Mount Road, Manchester

Kellen Homes

Energy and Sustainability Statement

AES Sustainability Consultants Ltd

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Rev 1	Henry Knight	28/09/2023	Revised site layout
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Rev 3	Craig Wilson	17/05/2023	Description amendment

This statement has been commissioned by Kellen Homes to detail the proposed approach to energy and CO_2 reduction to be employed in development of Mount Road, Manchester. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved.

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Contents

1. Introduction 4
2. National Policy Framework 5
3. Local Planning Requirements 6
4. Energy Consumption and CO_2 Emissions 7
5. Future Homes Standard 10
6. Low Carbon and Renewable Energy 11
7. Total CO_2 reductions 15
8. Overheating Risk and Passive Design 16
9. Sustainable Design 17
10. Conclusions 19

List of figures & tables

Figure 1. Site Plan 4

Table 1. CO_2 Emissions improvements from successive Part L editions 7

Figure 2. The Energy Hierarchy 7

Table 2. Benefits of the Fabric First approach 8

Table 3. Proposed construction specification – main elements 9

Table 4. Individual biomass heating feasibility appraisal 12

Table 5. Solar thermal systems feasibility appraisal 12

Table 6. Solar photovoltaic systems feasibility appraisal 13

Table 7. Air Source Heat Pump systems feasibility appraisal 13

Table 8. Ground Source Heat Pump systems feasibility appraisal 14

Table 9. Sample dwelling as-designed CO_2 emissions after renewables (Part L 2021) 15

Table 10. Site-wide CO_2 emission reductions achieved 15

Table 11. Typical Water Demand Calculation 18

1. Introduction

Preface

1.1. This Energy and Sustainability Statement has been prepared on behalf of Kellen Homes in support of the application for development of Mount Road, Manchester.

Development Description

1.2. The proposal seeks to deliver 303 new dwellings across a mix of one bed apartments and 2, 3 and four bed detached, semi-detached, terraced houses and a community hub building. The site is located to the south east of the heart of Manchester.

1.3. The proposed site plan is shown in Figure 1.

Purpose and Scope of the Statement

1.4. This statement demonstrates that, by following a fabric first approach, the development will result in compliance with Part L of the Building Regulations 2021 exceeding the required improvement of 15% CO2 emissions from Part L of the Building Regulations 2010 as stated in policy EN6 within the Manchester Core Strategy, with a further reduction to be achieved through low or zero carbon systems. Due to development timescales, part of the development is likely to fall under future Building Regulations, namely the governments proposed Future Homes Standard. The statement will further detail how a proportion of the development may seek to achieve the required 75% CO_2 emissions reductions in line with this standard, likely to be introduced in 2025.



Figure 1. Site Plan

2. National Policy Framework

National Planning Policy Framework

2.1. In July 2021, the Government published the updated National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England and how these are expected to be applied.

2.2. The planning process has been identified as a system to support the transition to a low carbon future in response to climate change by assisting in the reduction of greenhouse gas emissions and supporting renewable and low carbon energy.

2.3. Paragraph 154 sets out what is expected from new developments when considering strategies to mitigate and adapt to climate change:

> 154. New development should be planned for in ways that:
>
> Avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaption measures, including through the planning of green infrastructure; and
>
> Can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

Current National Policy Standards

2.4. The NPPF requires that "local planning authorities should ...when setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards."[1]

2.5. The government introduced the next revision in Building Regulations, known as Part L 2021 in December 2021, to come into effect for buildings where construction is commenced after 15th June 2023. The new standards will require a 31% reduction in CO_2 emissions compared with the current Building Regulations standard.

[1] Department for Communities and Local Government, 2012, *NPPF, paragraph 95*

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3. Local Planning Requirements

3.1. Manchester's existing Core Strategy document was adopted in July 2012, and sets out the requirements for sustainable construction in Policy EN4 as extracted below:

Policy EN4

Reducing CO_2 Emissions by Enabling Low and Zero Carbon Development

The Council will seek to reduce fuel poverty and decouple growth in the economy, growth in CO_2 emissions, and rising fossil fuel prices, through the following actions:

- All development must follow the principle of the Energy Hierarchy, being designed:
- To reduce the need for energy through design features that provide passive heating, natural lighting and cooling
- To reduce the need for energy through energy efficient features such as improved insulation and glazing
- To meet residual energy requirements through the use of low or zero carbon energy generating technologies
- Wherever possible new development and retrofit projects, including energy generation plant, must be located and designed in a manner that allows advantage to be taken of opportunities for low and zero carbon energy supplies.
- Where possible new development and retrofit projects will be used as a mechanism to help improve energy efficiency and provide low and zero carbon energy supplies to existing buildings.
- Where appropriate new development and retrofit projects will be required to connect to and/or make contributions to low or zero carbon energy schemes and/or to incorporate provision to enable future connection to any existing / potential decentralised energy schemes.
- The use of building materials with low embodied carbon in new development and refurbishment schemes.

3.2. Further detail on CO_2 reductions is contained within Policy EN6:

Policy EN6

Target Framework for CO_2 reductions from low or zero carbon energy supplies

Applications for residential development of 10 or more units and all other development over 1,000 sq m will be expected as a minimum to meet the target shown in Tables 12.1 or 12.2, unless this can be shown not to be viable. This should be demonstrated through an energy statement, submitted as part of the Design and Access Statement. Such a statement will be expected to set out the projected regulated energy demand and associated CO_2 emissions for all phases of the development.

Developments smaller than the above threshold, but involving the erection of a building or substantial improvement to an existing building will also be expected to meet the minimum target, where viable, but will not be expected to submit an energy statement. The target framework relates to three broad development locations and their potential for low and zero carbon, decentralised energy. The areas are defined as follows:

- Target 1 Network development areas: Locations where the proximity of new and existing buildings, the mix of uses and density of development provide the right conditions to support district heating (and cooling).
- Target 2 Electricity intense areas: Locations where the predominant building type has an all electric fit-out such as retail units and leisure complexes.
- Target 3 Micro-generation areas: Locations where lower densities and a fragmented mix of uses tend to mean that only building scale solutions are practical

Domestic CO_2 emissions reduction targets

Target	% Minimum requirement
Target 1: Network development area	CHP/district heating anchor or connection or where not feasible a 15% increase on Part L 2010
Target 2: Electricity intense buildings	+15% increase on Part L 2010
Target 3: Micro generation area	+15% increase on Part L 2010

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4. Energy Consumption and CO_2 Emissions

4.1. As one of the key areas of ongoing impact of any development, the energy demand of the dwellings to be constructed is a key consideration in the overall sustainability strategy.

4.2. As set out within the policy review section of this statement, it is considered that Building Regulations form the minimum requirement for new dwellings in terms of energy performance.

4.3. As shown in Table 1, the CO_2 standards contained within Part L were increased in 2013, reducing the TER by approximately 6% (9% for non-residential).

4.4. Part L 2021 will be mandatory from June 2023, which constitutes a much larger step change of a 31% reduction in emissions.

Table 1. CO_2 Emissions improvements from successive Part L editions

Building Regulations	CO_2 emissions improvements preceding regulations
L1A 2010	-
L1A 2013	6%
L1 2021	31%

4.5. It should be noted that all calculations within this report have been calculated using SAP software available for the calculation of Part L 2021.

Energy Reduction Strategy – Fabric First

4.6. The proposed construction specification and sustainable design principles to be applied to the development will ensure that each dwelling meets the CO_2 reductions mandated by Part L1A of the Building Regulations through fabric measures alone.

4.7. It is proposed that the energy demand reduction strategy for the development incorporates further improvements beyond a Part L compliant specification and initially concentrates finance and efforts on reducing energy demand as the first stage of the Energy Hierarchy.

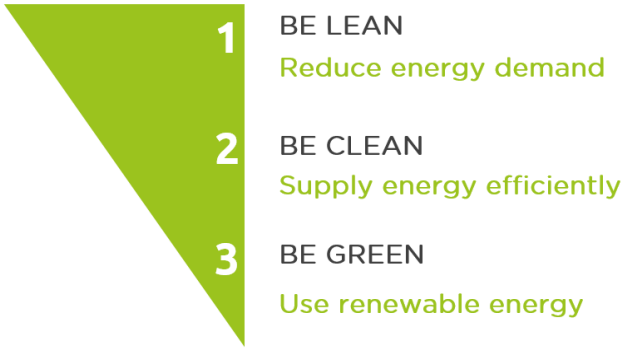


Figure 2. The Energy Hierarchy

Be Lean – reduce energy demand

4.8. The design of a development - from the masterplan to individual building design - will assist in reducing energy demand in a variety of ways, with a focus on minimising heating, cooling and lighting loads. Key considerations include:

- Building orientation – maximise passive solar gain and daylight
- Building placement – control overshading and wind sheltering
- Landscaping – control daylight, glare and mitigate heat island effects
- Building design – minimise energy demand through fabric specification

Be Clean – supply energy efficiently

4.9. The design and specification of building services to utilise energy efficiently is the next stage of the hierarchy, taking into account:

- High efficiency heating and cooling systems
- Ventilation systems (with heat recovery where applicable)
- Low energy lighting
- High efficiency appliances and ancillary equipment

Be Green – use low carbon / renewable energy

4.10. Low carbon and renewable energy systems form the final stage of the energy hierarchy and can be used to directly supply energy to buildings, or offset energy carbon emissions arising from unavoidable demand. This may be in the form of:

- Low carbon fuel sources – e.g., biomass
- Heat pump technologies
- Building scale renewable energy systems
- Small-scale heat networks
- Development-scale heat networks

4.11. As this hierarchy demonstrates, designing out energy use is weighted more highly than the generation of low-carbon or renewable energy to offset unnecessary demand. Applied to the development, this approach is referred to as 'fabric first' and concentrates finance and efforts on improving U-values, reducing thermal bridging, improving airtightness, and installing energy efficient ventilation and heating services.

4.12. This approach has been widely supported by industry and government for some time, particularly in the residential sector, with the Zero Carbon Hub[2] and the Energy Savings Trust[3] having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.

4.13. The benefits to prospective homeowners of following the Fabric First approach are summarised in Table 2.

Table 2. Benefits of the Fabric First approach

	Fabric energy efficiency measures	Bolt-on renewable energy technologies
Energy/CO_2/fuel bill savings applied to all dwellings	✓	×
Savings built-in for life of dwelling	✓	×
Highly cost-effective	✓	×
Increases thermal comfort	✓	×
Potential to promote energy conservation	✓	✓
Minimal ongoing maintenance / replacement costs	✓	×
Significant disruption to retrofit post occupation	✓	×

Building Regulations Standards – Fabric Energy Efficiency

4.14. In addition to the CO_2 reduction targets, the importance of energy demand reduction was further supported by the introduction of a minimum fabric standard into Part L1A 2013, based on energy use for heating and cooling a dwelling. This is referred to as the 'Target Fabric Energy Efficiency' (TFEE), and expressed in kWh/m²/year.

4.15. This standard enables the decoupling of energy use from CO_2 emissions and serves as an acknowledgement of the importance of reducing demand, rather than simply offsetting CO_2 emissions through low carbon or renewable energy technologies.

[2] Zero Carbon Hub, Zero Carbon Strategies for tomorrow's new homes, Feb 2013

[3] Energy Savings Trust, Fabric first: Focus on fabric and services improvements to increase energy performance in new homes, 2010

4.16. The TFEE is calculated based on the specific dwelling being assessed with reference values for the fabric elements contained within Approved Document L1A. These reference values are described as 'statutory guidance' as opposed to mandatory requirements, allowing full flexibility in design approach and balances between different aspects of dwelling energy performance to be struck so that the ultimate goal of achieving the TFEE is met. The proposed approach and indicative construction specifications are set out in the following sections of this Strategy.

Proposed Fabric Specification

4.17. In order to ensure that the energy demand of the development is reduced, the dwellings should be designed to minimise heat loss through the fabric wherever possible. Table 3 details the proposed fabric specification of the major building elements, with the first column in this table setting out the Part L1A limiting fabric parameters in order to demonstrate the improvements delivered.

Table 3. Proposed construction specification – main elements

	Part L1A 2013 Limiting Fabric Parameters	Part L1 2021 Limiting Fabric Parameters	Proposed Specification
External wall – u-value	0.30 W/m²K	0.26 W/m²K	0.19 W/m²K
Party wall – u-value	0.20 W/m²K	0.20 W/m²K	0.00 W/m²K
Plane roof – u-value	0.20 W/m²K	0.16 W/m²K	0.09 W/m²K
Ground floor – u-value	0.25 W/m²K	0.18 W/m²K	≤ 0.12 W/m²K
Windows – u-value	2.00 W/m²K	1.60 W/m²K	1.30 W/m²K
Doors – u-value	2.00 W/m²K	1.60 W/m²K	1.10 W/m²K
Air Permeability	10.00 m³/h.m² at 50 Pa	8.00 m³/h.m² at 50 Pa	4.00 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = 0.150 (default)	Y = ≤ 0.037 (calculated)

Thermal bridging

4.18. The significance of thermal bridging as a potentially major source of fabric heat losses is increasingly understood. Improving the U-values for the main building fabric without accurately addressing the thermal bridging will not achieve the desired energy and CO_2 reduction targets.

4.19. The specification should seek to minimise unnecessary bridging of the insulation layers, with avoidable heat loss therefore being reduced wherever possible. Accurate calculation of these heat losses forms an integral part of the SAP calculations undertaken to establish energy demand of the dwellings, and as such thermal modelling will be undertaken to assess the performance of all main building junctions.

Air leakage

4.20. After conductive heat losses through building elements are reduced, convective losses through draughts are the next major source of energy wastage. The proposal adopts an airtightness standard of 4.00m³/h.m² at 50Pa, with pressure testing of all dwellings to be undertaken on completion to confirm that the design figure has been met.

Provisions for Energy-Efficient Operation of the Dwelling

4.21. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services. Currently it is assumed that all houses will be provided with modern gas-fired heating systems, fully insulated primary pipework, and controls including programmers, thermostats and Thermostatic Radiator Valves to avoid unnecessary heating of spaces when not required.

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5. Future Homes Standard

5.1. under the governments proposed Future Homes Standard, detailing the next step in reducing carbon emissions within the built environment.

5.2. Expected to be introduced in 2025 and with consultation due to commence in 2023, the proposed standard will tighten fabric efficiency and propose a 'ban' on fossil fuel heating systems. Although yet to be defined, this is expected to mean a move to electric space and water heating in the form of heat pumps. This presents a step forward in the governments overall target of 'net zero' greenhouse gas emissions by 2050 and highlights the responsibility that the built environment has to reduce carbon emissions by 75-80% over 1990 levels.

5.3. Research and analysis has been underway for a period of time now, with the aim of developing a technical specification capable of delivering the required carbon reduction targets. Between the summer of 2022 and 2024 it is expected that government and industry groups will develop sector specific guidance and understanding of the FHS. Within the same timeframe it is expected that technical consultation on the proposed specification will take place, ultimately concluding with policy development.

5.4. Regulations are currently set to be made in 2024 and it is expected that the full Part L for Future Homes Standard will come into effect from 2025 onwards.

5.5. It is currently unclear how the carbon reduction target will be defined and calculated but it is proposed that the FHS will provide a 75% carbon reduction over Part L 2013.

5.6. Table 6 shows a potential FHS specification in comparison to Part L 2013 and 2021 limiting parameters.

Table 6. Proposed FHS specifications against Part L 2013 & 2021 limiting fabric parameters

	Part L1a 2013 Limiting Fabric Parameters	Part L1a 2021 Limiting Fabric Parameters	Provisional notional dwelling)	Proposed Specification
External wall – u-value	0.30 W/m²K	0.26 W/m²K	0.15 W/m2K	0.18 W/m2K
Party wall – u-value	0.20 W/m²K	0.20 W/m²K	0.00 W/m²K	0.00 W/m²K
Plane roof – u-value	0.20 W/m²K	0.16 W/m²K	0.11 W/m²K	0.09 W/m²K
Ground floor – u-value	0.25 W/m²K	0.18 W/m²K	0.11 W/m²K	0.12 W/m²K
Windows (Houses) – u-	2.00 W/m²K	1.60 W/m²K	0.50 W/m²K	0.80 W/m²K
Windows (Apartments) –	2.00 W/m²K	1.60 W/m²K	0.63 W/m²K	0.80 W/m²K
Doors – u-value	2.00 W/m²K	1.60 W/m²K	1.00 W/m²K	1.20 W/m²K
Air Permeability	10 m³/h.m² at 50 Pa	8.00 m³/h.m² at 50 Pa	5.00 m³/h.m² at 50 Pa	4.00 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = 0.150 (default)	Y = ≤ 0.033 (calculated)	Y = ≤ 0.033 (calculated)
Space and Water Heating	Gas	Gas + PV	ASHP	ASHP
Ventilation	System 1	Optional	System 1	System 3 dMEV
Additional systems	Optional	Optional	WWHR	N/A
Photovoltaic Systems (PV)	N/A	As required for compliance	N/A	Approx 1.00 kWp per dwelling

6. Low Carbon and Renewable Energy

6.1. A range of technologies have been assessed for potential incorporation into the scheme in accordance with Regulation 25A of the Building Regulations and to assess the systems which may be applicable on site to meet Regulatory standards.

Combined Heat and Power (CHP) and District Energy Networks

6.2. A CHP unit is capable of generating heat and electricity from a single fuel source. The electricity generated by the CHP unit is used to displace electricity that would otherwise be supplied from the national grid, with the heat generated as effectively a by-product utilised for space and water heating. However, the reduced emissions from the national grid due now means that CHP systems will not deliver CO_2 savings.

6.3. In addition, the economic and technical viability of a CHP system is largely reliant on a consistent demand for heat throughout the day to ensure that it operates for over 5000 hours per year. Heat demand from mainly residential schemes is not conducive to efficient system operation, with a defined heating season and intermittent daily profile, with peaks in the morning and the evening. For this reason, the use of a CHP system is considered unfeasible for this development.

6.4. There are currently no heat networks which extend near the proposed development. High network heat losses associated with distribution to individual houses, as opposed to large high-rise apartment blocks and commercial developments mean that a new heat network to serve the area is not considered viable or an environmentally preferred option.

6.5. The adjacent Countryside development discounts heat network solutions on the same basis, therefore there is no potential for a combined network serving both developments.

Wind Power

6.6. Locating wind turbines adjacent to areas with buildings presents a number of potential obstacles to deployment. These include the area of land onsite required for effective operation, installation and maintenance access, environmental impact from noise and vibration, visual impact on landscape amenity and potential turbulence caused by adjacent obstacles, including the significant amount of woodland on and around the development.

6.7. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 6.00m/s[4]. Wind turbines at this site are therefore unlikely to generate sufficient quantities of electrical energy to be cost effective[5]. For these reasons wind power is not considered feasible.

Building Scale Systems

6.8. The remaining renewable or low carbon energy systems considered potentially feasible are at a building scale. These are as follows;

- Individual biomass heating
- Solar thermal
- Solar photo-voltaic (PV)
- Air Source Heat Pumps (ASHPs)
- Ground Source Heat Pump (GSHPs)

6.9. The advantages and disadvantages of these technologies are evaluated in Tables 4-8.

[4] NOABL Wind Map (http://www.rensmart.com/Weather/BERR)

[5] CIBSE TM38:2006. Renewable energy sources for buildings.

Table 4. Individual biomass heating feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Potential to significantly reduce CO_2 emissions as the majority of space and water heating will be supplied by a renewable fuel • Decreased dependence on fossil fuel supply	• A local fuel supply is required to avoid increased transport emissions • Fuel delivery, management and security of supply are critical • Space is required to store fuel, a thermal store and plant • A maintenance regime would be required even though modern systems are relatively low maintenance • Building users or a management company must be able to ensure fuel is supplied to the boiler as required. • Local environmental impacts potentially include increased NO_x and particulate emissions
Estimated costs and benefits	
• Cost £2,000 upwards for a wood-pellet boiler, not including cost of fuel • Not eligible for RHI payments as new-build properties	
Conclusions	
Biomass heating is considered technically feasible in large dwellings provided sufficient space can be accommodated for fuel supply, delivery and management however air quality concerns mean that it is not considered appropriate.	

Table 5. Solar thermal systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Mature and reliable technology offsetting the fuel required for heating water (typically gas) • Solar thermal systems require relatively low maintenance • Typically, ~50% of hot water demand in dwellings can be met annually	• Installation is restricted to favourable orientations on an individual building basis • The benefit of installation is limited to the water heating demand of the building • Safe access must be considered for maintenance and service checks • Buildings need to be able to accommodate a large solar hot water cylinder • Distribution losses can be high if long runs of hot water pipes are required • Visual impact may be a concern in special landscape designations (e.g. AONB)
Estimated costs and benefits	
• Cost £2,000 - 5,000 for standard installation • Not eligible for RHI payments as new-build properties • Ongoing offset of heating fuel, minimal maintenance requirements	
Conclusions	
Solar thermal systems are considered technically feasible on all buildings with suitable roof orientations.	

Table 6. Solar photovoltaic systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• The technology offsets the high carbon content of grid supplied electricity used for lighting, pumps and fans, appliances and equipment • Mature and well proven technology that is relatively easily integrated into building fabric • Adaptable to future system expansion • Solar resource is not limited by energy loads of the dwelling as any excess generation can be transferred to the national grid • PV systems generally require very little maintenance • Service and maintenance requirement minimal, and 2-3 storey buildings should not require significant additional safety measures (mansafe systems etc) for roof access	• Poor design and installation can lead to lower than expected yields (e.g. from shaded locations) • Installation is restricted to favourable orientations • Feed in Tariff support mechanism has been discontinued • Safe access must be considered for maintenance and service checks • Visual impact may be a concern in special landscape designations (e.g. AONB) or conservation areas • Reflected light may be a concern in some locations
Estimated costs and benefits	
• Cost £1,500 upwards (1kWp+) and scalable • Ongoing offset of electricity fuel costs, minimal maintenance requirements	
Conclusions	
PV panels are considered technically feasible for all buildings with suitable roof orientations. The relatively low cost, carbon saving potential and limited additional impacts mean that PV is considered a feasible option for this development.	

Table 7. Air Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 250% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings • With grid decarbonisation will be a low carbon heating source in future	• Air source heat pumps are powered by electricity, with a significantly higher unit price than gas, leading to potentially increased running costs • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved. Users must be educated in how heat pump systems should be operated for optimal efficiency • Air source heat pump plant should be integrated into the building design to mitigate concerns regarding the visual impact of bolt-on technology • Noise in operation may be an issue particularly when operating at high output
Estimated costs and benefits	
• Cost £5,000 - £7,000 for standard installation • Not eligible for RHI payments as new-build properties	
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme. However, the capital and running cost increases in comparison to a gas baseline means that they are not considered a preferred low carbon technology at this stage.	

Table 8. Ground Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 320% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings • With grid decarbonisation will be a low carbon heating source in future	• Low temperature heating circuits (underfloor heating) would be required to maximise the efficiency of heat pumps • A hot water cylinder would also be required for both space and water heating • Ground source heat pumps are powered by electricity with a significantly higher unit price than gas, leading to potentially increased running costs • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved • Ground source heat pumps either require significant land to incorporate a horizontal looped system or significant expense to drill a bore hole for a vertical looped system
Estimated costs and benefits	
• Cost circa £10,000+ • Shared ground loop approach eligible for non-domestic RHI. Estimated simple payback at circa 18 years (systems only) • Running cost linked to COP of heat pump, circa 3.0 equates to 66% reduction vs electricity or around 5-6p/kWh (higher than mains gas) • Additional costs to upgrade electricity infrastructure currently unknown	
Conclusions	
Ground source heat pumps are considered technically feasible for buildings in this scheme. However, the cost and difficulty associated with vertical boreholes at this site means that they are not considered a preferred low carbon technology at this stage.	

Summary

6.10. Following this feasibility assessment, it is considered that as biomass heating systems would require significant storage space for fuel as well as regular deliveries at different times to all dwellings, they are not appropriate for this development.

6.11. Roof-mounted systems are therefore likely to be most suited to the development:

- Solar thermal systems to dwellings that have space to incorporate a hot water cylinder and a suitable roof orientation.
- Solar photovoltaic modules to dwellings that have suitable roof orientations.

6.12. It is considered that solar PV systems are most appropriate in meeting a significant proportion of energy demand without introducing additional energy loss through larger hot water cylinders. These will be installed to south and west facing roof pitches, with the specific units and system sizes to be assessed at design stage

7. Total CO_2 reductions

7.1. Through following the strategy described, the dwellings will significantly reduce energy demand and consequent CO_2 emissions beyond a Part L 2021 compliant level of performance through the dwelling fabric, Waste Water Heat Recovery (WWHR) to houses and the incorporation of solar PV systems.

7.2. A sample range of dwellings have been assessed under Part L 2013 to build a representative site model in order to establish the baseline CO_2 emissions of the development under Regulations already improved over Part L 2010.

7.3. A sample range of dwellings have also been assessed under Part L 2021 to build a representative site model and establish the predicted CO_2 emissions of the development under Part L 2021, with the proposed fabric strategy applied to provide an overview of the typical as-designed CO_2 emissions. The results of these calculations are shown in Table 9.

7.4. Following these sample SAPs, to ensure compliance with Part L 2021, an estimated 390kWp of PV will be required. This figure will be updated once full design calculations are complete whilst still ensuring compliance is met.

Table 9. Sample dwelling as-designed CO_2 emissions after renewables (Part L 2021)

House Type	Part L 2021 Target CO_2 Emissions ($kgCO_2/yr.$)	As-Designed CO_2 Emissions ($kgCO_2/yr.$)	Reduction %
Cedar Mid	950	939	1.13
Acacia Semi	1011	1002	0.89
Cedar Semi	1039	1030	0.86
Olive Semi	957	926	3.23
Hickory Mid	811	760	6.33
Emerson Semi	982	962	2.01
Hickory End	875	831	4.97
APT GF Semi	646	623	3.42
APT FF Semi	560	549	2.00
APT 3F Semi	721	666	7.62

7.5. Table 10 demonstrates the site-wide savings over and above the Part L 2013 compliant baseline that will be delivered.

Table 10. Site-wide CO_2 emission reductions achieved

	CO_2 Emissions ($kgCO_2/yr.$)	
Part L 2013 compliant baseline	459,000	
Part L 2021 calculated emissions	273,102	
	$kgCO_2/yr.$	%
Total site-wide savings over Part L 2013	185,897	40.50

8. Overheating Risk and Passive Design

8.1. Dwellings constructed today may be operating in a substantially different climate over the coming decades, and therefore should be designed to ensure that they are able to adapt and reduce the risk of overheating with potentially higher summer temperatures and longer hot spells.

8.2. Key design decisions can affect the potential risk of overheating:

- Poor consideration of orientation of large glazed facades
- High density development contributing to urban heat island effects
- High glazing ratios contributing to excessive unwanted solar gain
- Inadequate ventilation strategies
- Very high levels of thermal insulation without considering heat build-up

8.3. Other factors which additionally contribute to heat build-up within homes and should be addressed where possible include:

- High levels of occupation
- Appliance use contributing to internal gains

Cooling hierarchy

8.4. In common with sustainable heating strategies, it is possible to apply a sustainable 'cooling hierarchy' which sets out the priorities to ensure overheating risk is minimised:

- Minimise internal heat gain
- Manage heat through internal thermal mass and design of spaces
- Passive ventilation strategies
- Mechanical ventilation systems
- Active cooling systems

Addressing overheating risk

8.5. The cooling hierarchy described has been considered, with passive measures of reducing overheating risk given priority. Key measures which will be taken within the development include:

- A layout which incorporates significant green space around the site and in rear gardens reducing the potential for heat build-up in enclosed and low albedo external areas such as tarmac and dark roofs
- Glazing specification which has been considered to balance the requirements for useful solar gain with unwanted summer gain
- Consideration of thermal mass of construction materials to smooth internal temperature profiles, storing excess heat during the day and releasing at night

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9. Sustainable Design

9.1. This section sets out details of additional resource efficiency and sustainable design principles to be applied at the development.

Materials

9.2. The impacts of construction materials range from the depletion of natural resources to the greenhouse gas emissions and water use associated with their manufacture and installation.

9.3. Within the development choices will be made in order to reduce the consumption of primary resources and using materials with fewer negative impacts on the environment, including but not limited to the following;

- Use fewer resources and less energy through designing buildings more efficiently
- Specify and select materials and products that strike a responsible balance between social, economic and environmental factors
- Incorporate recycled content, use resource-efficient products and give due consideration to end-of-life uses
- Influence, specify and source increasing amounts of materials which can be reused and consider future deconstruction and recovery
- All insulating materials will have a Global Warming Potential (GWP) of < 5 in manufacture and installation.
- All materials used in construction will be responsibly sourced, with certification obtained wherever possible. Materials with a low environmental impact as per the BRE Green Guide will be preferred.

Waste

9.4. Sending waste to landfill has various environmental impacts, such as the release of local pollution, ecological degradation and methane emissions, in addition to exacerbating resource depletion. Waste in housing comes from two main streams; construction waste and domestic waste during occupation.

Household waste

9.5. In this respect regard has been given to the policy advice contained in the NPPF together with the Council's current guidance to ensure that the new dwellings are provided with adequate storage facilities for both waste and recyclable materials.

9.6. Manchester City Council currently operates domestic waste collection services through which households are able to recycle materials including paper and cardboard, plastic bottles and food containers, tins, glasses and metal foils, together with garden waste.

Construction waste

9.7. The construction process will be managed to effectively and appropriately monitor and manage construction site waste. Target benchmarks for resource efficiency will be set in accordance with best practice – e.g., m^3 of waste per $100m^2$ / tonnes waste per m^2.

9.8. Wherever possible materials will be diverted from landfill through re-use on site, reclamation for re-use, returned to the supplier where a 'take-back' scheme is in place or recovered and recycled using an approved waste management contractor.

Water Conservation

9.9. In line with current Building Regulations, water use will be managed effectively throughout the development through the incorporation of appropriate efficiency measures.

9.10. Water efficiency measures including the use of efficient dual flush WCs, low flow showers and taps and appropriately sized baths will be encouraged with the aim to limit the use of water during the operation of the development to limit water use.

9.11. Table 11 shows how the development could achieve the required 105 litres/occupier/day calculated in accordance with Building Regulations 17.K methodology: water will be managed effectively throughout the development by the incorporation of appropriate efficiency measures.

9.12. The calculation results in a total water consumption of 104.2 Litres/Person/Day for the intended specification, well below the maximum of 125 Litres/Person/Day required by Building Regulations.

Table 11. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/Person/Day
WC (dual flush)	Full flush (l)	4.5	6.57
	Part flush (l)	3	8.88
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
Bath	Capacity to overflow (l)	150	16.50
Shower	Flow rate (l/min)	8	34.96
Kitchen sink taps	Flow rate (l/min)	6	13.00
Calculated Use			109.0
Normalisation Factor			0.91
Total Internal Consumption (L)			99.2
External Use			5.0
Building Regulations 17.K			104.2

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10. Conclusions

10.1. This Energy and Sustainability Statement has been prepared by AES Sustainability Consultants Ltd on behalf of Kellen Homes to detail the proposed approach to sustainable construction to be employed at Mount Road.

10.2. The proposed development is located to the South East of the heart of Manchester. The proposal seeks to deliver 303 new dwellings across a mix of one bed apartments and 2 to four bed detached, semi-detached and terraced houses.

10.3. The statement has been specifically prepared to address policies EN4 and EN6 of the Manchester Core Strategy, and to address national policy relating to sustainable design and construction of dwellings.

10.4. The site will fall under Part L 2021, and therefore the development will be designed to meet these increased standards. This will deliver a >31% reduction compared with L1A 2013 standards, which is a 6% reduction over Part L1A 2010 outlined within the Manchester Core Strategy.

10.5. The statement demonstrates that the development will achieve these carbon reductions through higher fabric standards and low carbon and renewable energy systems. Roughly 390kWp of PV will be required across the site to ensure compliance with Part L 2021. This figure will be updated once full design calculations are complete whilst still ensuring compliance is met.

10.6. The statement additionally details the proposed approach to addressing overheating risk and climate resilience, sustainable and responsible materials usage and water consumption of the dwellings.

10.7. By implementing the described energy efficiency and renewable energy measures the total reduction in regulated site wide CO_2 emissions for dwellings is calculated as 185,897 kgCO_2 per year; a saving of 40.50% against a Part L 2013 compliant scheme which was already a ~6% improvement over Part L1A 2010.

10.8. The development will therefore significantly exceed the requirements of Policy EN4 and EN6, and the National Planning Policy Framework (NPPF).

10.9. It has been determined that the calculated internal water consumption would equate to 104.2 litres/person/day, and therefore satisfy the requirements of current building regulations which requires a maximum water consumption of 125 litres/person/day.

10.10. Plots built after the implementation of the governments Future Homes Standard will benefit from air source heat pumps, supplemented with PV to achieve a circa 75% reduction in CO_2 emissions.