at a 45° angle.
- System autonomy can be achieved by using photovoltaics to power circulation pumps or by designing the manifold below the heat exchanger to eliminate the need for a pump.

Appropriateness of Solar Thermal Technology to the Site:
Solar thermal technology can provide hot water for domestic use within the development. However, due to longer lifespans and greater versatility, solar PV is recommended over solar thermal. Therefore, solar PV is considered preferable, and further consideration of solar thermal is not pursued. It would also be necessary to use a small number of systems with central storage rather than independent systems for each dwelling, adding the complexity of sub metering and the costs/carbon emissions associated with pipework losses and circulating the domestic hot water throughout the development. The failure of one system would therefore likely affect a large number of dwellings.

Key Details:
- **Lifetime and Payback:** Solar thermal systems typically have a lifetime of 20 years. Payback calculations are not conducted as the system is not deemed viable.
- **Land Use:** Solar collectors are typically installed on rooftops, facing south at an inclination of 30-45°.
- **Noise**: Solar thermal systems do not generate noise.
- **Carbon Savings**: Carbon savings are not calculated as the system is not considered viable for implementation.

This summary confirms that the use of solar thermal water heating for domestic hot water generation is no considered viable for this scheme.

Solar thermal water heating not considered viable – not proposed to be incorporated into scheme.

3.11 Hydropower

Hydropower harnesses the kinetic energy of flowing water to generate electricity. This process involves spinning a turbine connected to an electric generator via a shaft.

Key Points:
- Hydropower plants can be categorized into run-of-river (ROR) plants, which utilize flowing water from rivers, and pumped storage hydropower (PSH) plants, which rely on dams or reservoirs.
- The effectiveness of hydropower is influenced by locations with high flow rates, typically associated with significant changes in water level known as the head.

Appropriateness of Hydropower to the Site:

Whilst the River Mersey flows in relatively close proximity to the site, it is not considered to have sufficient or reliable enough water flow for an ROR application.

Consequently, hydropower is not considered viable for this scheme.

Hydropower is not considered viable – not proposed to be incorporated into scheme.

Summary

Low and Zero Carbon Technologies		Viable	Available Schemes
District Heat Network		No	Shall have the facility to connect when a heat network is available with space for risers and room to remove the ASHP and isntall a HIU and wet heating system.
Heat Pumps	Ground Source	No	ASHP shall be used for Domestic hot water
	Air Source	YES	
Biomass Heating		No	None
Combined Heat and Power (CHP)		No	None
Wind Power		No	The Smart Export Guarantee scheme has been available for operational use since January 2020, although the rate is not guaranteed.
Photovoltaics & Battery Storage	Photovoltaics	YES	40 % of building footprint area located on the roof
	Battery Storage	No	The Smart Export Guarantee scheme has been available for operational use since January 2020, although the rate is not guaranteed.
Solar Thermal Water Heating		No	None

4.0 Mechanical Services Design Criteria

The modelled mechanical services systems, configurations and efficiencies are all based on the current M&E design. Any deviations need to be carefully considered to ensure the minimum efficiencies are achieved.

It is the responsibility of the contractor as part of his plant selection and installation to implement these measures. Should the contractor deviate from these assumptions he will be responsible for producing a revised Part L calculation and report to demonstrate compliance.

The following table summarises the strategy adopted by TACE to the mechanical services modelling:

Type of system	System Performance Data	System Performance Values
Heating System	a) Heat Source Generator Type b) Fuel Type c) Generator Seasonal Efficiency d) Heat Recovery Effectiveness e) Delivery Efficiency	Electric Panel Heaters Grid Supplied Heaters 100% N/A 100%
DHW	a) Method of DHW generation, i.e. combi boilers, cylinder, etc. b) Size and type of DHW cylinder c) DHW delivery efficiency d) Fuel Type e) Generator Seasonal Efficiency	ASHP N/A 300% Grid Supplied Electricity 3.5
Mechanical Ventilation HRU	a) Details of all AHUs and which areas served by AHU b) Specific fan power of AHUs (W/l/s) c) Efficiency of heat recovery	HRU 1.8 75%
Control Corrections	a) Are there system provisions for metering? b) Does the system warn of 'out of range' values?	Yes No

5.0 Electrical Services Design Criteria

The modelled services systems, configurations and efficiencies are all based on the current M&E design. Any deviations need to be carefully considered to ensure the minimum efficiencies are achieved.

It is the responsibility of the contractor as part of his plant selection and installation to implement these measures. Should the contractor deviate from these assumptions he will be responsible for producing a revised Part L calculation and report to demonstrate compliance.

Due to the current design stage a standard luminaire efficacy of 95 lm/W has been applied throughout. It is, however, believed that at the next design stage this can be improved upon and therefore enhance the current BER.

The following table summarises the assumptions made to the electrical services installation:

Spaces	Power correction factor	Lighting level (Lux)	Day light dimming	Local manual switching
Circulation	0.9	100	No	Presence Detection
Comms	0.9	100	No	Manual
Stairs	0.9	100	No	Presence Detection
Store	0.9	100	No	Presence Detection
Plantroom	0.9	200	No	manual

Appendix I – Landlord Draft EPC

Energy Performance Certificate
Non-Domestic Building

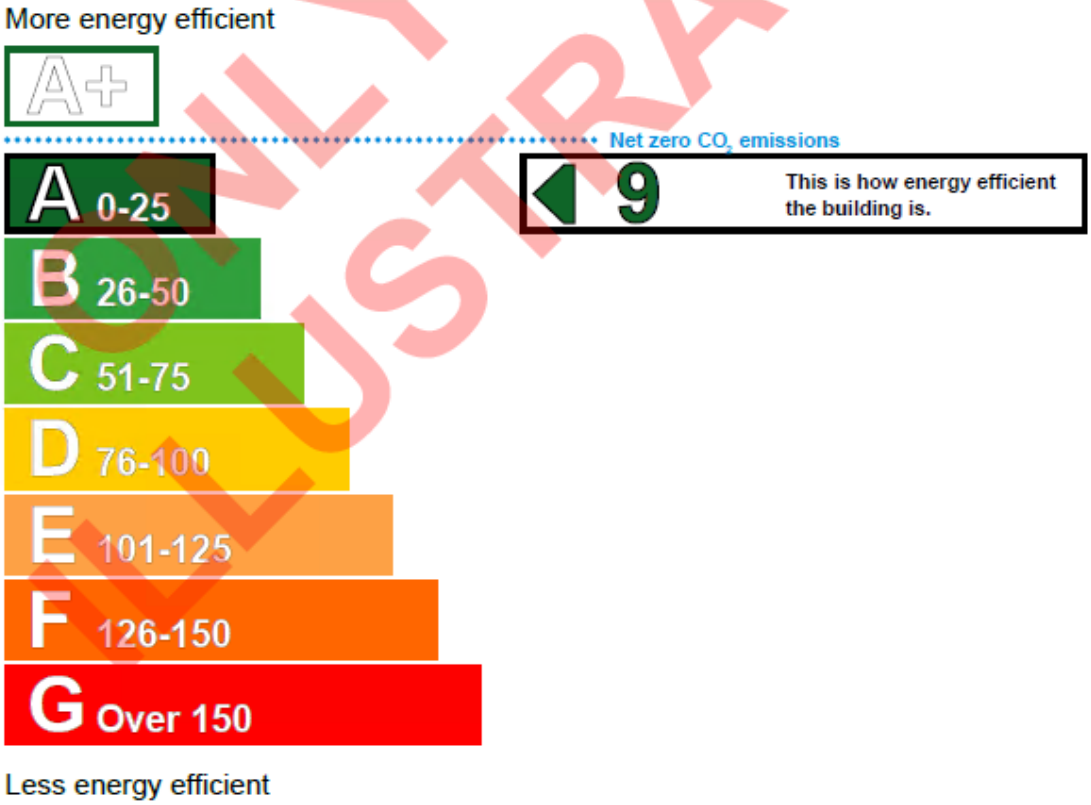
HM Government

Manchester

Certificate Reference Number:
0133-4938-7162-7502-8230

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating



Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Heating and Natural Ventilation
Total useful floor area (m^2):	1184
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	1.72
Primary energy use (kWh_{pe}/m^2 per year):	16.29

Benchmarks

Buildings similar to this one could have ratings as follows:

10 If newly built

39 If typical of the existing stock

ONLY FOR ILLUSTRATION

Appendix 11

Sample SAP

Plot Reference	DPER	TPER	% DPER < TPER	DER	TER	% DER < TER
Plot 1	46.82	68.34	31.49	4.53	12.82	64.66

Carbon Emission Improvement Summary (Single Scenario)
The carbon performance of the apartment was assessed by comparing:

- Design Emission Rate (DER) – improved design specification
- Target Emission Rate (TER) – baseline requirement

Carbon emissions were calculated using the UK carbon factor of 0.177 $kgCO_2/kWh$.

Results

Case	Annual Energy (kWh)	Carbon Factor ($kgCO_2/kWh$)	Annual CO_2 Emissions (kg)
Design (DER)	244.62	0.177	43.3
Baseline (TER)	692.28	0.177	122.53

Carbon Reduction

- Absolute reduction:
  122.53 − 43.30 = 79.24 $kgCO_2$ per year
- Percentage improvement:
  (79.24 ÷ 122.53) × 100 = 64.7% reduction
- $KgCO_2$ difference (as per sheet):
  –79.23582 $kgCO_2$
- Emission-rate difference (DER vs TER):
  –1.46733

Appendix 111

Sample EUI

C2 EUI SUMMARY **Building Specification**	
Floor (W/m2K)	0.1
Wall (W/m2K)	0.15
Roof (W/m2K)	0.1
Windows (W/m2K)	1.6
Airtightness (m3/m2h)	4.0
Thermal Bridging (W/m2K)	Recognised Construction Details
Ventilation strategy	MVHR
Space heating	Panel heaters
Hot Water	Dimplex Edel
Lighting	100% LED / Efficient Lighting
Appliances	Low Energy Appliances
PV	40% of building foot print
Energy Consumption kWh/m2GIA/yr	
Space Heating < 15kWh/m2 (Average)	**8.29**
Hot Water	**14.27**
Lighting	**2.67**
Fans & Pumps	**3.19**
Equipment & Appliances	**15.06**
Energy Use Intensity (EUI) < 35kWhrs/m2/yr	**43.48**