

Environmental Standards Statement

Ref: Z61922 revB

Russell Road Development

Russell Road,
Manchester

for

Rowlinson Constructions Ltd.



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Executive Summary

This Environmental Standards Statement (ESS) has been developed in support of the planning application for the proposed development of 120No. residential dwellings at Russell Road, Manchester. The statement will evaluate the technical and economic feasibility of using both passive and low and zero carbon technologies and will assess the practical levels of CO₂ reduction possible for this development to comply with the following planning requirements:

- National Planning Policy Framework (2023)
- Places for Everyone Joint Development Plan 2022 to 2039 (PFE) (March 2024)

The following low and zero carbon technologies have been evaluated:

- | | |
|--|-------------------------------|
| • Biomass | • Geothermal |
| • Wind | • Combined Heat & Power (CHP) |
| • Biogas | • Solar Hot Water |
| • Air Source Heat Pumps & Exhaust Air Heat Pumps | • Solar Photovoltaic |

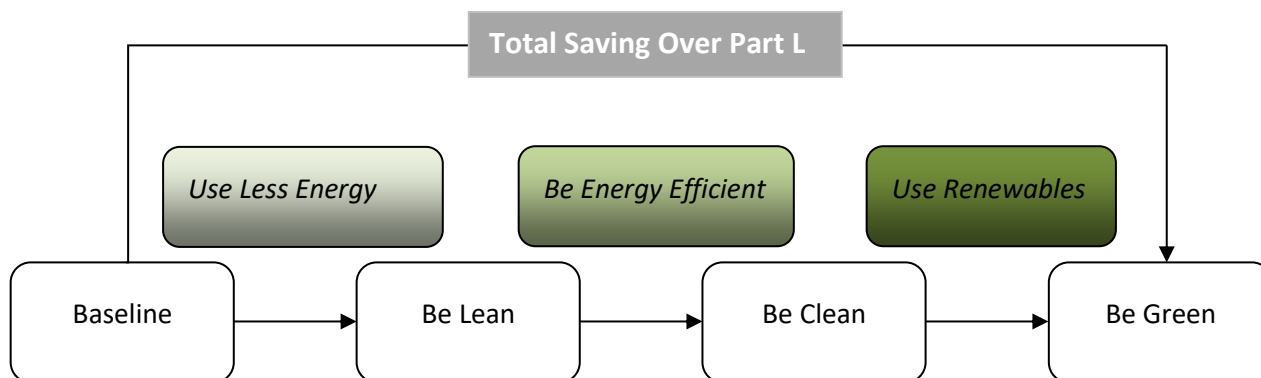
The approach for the Russell Road, Manchester residential development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

1. Enhanced building fabric to meet the new Building Regulations ADL1 2021 (15/06/2022)
2. Enhanced air tightness and thermal bridging.
3. Apartments – MVHR for the ground floor flats. Continuous mechanical extract ventilation system for all upper floors
4. Apartments - Space heating will be provided by highly efficient direct electric heating
5. Apartments - Hot water will be provided by highly efficient air to water heat pumps
6. Communal space - Space heating will be provided by highly efficient heat pumps with heating and cooling facility in the main areas as set out in Appendix 1
7. Communal space - Hot water will be provided by highly efficient heat pumps
8. Efficient lighting strategy primarily using CFL or LED type fittings.

For the purpose of the assessment, we have evaluated a selection of dwelling types in SAP 10 Standard Assessment Procedure) to provide an accurate estimate of predicted energy/ CO₂ emissions. We have completed SAP calculations based on a representative dwelling type to provide an estimation of the worst-case total energy/emissions on site.

Summary

The development has been provided with energy savings through the use of passive improvement measures such as improved energy efficiency. This passive approach to compliance will complement the integrated approach to the sustainable energy objectives of the national and local policies. The use of heat pumps for hot water in the dwellings achieves the necessary levels of carbon reduction.



The principles of a Be Lean, Be Clean, Be Green philosophy have been applied, resulting in a 62.53% carbon emissions improvement and a 27.51% primary energy improvement over Building Regulations Part L1 2021, as indicated in Table 1. A full design specification that confirms inputs used within the SAP calculations is provided within the appendices of this report.

Table 1 - Proposed development CO₂ emissions against Building Regulations Part L1 2021

	Total CO₂ Emissions (kgCO₂/yr)	Total Primary Energy (kWh/yr)
Target Dwelling Performance	76,030	407,771
Proposed Dwelling Performance	28,488	295,578
Total Reduction	47,542	112,194
Percentage Improvement (above ADL1 2021)	62.53%	27.51%

1. Introduction

The proposed Russell Road development consists of 120No. residential dwellings and some communal facilities located at Russell Road, Manchester. The development is required to achieve compliance under Building Regulations Approved Document Part L1 (2021).

Supporting information is provided within this report for the proposed energy strategy to be considered on site in accordance with the following planning policies:

- National Planning Policy Framework (2023)
- Places for Everyone Joint Development Plan 2022 to 2039 (March 2024)

Throughout this report, passive design techniques, energy efficient equipment and appropriate low carbon technologies will be appraised in line with the 'Be Lean, Be Clean, Be Green' philosophy of relevant planning documents and the Energy Hierarchy.

An assessment of CO₂ emissions will be made based on the calculation methodology dictated by the Standard Assessment Procedure (SAP) and in line with the requirements of Places for Everyone Joint Development Plan (2024).

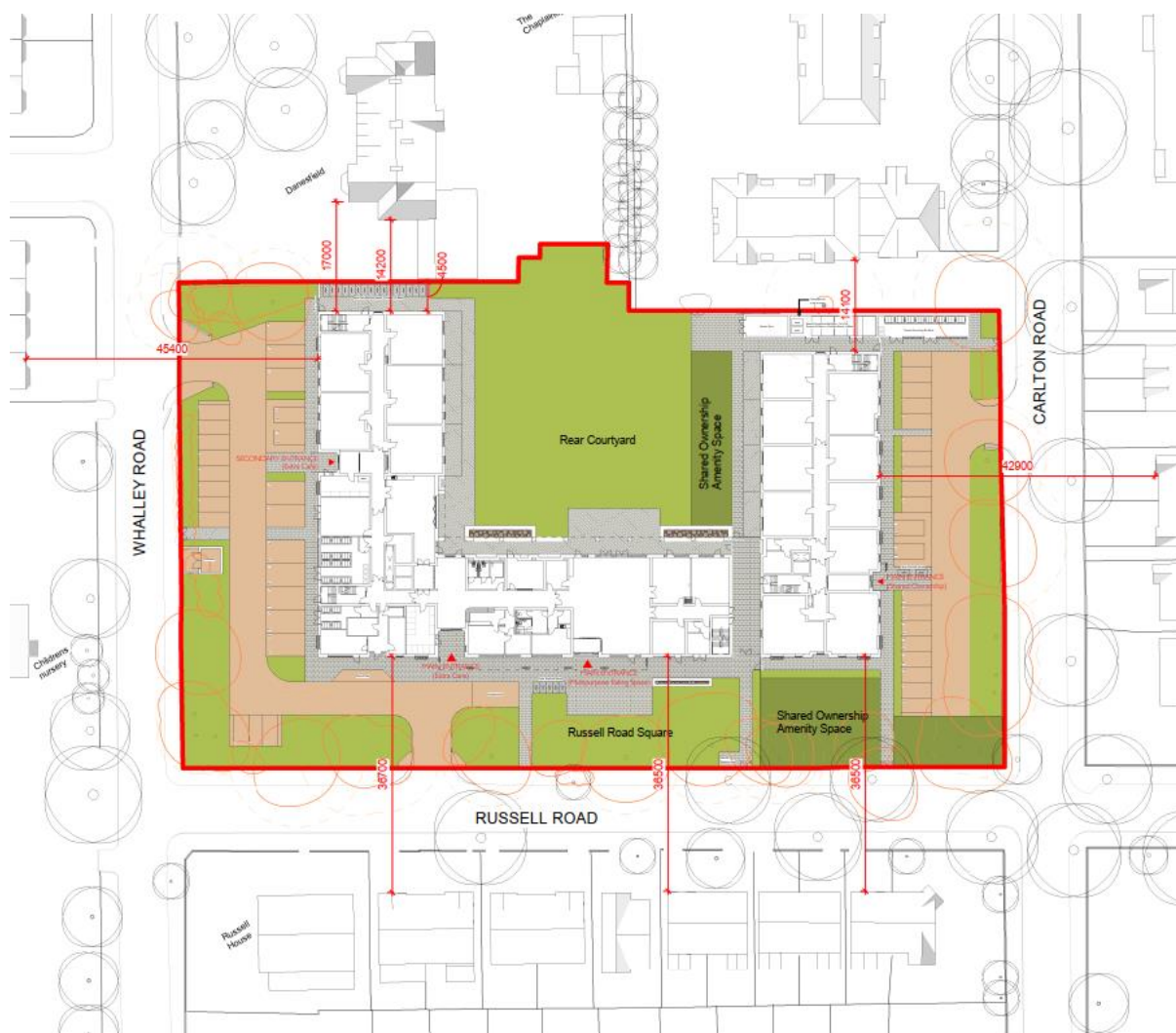
1.1. Location

The area for the proposed development in Manchester is highlighted by the red line boundary shown in Figure 1. The area in Manchester is called Whalley Range.



Figure 1 - Location and surrounding area of proposed Russell Road, Manchester residential development.

The site is to be accessed off Carlton Road, Manchester. Existing residential development surrounds the proposed site.



The proposed development consists of 120No. dwellings, arranged across the site as indicated in Figure 2 above. Plot types and numbers are defined across the site as shown below:

Dwelling Type	Description	Number of Units
1B2P	1 Bed 2 Person Apartment	39
1B2P (CAT 3)	1 Bed 2 Person Apartment	2
2B3P	2 Bed 3 Person Apartment	38
2B3P (CAT 3)	2 Bed 3 Person Apartment	1
1B2P SO	1 Bed 2 Person Apartment	25
2B4P SO	2 Bed 4 Person Apartment	15
		120

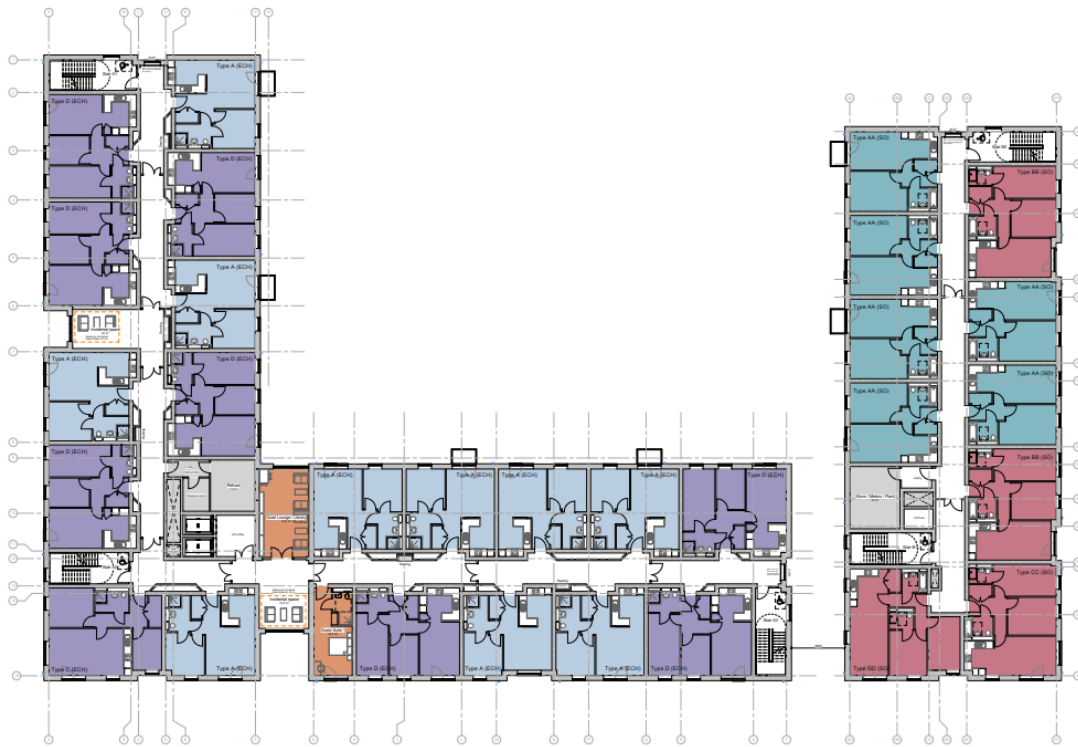
Figure 3 – Floor Plans of the proposed Russell Road, Manchester residential development.



Ground Floor

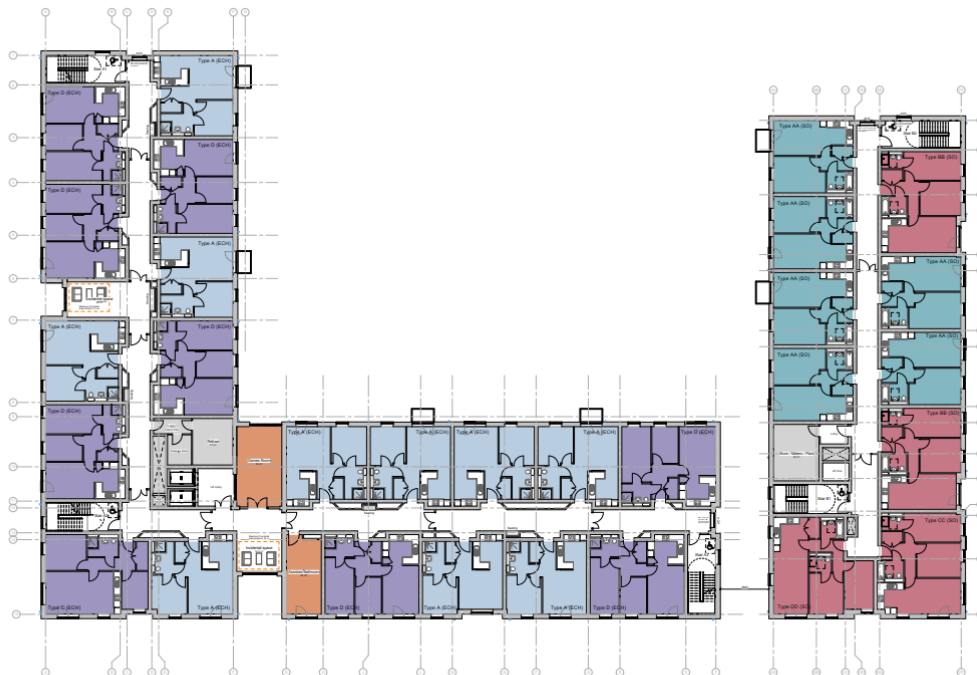


First Floor



① GA Second Floor Plan
1:100

Second floor



② GA Third Floor Plan
1:100

Third floor



GA Fourth Floor Plan
1:100

Fourth floor

2. Policy Drivers for Energy Efficiency and Renewable Energy

This section presents a range of planning policy that is applicable to the Russell Road, Manchester residential development, at both a national and a local level.

2.1. National Policy

The National Planning Policy Framework was published in July 2021 and sets out the government's planning policies for England and they should be applied. Table 2 sets out the relevant energy standards for new developments and provides an indication of the design response to be provided.

Table 2 – Key National Planning Policy Requirements and Design Responses

Section	Policy Requirements	Design Response
14. Meeting the challenge of climate change, flooding and coastal change	The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: Shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.	This development will follow the principles set out in the Places for Everyone Joint Development Plan 2022 to 2039 (March 2024), using a 'Be Lean, Be Clean, Be Green' approach in reducing operational carbon emissions. An overview of current decentralised energy schemes in Manchester and an assessment on the potential for future schemes in relation to this development is provided in Section 6 of this report. This sustainability and renewable Environmental Standards Statement appraises site specific information to determine the most appropriate approach to minimise energy consumption.

2.2. Local Policy

The adopted Places for Everyone Joint Development Plan 2022 to 2039 (March 2024) provides a set of guidelines for new development within Manchester. All relevant energy policy within these documents is provided within this section together with a design response.

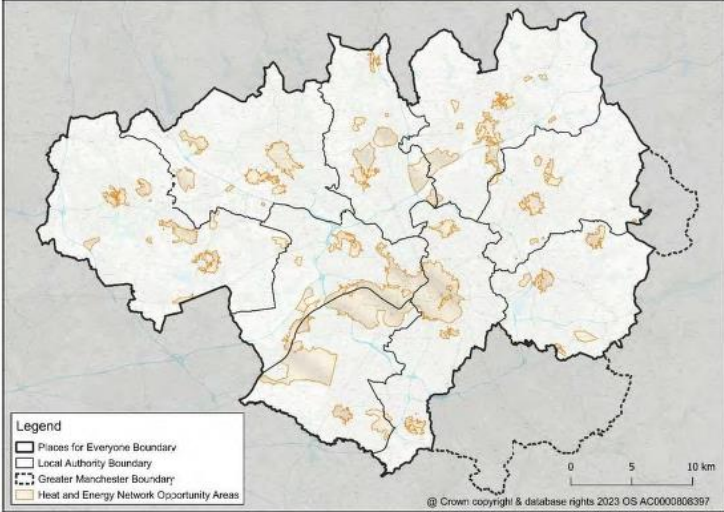
Table 3 – Key Local Planning Policy Requirements and Design Responses

Places for Everyone Joint Development Plan 2022 to 2039 (March 2024)		
Section	Policy Requirements	Design Response
Policy JP-S1: Sustainable Development	To help tackle climate change, development should aim to maximise its economic, social and environmental benefits simultaneously, minimise its adverse impacts, utilise sustainable construction techniques and actively seek opportunities to secure net gains across each of the different objectives. Carbon and Energy Within this, new development will have a critical role to play and all new homes and commercial/industrial buildings will need to achieve net zero carbon by 2028. The definition of net zero carbon development has been established by the UK Green Building Council. It is expected that development in the Plan area will apply a net zero carbon approach to operational emissions up until 2028, thereafter emissions in construction should be considered. Minimum carbon reduction targets will be set in line with the Future Homes Standard of 80% or until such a time this is superseded. To provide further confidence in decision making, supporting research²³ was commissioned to outline how the pathway to 2028 can be achieved for ‘net zero in operation’²⁴ by setting out critical milestones and measures that would be expected when following the energy ‘hierarchy’ and adopting a fabric first approach. 5.17 Based on the evidence which has informed the 5 Year Environment Plan and achieving net zero carbon in new development, this has shown that there will need to be a significant increase in	The proposed Russell Road, Manchester development will follow the principles of the Energy Hierarchy by adopting a passive fabric-first approach to design rather than adopting the use of renewable technologies. A full energy strategy is provided in Section 8 of this report, following an appraisal of a range of site-specific measures in line with the ‘Be Lean, Be Clean, Be Green’ approach. A fabric first approach to the development is a much preferred method with the use of highly efficient heat pumps to provide hot

	photovoltaic technology. Therefore, where planning applications for residential development are accompanied by an energy statement, the following best practice thresholds should be seen as the starting point in relation to reducing energy demand and onsite renewable energy generation. The thresholds set out in Table 5.1, for post 2025, are consistent with the GM Five Year Environment Plan. Table 5.1 Best Practice Thresholds for Reducing Energy Demand and Onsite Renewable Energy Generation within residential developments <table><tr><th>-</th><th>Space Heat Demand²⁵</th><th>Hot Water Energy Demand²⁶</th><th>Renewable Energy Generation Targets</th></tr><tr><td>2021 - 2025</td><td>Houses (30kWh/m2) Flats (25kWh/m2)</td><td>20% energy demand reduction in the total heat required for water heating</td><td>*Photovoltaic installation: 20% ground floorspace</td></tr><tr><td>2025 - onwards</td><td>Houses (20kWh/m2) Flats (15kWh/m2)</td><td>^20% energy demand reduction in the total heat required for water heating</td><td>*Photovoltaic installation: 40% ground floorspace</td></tr><tr><td>*Ground floorspace used as a proxy for available roof area.</td><td>-</td><td>-</td><td>-</td></tr><tr><td>^Will need to be reviewed with Future Homes Standard 2025 to determine if savings already embedded.</td><td>-</td><td>-</td><td>-</td></tr></table> 5.19 By following the energy hierarchy, new development will need to achieve net zero carbon through the maximisation of on-site measures first. However, in circumstances where a development has demonstrated that the hierarchy has been followed and there are no reasonable alternatives to meet the minimum carbon reductions, then payment to offset remaining emissions will also be required. Such payments should be expected to fund other carbon saving programmes within Greater Manchester to help meet the 5 Year Environment Plan targets (such as energy efficiency retrofit and renewable energy installations).	-	Space Heat Demand ²⁵	Hot Water Energy Demand ²⁶	Renewable Energy Generation Targets	2021 - 2025	Houses (30kWh/m2) Flats (25kWh/m2)	20% energy demand reduction in the total heat required for water heating	*Photovoltaic installation: 20% ground floorspace	2025 - onwards	Houses (20kWh/m2) Flats (15kWh/m2)	^20% energy demand reduction in the total heat required for water heating	*Photovoltaic installation: 40% ground floorspace	*Ground floorspace used as a proxy for available roof area.	-	-	-	^Will need to be reviewed with Future Homes Standard 2025 to determine if savings already embedded.	-	-	-	water to the apartments.
-	Space Heat Demand ²⁵	Hot Water Energy Demand ²⁶	Renewable Energy Generation Targets																			
2021 - 2025	Houses (30kWh/m2) Flats (25kWh/m2)	20% energy demand reduction in the total heat required for water heating	*Photovoltaic installation: 20% ground floorspace																			
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*Ground floorspace used as a proxy for available roof area.	-	-	-																			
^Will need to be reviewed with Future Homes Standard 2025 to determine if savings already embedded.	-	-	-																			
Policy JP-S2: Carbon and Energy	The aim of delivering a carbon neutral Greater Manchester no later than 2038, with a dramatic reduction in greenhouse gas emissions, will be supported through a range of measures including:	Renewable technologies have not been specified for this																				

	1. Promoting the retrofitting of existing buildings with measures to improve energy efficiency and generate renewable and low carbon energy, heating and cooling; 2. Promoting the use of life cycle cost and carbon assessment tools to ensure the long-term impacts from development can be captured; 3. Taking a positive approach to renewable and low carbon energy schemes, particularly schemes that are led by, or meet the needs of local communities; 4. Increasing the range of nature-based solutions including carbon sequestration through the restoration of peat-based habitats, woodland management, tree-planting and natural flood management techniques; 5. An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable; a. Be net zero carbon which applies: • from adoption– to regulated operational carbon emissions; • from 2028 -to all emissions ‘in construction’. From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions. Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to: i. Minimise energy demand; ii. Maximise energy efficiency; iii. Use renewable energy; iv. Use low carbon energy; and v. Utilise other energy sources. From 2025 any residual carbon emissions that cannot be fully mitigated on-site should be offset, in agreement with the relevant local planning authority through a financial contribution to a carbon offset fund. As an interim measure, development should be consistent with the 2022 Part L Building Regulations unless superseded by changes to building regulations and/or national or local planning policies. b. Incorporate adequate electric vehicle charging points, in line with Part S of the Building Regulations, unless superseded by relevant Local Plan policies, to future proof for the likely long-term demand, taking account of the potential maximum energy demand for the site;	development due to financial viability and ongoing maintenance issues.
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	c. Where practicable, prioritise connection to a renewable energy/heating/cooling network in the first instance or a low carbon energy/heating/cooling network that is adaptable to non-fossil fuels at a later date; d. In residential developments, achieve energy demand reductions in terms of space heat demand; hot water energy demand and the delivery of on-site renewable energy generation, in accordance with Table 5.1. For renewable energy generation priority should be given to PV installation where technically feasible, alternative technologies will be appropriate where the equivalent generation is evidenced. Include a detailed energy statement to demonstrate via site relevant evidence how the development has sought to maximize reductions in carbon emissions in line with relevant policy targets, including the minimisation of overheating risks and appropriate measures for post occupancy evaluation.	
Policy JP-S3: Heat and Energy Networks	The provision of decentralised energy infrastructure is critical to the delivery of our objectives for low carbon growth, carbon reductions and an increase in local energy generation. The following measures will help to achieve this: 1. Delivery of renewable and low carbon energy schemes will be supported with particular emphasis on the use of decentralised energy networks in areas identified as “Heat and Energy Network Opportunity Areas”. These have been identified where: - Existing heat/energy networks are operational or have been commissioned; - Proposals for new heat networks/energy networks are being progressed, or future opportunities have been identified in city-region master planning; - Sufficient density of existing heat demand occurs; and - Significant future development is proposed at the strategic development locations. 2. Within the identified “Heat and Energy Network Opportunity Areas”, unless it can be demonstrated that there are more effective alternatives for minimising carbon emissions or such connection is not practicable or financially viable, it is expected that:	An overview of the site in relation to current decentralised networks in the region is provided in Section 6.1. A review of district heating opportunities is provided in Section 6 of this report, in line with current local development. The proximity of the site to current decentralised energy networks is illustrated within Section 6.1 of this report.

	• New residential developments that are '10 dwellings or more' or other developments over 1,000 m2 floorspace shall: a. Connect to an existing or planned heat/energy network or be designed to enable future connection (where within 500m of such a network); and/or b. Install a site-wide or communal heat/energy network solution. • An expectation that new industrial development will demonstrate that opportunities for using waste heat locally have been fully examined, and included in proposals; • An expectation that where publicly-owned buildings and assets adjoin new major development sites, opportunities for these buildings and assets to connect to site-wide proposals will be considered; and • An expectation that any site-wide networks will be designed so as to enable future expansion to adjoining buildings or assets as appropriate. Figure 5.1 Heat and Energy Network Opportunity Areas  Flood Risk and the Water Environment 5.39 Climate change and population and economic growth can put increasing pressure on the available potable water supply for homes and businesses. It is important that water is conserved and efficiently used as much as possible to help build resilience to periods of drought; avoid over abstraction; reduce carbon emissions from water treatment and disposal; and protect river and wetland habitats from	Due to the relatively small scale of the development, the development of an energy centre would not be a feasible design solution.
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	degradation. All new homes have to meet mandatory national standard set out in Building Regulations (of 125 litres/person/day). Where there is a clear local need, the government's Housing Optional Technical Standards paragraph 013 and 014 set out that local authorities may also consider tighter water efficiency requirements for new homes (110 litres a day) to help manage water demand. This will be determined through the preparation of district local plans.	
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3. Methodology

The first step of the full energy strategy assessment has been to undertake a baseline energy assessment. The baseline energy assessment consists of calculating the total CO₂ emissions of the development to meet Building Regulations and then compare the proposed improvement measures against this baseline. Building Regulations Part L1 2021 (SAP) applies to each of the 120 No. dwellings and provides carbon emissions from regulated energy.

The building can then be benchmarked/ thermally modelled using the energy hierarchy:

1. Be Lean <i>A reduction in energy use as a result of passive design and energy efficiency</i>
Thermal performance of envelope (U values) Glazing design Airtight construction Efficient mechanical ventilation Variable speed fans and pumps Efficient lighting
2. Be Clean <i>A focus on supplying energy to the development through efficient means</i>
Connect to low carbon heat networks Develop site wide heat network from single energy centre On site district heating network Provide energy efficient individual heating
3. Be Green <i>The installation of renewable technologies to meet energy demand where possible</i>
Consider the feasibility of renewable energy technologies Assess the integration of renewable technologies based on the above measures

The development must be provided with energy savings through the use of thermal improvements to fabric (a 'fabric first' approach), followed by other clean energy solutions (energy efficiency improvements, district heating, etc.) and finally the use of renewable energy technologies, where

practical. This hierarchy complements the integrated approach to the sustainable energy objectives of the energy hierarchy, as set out in the PFE (2024) planning policies.

The planning policies require a full review of the technical and economic feasibility of the following renewable technologies:

- Biomass heating
- Biomass combined heat and power
- Solar hot water
- Solar photovoltaic
- Ground source heat pumps
- Air source heat pumps / exhaust air heat pumps
- Wind power

To achieve the targets set the development must achieve a balance between fabric, heating and control, ventilation and air leakage improvements, the amount of zero or low carbon technology installed and the capital, life cycle and running costs, maintenance, and operation, etc.

Feasible renewable energy technologies have been considered during the assessment to ensure the most suitable renewable energy is chosen for the demands of this scheme. The pros and cons of each technology with respect to this site are considered as part of this statement.

4. Baseline Energy Assessment

Energy Counsel have based the analysis on current Building Regulations ADL1 2021 (SAP 10), taking into account solutions that must not only be energy efficient but also practical, reliable and user friendly. Energy Counsel have carried out preliminary SAP 10 calculations for the dwellings. Under Building Regulations Part L1 2021, dwellings must comply with all three metrics set by the notional building shown below.

- Dwelling Emissions Rate (DER) < Target Emissions Rate (TER), Dwelling Primary Energy Rate (DPER) < Target Primary Energy Rate (TPER), Dwelling Fabric Energy Efficiency Rate (DFEE) < Target Fabric Energy Efficiency Rate (TFEE)

SAP 10 is the Governments Standard Assessment Procedure (SAP) for calculating the energy aspects of a dwelling. SAP is a measure of fuel costs for heating, hot water and lighting for a dwelling. SAP 10 can also be used to ascertain the energy requirements of a development.

To assess the baseline carbon emissions, we must make an estimation of the energy demands through Building Regulations in order to set a target upon which the actual development can be compared.

4.1. Predicted Baseline Energy Requirements

The predicted baseline CO₂ emission and primary energy demands for the development:

Table 4 - Baseline dwelling carbon emissions and primary energy

Our Ref	Dwelling Type	No. of Type	Floor Area m ²	TER (Kg CO ₂ /yr/m ²)	TPER (kWh/yr/m ²)	Total Target Carbon Emissions (Kg CO ₂ /yr)	Total Target Primary Energy (kWh/yr)
Z61922	1B2P MID MFF	15	52	9.84	52.67	7,675	41,083
Z61923	1B2P MID MFF + EXP FLOOR	6	52	13.26	71.12	4,137	22,189
Z61924	1B2P MID TFF	6	52	11.53	61.76	3,597	19,269
Z61925	1B2P END MFF	7	52	10.7	57.31	3,895	20,861
Z61926	1B2P END MFF + EXP FLOOR	2	52	14.23	76.31	1,480	7,936
Z61927	1B2P END TFF	3	52	12.38	66.34	1,931	10,349
Z61928	1B2P (CAT 3) END GFF	2	62	12	64.39	1,488	7,984
Z61929	2B3P END GFF	2	65	11.47	61.35	1,491	7,976
Z61930	2B3P MID MFF	7	65	8.91	47.47	4,054	21,599
Z61931	2B3P MID MFF + EXP FLOOR	6	65	12.09	64.6	4,715	25,194
Z61932	2B3P MID TFF	3	65	10.61	56.59	2,069	11,035
Z61933	2B3P END MFF	14	65	8.91	47.47	8,108	43,198
Z61934	2B3P END TFF	6	65	11.33	60.5	4,419	23,595
Z61935	2B3P (CAT 3) END GFF	1	70	11.56	61.77	809	4,324

Z61936	1B2P SO MID GFF	4	51	12.42	66.77	2,534	13,621
Z61937	1B2P SO MID MFF	8	51	10.96	58.78	4,472	23,982
Z61938	1B2P SO MID TFF	4	51	12.58	67.52	2,566	13,774
Z61939	1B2P SO END GFF	3	51	13.63	73.29	2,085	11,213
Z61940	1B2P SO END MFF	4	51	12.02	64.5	2,452	13,158
Z61941	1B2P SO END TFF	2	51	13.57	82.83	1,384	8,449
Z61942	2B4P SO MID MFF	2	70	8.72	46.51	1,221	6,511
Z61943	2B4P SO MID TFF	1	70	10.49	56.06	734	3,924
Z61944	2B4P SO END GFF	3	70	11.51	61.54	2,417	12,923
Z61945	2B4P SO END MFF	6	70	9.42	50.29	3,956	21,122
Z61946	2B4P SO END TFF	3	70	11.14	59.53	2,339	12,501
Total		120				76,030	407,771

The baseline carbon emissions rate for the development is **76,030 KgCO₂/yr** and the baseline primary energy rate is **407,771 kWh/yr**.

5. Passive Design and Energy Efficiency

The approach of the development is to embed sustainability into the heart of the design from the outset of the project design process. The design will be developed with sustainable solutions, taking into account the relevant policies and strategies of the Places for Everyone Joint Development Plan (2024). The development will seek to consider all aspects and principles of sustainable development, taking into account environmental, social and economic impacts.

5.1. Passive Design Measures

The philosophy for the site is to achieve as much of the necessary reduction in carbon emissions through the use of passive design techniques and energy efficient measures as possible, before resorting to the use of LZCs. This ensures that the highest standards of building fabric and energy efficiency are achieved, rather than offsetting a poorer performance with LZC contributions.

This will be undertaken through a fabric first energy efficient design approach with high levels of thermal efficiency and a reduction in energy demand through efficient lighting design.

5.2. Energy Efficient Systems

Options have been reviewed for improving the energy efficiency of the development by installing an efficient heating system. The apartments will benefit from high efficiency hot water heat pumps for water heating, with efficient direct electric heating. The communal areas will be served by heat pumps in the majority of spaces excl ancillary areas such as storerooms, laundry etc. Corridors will be provided with heat pumps fed from a heat pump on the 80 apartment facility only.

6. District & Communal Heating Networks

This section outlines how consideration of energy supplied efficiently from a district heating network can be provided to the dwellings in line with the energy hierarchy.

6.1. Decentralised Heating Networks

The energy policy reaffirms the view that energy generated by centralised power stations and transmitted through the national grid is highly inefficient and wasteful.

One of priorities for reducing CO₂ emissions is to reduce the 's reliance on centralised power stations. This means increasing the use of local, low-carbon energy supplies through de- centralised energy systems.

Decentralised plant generally means any heating and hot water and/or electricity generation provided on a district wide (DHN) or site wide (CHN) basis. DHN and CHN can typically include combined heat and power equipment (CHP). CHP is an engine which, when running, generates electricity and heats water which can then be distributed around a development.

A number of heat network opportunities across the region are at various stages of development. Benefits of district heating networks can include:

- Provision of low carbon / lower cost heat to domestic and commercial customers
- Diversification of the energy mix
- Reductions in region-wide carbon emissions
- Targeting and reduction of fuel poverty
- Potential long-term revenue streams for local authorities
- Alignment with regeneration programmes
- Driving the growth of the low carbon services sector

There are currently no existing district heating networks within proximity to the site. The nearest district heating network is located at Christie Hospital over 3 miles South-East of the site.

6.2. New Heating Networks – Options

Consideration has been given to adopting a centralised or decentralised energy strategy. A decentralised energy option would typically be an energy centre distributing heat, hot water and electricity to the development from a single source either as a DHN or CHN. This typically would include boilers and a CHP type unit or district heat pumps, sized to provide the whole development.

Sometimes multiple energy centres are used to split the loads, provide resilience and to serve different buildings.

The proposed heating and hot water demand from the development of 120No. dwellings is not sufficient to justify a DHN or CHN. The existing site is spatially constrained and there is insufficient space to locate the equipment and associated plant.

7. Renewable Energy Technologies

Energy Counsel have reviewed options for the use of on-site renewable energy/ Low or Zero Carbon Technology (LZT) in line with Places for Everyone Joint Development Plan (2024).

This renewable Environmental Standards Statement/strategy reviews the technical and economic feasibility of the following technologies –

- Solar Photovoltaic
- Solar Hot Water
- Ground Source Heat Pumps
- Air Source Heat Pumps / Exhaust Air Heat Pumps
- Micro Wind Power
- Biomass

7.1. Photovoltaics (PV)

Photovoltaic panels convert sunlight into electricity to run lights and appliances. Photovoltaic panels use cells to convert light into electricity. A PV cell normally consists of 1 or 2 layers of a semi conducting material such as silicon. When light shines on a cell it generates energy causing electricity to flow, the higher the light intensity is, the more electricity flows.

The amount of energy PV cells generate is referred to as Kilowatt Peak (KWp). PV arrays now come in a variety of shapes and colours, ranging from grey 'solar tiles' that look like roof tiles to panels and transparent cells that you can use on conservatories and glass to provide shading as well as generating electricity. The roof must be strong enough to take the weight of the panels, especially if the panel is placed on top of existing tiles. For flat roofs the panels can be mounted on A-frames to give the optimum angle.

The optimum panel inclination for solar collection is 35°, oriented due south; however panels that are inclined between 35° and 45° and oriented south of west or east are generally suitable. If solar

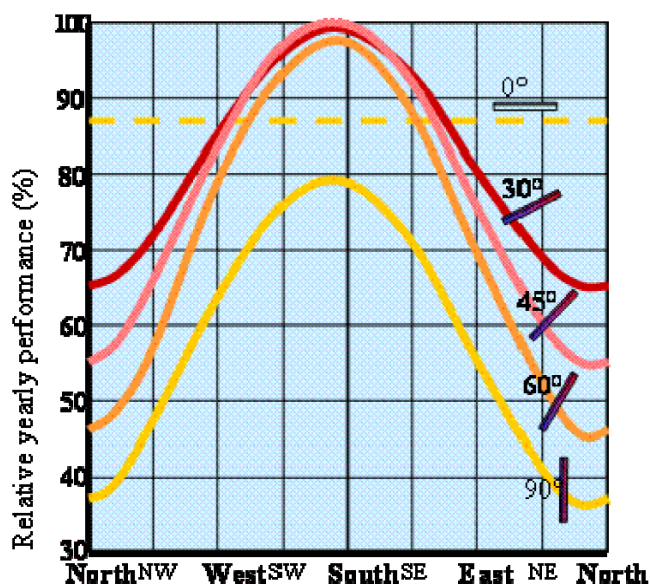


Figure 3 - Performance of photovoltaic panel orientation

collectors are oriented away from due south then a larger surface area will be required to generate a set amount of energy. The effect of non-optimal orientation is illustrated by the graph to the right:

The cost to install PV is typically £1,000 - £1,500 per kWp for 'on-roof' panel systems.

Photovoltaic panels have not been proposed on the building in this instance, however the use of heat pumps for heating and hot water ensure that carbon emission reductions are provided in line with Places for Everyone Joint Development Plan (2024).



Figure 4 - Photovoltaic array on a pitched roof

7.2. Solar Thermal HW Panels

Solar panel heating uses the radiant energy from the sun to heat hot water, most commonly for domestic hot water needs. There are two types of collectors used for solar water heating – flat plate collectors and evacuated tubes collectors. The systems function successfully in all parts of the UK, as they can work in diffuse light conditions. The collector should be mounted on a 10-60 degrees pitch facing south, although other variations can be used, south is the most efficient.

The cost of installing the system is dependent on the distance between the solar collector and the hot water storage and therefore costs vary. The closer the collectors are to the hot water storage; the less pipe work is required.

Annual maintenance checks are recommended. The solar collectors are connected to a condensing boiler via a HW cylinder with twin coil.

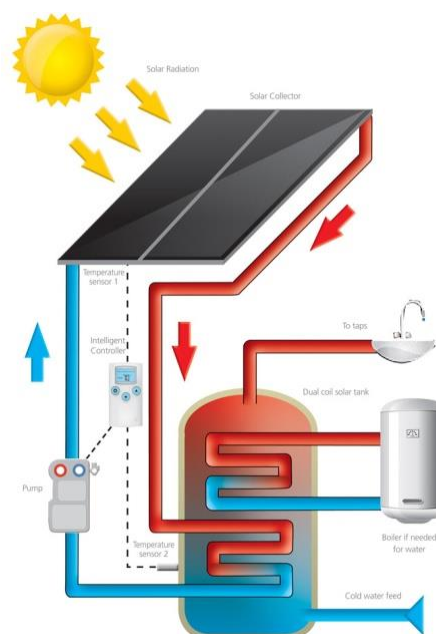


Figure 5 - The principles of a solar thermal system

A typical installation in the UK has a panel size of 3-5m² which is used in conjunction with a HW storage tank of 180-300litres, of which a minimum of 90-150 litres must be dedicated to solar hot water storage.

They are a 'simple' and guaranteed technology which will act as a pre-heat for the Hot Water and Heating usage. Payback between capital cost and energy saving can normally be achieved within 12 – 20 years, subject to usage and dwelling type.

The use of solar thermal panels are applied best in conjunction with individual heating systems for each dwelling. The orientation of the development is fine for the utilisation of solar water heating to provide domestic hot water however it will not achieve significant carbon savings. Carbon savings of approximately 4-5% are achievable with this technology. The dwellings are unlikely to require sufficient hot water storage to deem solar thermal a feasible technology for this site. For the reasons aforementioned this is not an appropriate option for this scheme.

7.3. Ground Source Heat Pump (GSHP)

GSHPs have been developed specifically for the housing market and are now considered to be an established reliable technology. The GSHP would be sized to cater for the heating and domestic hot water requirements. Typically, they are more suited to apartments as a centralised system would be

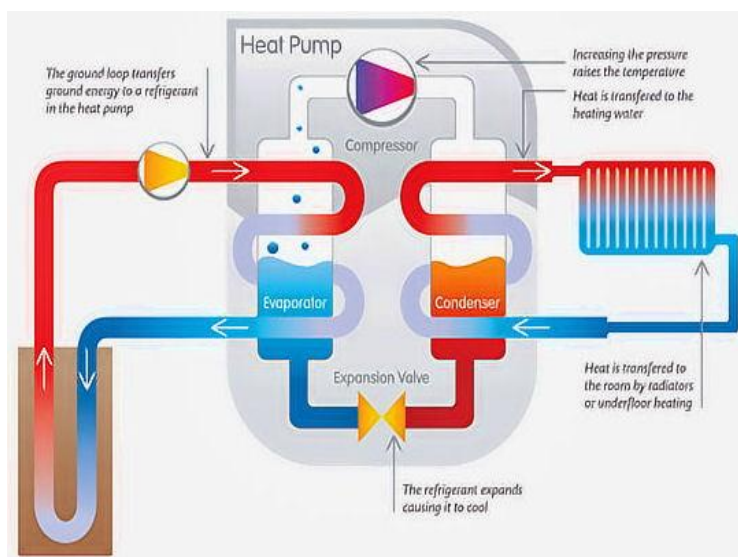


Figure 6 - Principles of a GSHP system

installed with multiple bore holes to a depth of up to 125 metres depending on the ground conditions. GSHPs use a heat exchanger to extract heat from the earth.

The efficiency of ground source heat pumps is measured by Co-efficient of Performance (CoP), this is the ratio of units of heat output for each unit of electricity used to drive the compressor and pump for the ground loop. Average CoP is around 2-4

although some systems may produce a greater rate of efficiency. This means that for every unit of electricity used to pump the heat, 2-4 units of heat are produced, making it an efficient way of heating a building. If grid electricity is used for the compressor and pump, then there is the opportunity to

consider a range of energy suppliers to benefit from the lowest running costs, for example by choosing an economy 10 or economy 7 tariff.

Due to the scale of these dwelling units, GSHPs are not considered an appropriate design solution.

7.4. Air Source Heat Pump/Exhaust Air Heat Pump

Air source heat pumps (ASHP) and exhaust air heat pumps (EAHP) work in a similar way to GSHP. Air source heat pumps can be fitted on the external façade or in the roof space. An air source heat pump uses small amounts of electricity to take in large quantities of air and extract heat. The efficiency of ASHP is measured by Coefficient of Performance (CoP); this is the ratio of units of heat output for each unit of electricity used to drive the system. Average CoP is around 2-4 although some systems may produce a greater rate of efficiency.

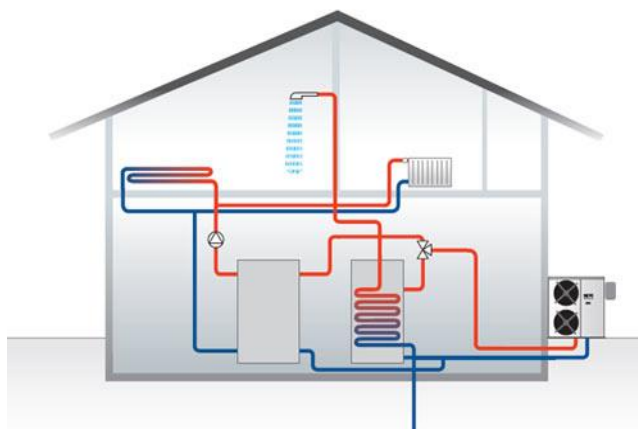


Figure 7 - Principles of an ASHP system

Exhaust air heat pumps such as the NIBE F370 work in a similar manner to ASHP units but have only indoor units (no outdoor compressors) and in addition they also recover heat from their integral exhaust air ventilation system. These units work well on apartment blocks and dwellings where mains gas is unavailable or unsuitable for a development. They are expensive in terms of capital cost of the equipment, installation and the enhanced structural requirements.

ASHPs are considered the most appropriate technology for this scheme and can be utilised for hot water throughout the dwellings. The introduction of this technology ensures that carbon emissions reductions can be provided in line with Places for Everyone Joint Development Plan (2024).

7.5. Micro Wind Power

Wind power is one of the cleanest and safest methods of generating electricity. However, wind power is unfeasible due to the fact the development is in an urban area and local wind conditions would not be sufficient to provide enough power. Most small wind turbines generate Direct Current (DC) electricity. Systems that are not connected to the national grid require battery storage and an inverter to convert DC electricity into Alternating Current (AC) which is mains electricity.

There are two types of wind turbine available:

- Roof mounted – These are mounted on the roof of dwellings
- Mast mounted – Which are free standing

Important issues to consider when using wind turbines are:

- Wind speed increases with height so it's best to have the turbine high on a mast or tower.
- The ideal site is a smooth top hill with a flat, clear exposure, free from excessive turbulence and obstructions such as large trees, dwellings or other buildings.
- Small scale wind power is particularly suitable for remote off grid locations where conventional methods of supply are expensive or impractical.
- Where the local annual average wind speed is 6 m/s or more.
- Where there are no significant nearby obstacles such as buildings, trees or hills that are likely to reduce the wind speed or increase turbulence



Figure 8 - Mounted wind turbine

As this development is in an urban area there will be obstacles which reduce wind speed. The average wind speed in this area is 4.5 m/s at a height of 10 metres, which is less than the 6 m/s required. Therefore, micro wind is not a viable technology for this development.

7.6. Biomass

Biomass is a generic name for any fuel produced from organic sources and falls into mainly two categories:

- Woody biomass- forest products, untreated wood products, energy crops and wood pellets
- Non-wood biomass – liquid biofuels (such as biodiesel, bioethanol) or animal waste industrial municipal products and high energy crops such as rape seed, sugar cane and maize.

For domestic properties the fuel used is normally wood pellets, wood chips or wood logs. For larger applications, biomass boilers replace conventional fossil fuel boilers and come with an automated feed by screw drives from hoppers.

Biomass systems require more cleaning than gas or oil boilers and they must be capable of being taken out of service for cooling and cleaning whilst maintaining the building heating supply particularly in

communal heating systems. Centralised gas boilers are therefore still required to support the biomass boiler, which would be the lead boiler. The size of the dedicated plant rooms is substantial. Fuel availability, delivery and storage are also important issues to consider.

Air quality issues are also an important factor when looking to install biomass. The cost of the fuel depends on the type, delivery distances and whether it is obtained as simple waste product or from another organisation. The cost of wood pellets is currently a little more expensive than mains gas, and woodchip is approx. 30% cheaper, however prices are fluctuating rapidly in the bio-fuel market at the present time creating uncertainty over their take up.



Figure 9 - Biomass boiler and hopper

Biomass CHP is still relatively new to the UK market and is more suitable to large developments where energy demand does not require significant modulation. There are technical issues with small scale Biomass CHP and until these can be resolved and proven the take up of these systems in the UK and Europe has been slow.

Overall carbon savings of 40%+ are achievable with biomass technology. Biomass is more suited to a communal heating system; there is insufficient space to accommodate the equipment and fuel storage to facilitate a biomass boiler. Furthermore, there are noise and air quality issues associated with this type of technology. For this reason, biomass is discounted.

8. Energy Assessment of Proposed Scheme

The Russell Road, Manchester residential development has adopted the principles of the 'Be Lean, Be Clean, Be Green' approach. The most practical and economically feasible solution for the development is a good quality thermally insulated fabric, air-tight envelope, passive improvements, and the use of direct electric heating with highly efficient hot water heat pumps with efficient ventilation system.

Table 5 - Proposed carbon emissions from the Russell Road, Manchester residential development

Ref	Dwelling Type	No.	TER	DER	TPER	DPER	Total Carbon Emissions (Kg CO ₂ /yr)	Total Primary Energy (kWh/yr)
Z61922	1B2P MID MFF	15	9.84	3.00	52.67	31.42	2,340	24,508
			69.51%		40.35%			
Z61923	1B2P MID MFF + EXP FLOOR	6	13.26	5.25	71.12	54.20	1,638	16,910
			60.41%		23.79%			
Z61924	1B2P MID TFF	6	11.53	4.48	61.76	46.39	1,398	14,474
			61.14%		24.89%			
Z61925	1B2P END MFF	7	10.70	3.58	57.31	37.31	1,303	13,581
			66.54%		34.90%			
Z61926	1B2P END MFF + EXP FLOOR	2	14.23	5.94	76.31	61.23	618	6,368
			58.26%		19.76%			
Z61927	1B2P END TFF	3	12.38	5.15	66.34	53.27	803	8,310
			58.40%		19.70%			
Z61928	1B2P (CAT 3) END GFF	2	12.00	5.29	64.39	54.66	656	6,778
			55.92%		15.11%			
Z61929	2B3P END GFF	2	11.47	4.97	61.35	51.37	646	6,678
			56.67%		16.27%			
Z61930	2B3P MID MFF	7	8.91	2.84	47.47	29.66	1,292	13,495
			68.13%		37.52%			
Z61931	2B3P MID MFF + EXP FLOOR	6	12.09	4.99	64.60	51.47	1,946	20,073
			58.73%		20.33%			
Z61932	2B3P MID TFF	3	10.61	4.25	56.59	43.93	829	8,566
			59.94%		22.37%			
Z61933	2B3P END MFF	14	8.91	2.84	47.47	29.66	2,584	26,991
			68.13%		37.52%			
Z61934	2B3P END TFF	6	11.33	4.93	60.50	50.89	1,923	19,847
			56.49%		15.88%			
Z61935	2B3P (CAT 3) END GFF	1	11.56	5.38	61.77	55.51	337	3,886
			53.46%		10.13%			
Z61936	1B2P SO MID GFF	4	12.42	4.77	66.77	49.50	973	10,098
			61.59%		25.86%			
Z61937	1B2P SO MID MFF	8	10.96	3.49	58.78	36.42	1,424	14,859
			68.16%		38.04%			
Z61938	1B2P SO MID TFF	4	12.58	4.92	67.52	50.94	1,004	10,392
			60.89%		24.56%			
Z61939	1B2P SO END GFF	3	13.63	5.57	73.29	57.62	852	8,816
			59.13%		21.38%			
Z61940	1B2P SO END MFF	4	12.02	4.21	64.50	43.77	859	8,929
			64.98%		32.14%			
Z61941	1B2P SO END TFF	2	13.57	5.70	82.83	58.92	581	6,010
			58.00%		28.87%			
Z61942	2B4P SO MID MFF	2	8.72	3.00	46.51	31.29	420	4,381
			65.60%		32.72%			

Z61943	2B4P SO MID TFF	1	10.49	4.63	56.06	47.85	324	3,350
			55.86%		14.65%			
Z61944	2B4P SO END GFF	3	11.51	5.31	61.54	54.83	1,115	11,514
			53.87%		10.90%			
Z61945	2B4P SO END MFF	6	9.42	3.54	50.29	36.77	1,487	15,443
			62.42%		26.88%			
Z61946	2B4P SO END TFF	3	11.14	5.22	59.53	53.91	1,096	11,321
			53.14%		9.44%			
Total		120	62.53%		27.51%		28,488	295,578

The carbon emissions are **28,488 kgCO₂/yr**. This is a total carbon reduction of **47,542 kgCO₂/yr** from the baseline emissions of **76,030 kgCO₂/yr**. This equates to a **62.53%** carbon reduction. The primary energy rate is **295,578 kWh/yr**. This is a primary energy reduction of **112,194 kWh/yr** from the baseline primary energy rate of **407,771 kWh/yr**. This equates to a **27.51%** primary energy reduction.

The development proposal achieves carbon efficiency reductions through a highly efficient thermal fabric, energy efficient lighting and ventilation, improved thermal bridging, low air leakage and highly efficient heat pumps for domestic hot water heating reduce emissions in line with Places for Everyone Joint Development Plan (2024).

9. Conclusion

Following the 'Be Lean, Be Clean, Be Green' hierarchy, the proposed design solutions are predicted to:

- 1) Reduce the total carbon emissions by 62.53% compared to new building regulations ADL 2021. New building regs are a 31% improvement on 2013 regs, which in turn were a 6% improvement on 2010 regs upon which the energy policies are based. Therefore, the overall improvement of this project, based on 2006 standards is 100.53% betterment, which is greater than the requested 15% in the energy policy EN6.
- 2) The heat pumps are the renewables/ low carbon technology. Their contribution to the overall energy reduction under the 'be green' energy hierarchy is approx. 50%.
- 3) Reduce the total primary energy by 27.51% compared to new building regulations ADL 2021. This is a new metric under Part L.

The approach for the Russell Road, Manchester residential development is to embed sustainability into the heart of the development through a range of design measures based on the 'Be Lean, Be Clean, Be Green' design hierarchy. Measures will include:

1. Enhanced building fabric to meet the new Building Regulations ADL1 2021 (15/06/2022)
2. Enhanced air tightness and thermal bridging.
3. Apartments – MVHR for the ground floor flats. Continuous mechanical extract ventilation system for all upper floors
4. Apartments - Space heating will be provided by highly efficient direct electric heating
5. Apartments - Hot water will be provided by highly efficient air to water heat pumps
6. Communal space - Space heating will be provided by highly efficient heat pumps with heating and cooling facility in the main areas as set out in Appendix 1
7. Communal space - Hot water will be provided by highly efficient heat pumps
8. Efficient lighting strategy primarily using CFL or LED type fittings.

9.1. Low/ Zero Carbon Technologies (LZT) Discounted

- Solar Thermal Hot Water is not a viable option as heat pumps are proposed and hot water demand will be heated and stored efficiently through this system.
- PV has not been included within the preliminary SAP calculations as heat pumps provide the necessary carbon emission reductions required by the Places for Everyone Joint Development Plan (2024).

- Biomass has been discounted as it poses problems in terms of air quality, delivery of fuel, storage and transportation for deliveries etc. It would require a centralised larger plant space for storing fuel, which on this constrained site is not viable.
- Micro-wind turbines do not work on this type of development due to problems with wind turbulence and mounting of the units. The wind speeds in the area are not conducive to wind power electricity generation and there would be issues with turbulence, wind shading, noise and air traffic.
- GSHPs are not viable for site because of spatial and financial costs. There is no room to accommodate a GSHP vertical bore and associated communal plant room, ground conditions are unknown, and systems are very costly.
- Hot Water Heat Pumps are considered the most viable option for the dwellings and can provide a carbon emission reduction in line with the requirements of Manchester City Council's Core Strategy.

A more detailed overview of LZT technologies is provided in the appendices of this report.

9.2. Summary Headlines

- A fabric-first approach to meeting Places for Everyone Joint Development Plan (2024) energy policy has been undertaken for the Russell Road, Manchester residential development, defined within the 'Be Lean, Be Clean, Be Green' energy hierarchy. The proposed design provides compliance with Building Regulations ADL1 2021, and the application of heat pumps for heating and hot water ensures reductions in line with Places for Everyone Joint Development Plan (2024).
- The use of high-efficiency heat pumps reduces carbon emissions by 62.53% and provides a primary energy reduction of 27.51% when compared to new building regulations Part L 2021.
- Site constraints and viability for District Heating Network (DHN) and Communal Heating Network (CHN) have been reviewed. Existing DHN is not sufficiently close to connect into. In addition to this, the scheme's heating and hot water (HW) demand is too small to justify connection to DHN or CHN.

An overall 62.53% improvement in CO₂ emissions and a 27.51% improvement in primary energy above the Building Regulations baseline is proposed to support our application and to meet policy requirements.

	Total CO₂ Emissions (kgCO₂/yr)	Total Primary Energy (kWh/yr)
Target Dwelling Performance	76,030	407,771
Proposed Dwelling Performance	28,488	295,578
Total Reduction	47,542	112,194
Percentage Improvement (above ADL1 2021)	62.53%	27.51%

10. Appendices

10.1. LZT Feasibility Table

Technology	Technical Feasibility	Carbon Savings	Estimated Costs	Financial Viability
Solar photovoltaics	A photovoltaic array is not required for the dwellings as carbon emissions reductions in line with BRegs Part L1 2021 are already achieved.	A 1kWp system could save around 213 kg of CO ₂ / year per dwelling	Average cost for such a system is around £1.5K per dwelling.	Current potential income generation is around £120 minimum per annum per dwelling with a fuel cost saving of around £40 / year per dwelling.
Wind	Average wind speeds on the site according to the <u>NOABL</u> Wind Speed Database are 4.5m/s. To be technically feasible a minimum of 6m/s is required, therefore this site is not considered feasible.	N/A	N/A	N/A
Micro Hydro	There is no capa for micro hydro on this site since there are no local water courses available.	N/A	N/A	N/A
District Heating	There are no existing or planned district heating networks to facilitate connection at this stage.	N/A	N/A	N/A
Solar Hot Water	This technology has been discounted as the level of hot water usage in each dwelling does not merit a storage system, which poses space issues.	Around 270 kg of CO ₂ / year per dwelling.	£3-5K per dwelling	Income generation from RHI in a 4-person household would be in the region of £340 / year (per dwelling) with a fuel saving of around £65 / year per dwelling
Heat Pumps	GSHP: Ground conditions on site are unknown, and installation of coils are likely not economically viable for this project. ASHP: Provided to all dwellings and hot water.	GSHP: 2,100 to 3,300 kg CO ₂ / year per dwelling ASHP: 1,700 to 2,700 kg CO ₂ / year per dwelling.	GSHP @ £13-20K per dwelling ASHP: £7-11K / dwelling	GSHP: £2,590 minimum annual RHI income generation per dwelling with fuel saving of £440 / year minimum per dwelling ASHP: £920 minimum annual RHI income generation per dwelling with fuel saving of £335 / year minimum per dwelling
Biomass	The small scale of this development would not facilitate the installation of biomass boilers due to the space required for pellet storage.	N/A	N/A	N/A

10.2. Specification for Apartment Energy Assessments (ADL1 2021 – SAP 10)

Item	Brief Description	Notes	Confirm
	The following information is required for the design submission (as per requirements of AD L1).	Please note submission is in two stages. A) Design , B) As installed	
1. Dwelling Type			
1.1	Building Regulations Part L1 2021 apply.		
1.2	Post code of site is M16 8AJ.		
1.3	Electricity is supplied by standard tariff rather than economy 7, 10 or 24.	<i>Assumed Standard tariff</i>	
1.4	It is assumed that the dwellings have a medium thermal mass parameter.	<i>Masonry Construction</i>	
2. Floor Construction Details			
2.1	Ground floor is insulated to achieve the U-value stated opposite.	U-Value = 0.12W/m ² K	
3. Wall Construction Details			
3.1	Main external walls to achieve the U-value stated opposite.	U-Value = 0.18 W/m ² K	
3.2	Party walls are fully filled and sealed to achieve the U-value stated opposite.	U-Value = 0.0 W/m ² K	
3.3	Corridors on the 80No. apartment extra care facility are assumed to be heated, therefore corridor walls are fully filled and sealed to achieve the U-Value stated opposite.	U-Value = 0.0 W/m ² K	
3.4	Corridors on the 40No. apartment facility are assumed to be unheated, therefore corridor walls must be designed with 100mm fully fill dritherm 32 insulation or equivalent and sealed to achieve the U-Value stated opposite.	U-Value = 0.22 W/m ² K	
4. Roof Construction Details			
4.1	All roofs are insulated to achieve the U-value indicated opposite.	U-Value = 0.11 W/m ² K	
5. Openings			
5.1	Apartment doors on the 80 unit extra care are not included in the assessment due to heated corridors.		
5.2	Apartment doors on the 40 unit apartment scheme open onto cold corridors and U value opposite applies	Ud-Value = 1.3 W/m ² K	
5.3	All BFRC certified double-glazed windows, rooflights and patio type doors/windows with Low-e glass hard coating to achieve the U-Value stated opposite.	U-value = 1.3 W/m ² K. G-value = 0.4 BFRC certified	
6. Ventilation			
6.1	Dwelling Design stage SAP calculation presumes an air permeability of 4m ³ /m ² /hr at 50pa will be achieved.	4m ³ /m ² /hr at 50pa	
6.2	Ground floor Apartments - Continuous mechanical ventilation with heat recovery system is installed in all apartments	MVHR – HR=90+% and SFP<0.7W/l/s as Nuair MRXBOX AB-ECO2 or equal and approved	
6.2	Upper floor Apartments - Continuous mechanical extract ventilation system is installed in wet areas.	Greenwood Unity CV3 or equal and approved.	
6.3	No open flues or fireplaces or flue-less gas fires are present anywhere.		
7. Space Heating			
7.1	Apartment Space Heating is provided by individual wall mounted electric panel heaters	Direct electric panel heating with programmer and appliance stats	
8. Water Heating			
8.1	Hot water is provided by hot water heat pumps with cylinder storage to the flats as indicated opposite	Dimplex EDL or equivalent.	

8.2	Water usage per person per day is ≤ 105 Litres.	To exceed Part G. Requires good specification of flow rates on all water consuming appliances – taps, showers, etc	
8.3	Showers will be supplied from the heat pump system	Flow regulated 8l/min@3bar	
9. Renewables			
9.1	There are no renewable technologies on the development.	PV could be added later to improve dwelling running costs.	
10. Other			
10.1	We have used a Y-Value of 0.08 for thermal bridging until form of construction is known.	Specialist thermal bridging to be reviewed by Contractor and their design team	
10.2	Low energy (LE) lights are installed throughout.	All lighting must be specified with efficacy of 80 lumens/circuit watt or more.	
10.3	Dwellings will require further analysis under part O	Part O overheating assessment required for flats for building regs	

10.3. Specification for Non-Dwelling Assessments (ADL2 2021 – SBEM)

Item	Brief Description	Notes	Confirm
	The following information is required for the design submission (as per requirements of AD L2).	Please note submission is in two stages. A) Design , B) As installed	
1. Dwelling Type			
1.1	Building Regulations Part L2 2021 apply.		
1.2	Post code of site is M16 8AJ.		
2. Floor Construction Details			
2.1	Ground floor is insulated to achieve the U-value stated opposite.	U-Value = 0.12W/m ² K	
3. Wall Construction Details			
3.1	Main external walls to achieve the U-value stated opposite.	U-Value = 0.18 W/m ² K	
3.2	Party walls are fully filled and sealed to achieve the U-value stated opposite.	U-Value = 0.0 W/m ² K	
3.3	Corridors on the 80No. apartment extra care facility are assumed to be heated, therefore corridor walls are fully filled and sealed to achieve the U-Value stated opposite.	U-Value = 0.0 W/m ² K	
3.4	Corridors on the 40No. apartment facility are assumed to be unheated, therefore corridor walls must be designed with 100mm fully fill dritherm 32 insulation or equivalent and sealed to achieve the U-Value stated opposite.	U-Value = 0.22 W/m ² K	
4. Roof Construction Details			
4.1	All roofs are insulated to achieve the U-value indicated opposite.	U-Value = 0.11 W/m ² K	
5. Openings			
5.1	Apartment doors on the 80 unit extra care are not included in the assessment due to heated corridors.		
5.2	Apartment doors on the 40 unit apartment scheme open onto cold corridors and U value opposite applies	Ud-Value = 1.3 W/m ² K	
5.2	All BFRC certified double-glazed windows, rooflights and patio type doors/windows with Low-e glass hard coating to achieve the U-Value stated opposite.	U-value = 1.3 W/m ² K. G-value = 0.4 BFRC certified	
6. Ventilation			

6.1	Non Dwelling areas - Design stage SAP calculation presumes an air permeability of 4m ³ /m ² /hr at 50pa will be achieved.	4m ³ /m ² /hr at 50pa	
6.2	Continuous mechanical ventilation with heat recovery system is installed in all areas identified in 7.1	Mitsubishi Lossnay units	
6.3	No open flues or fireplaces or flue-less gas fires are present anywhere.		
7. Space Heating			
7.1	All spaces including residents lounge, staff room, treatment rooms, offices, interview and reception, multipurpose eating space, multipurpose rooms, comms or IT rooms, café, cinema room, incidental space, library and all circulation space on the extra care facility will be provided with a heat pumps.	SCOP=500% SEER=600%	
7.2	Ancillary spaces including common toilets, laundry, store rooms, locker rooms, cleaners store etc – Space Heating is provided by individual wall mounted electric panel heaters with programmer and appliance stats	Direct electric heating	
7.3	The corridors and circulation space on the 40 apartment unit will remain unheated.	Refer to point 3.4 above.	
8. Water Heating			
8.1	Hot water for the communal facilities will be provided by heat pumps with cylinder storage to the flats as indicated opposite	SCOP=350%	
8.2	Water usage per person per day is ≤105 Litres.	To exceed Part G. Requires good specification of flow rates on all water consuming appliances – taps, showers, etc	
8.3	Communal Showers will be supplied from the heat pump system	Showers Flow regulated 8l/min@3bar	
9. Renewables			
9.1	There are no renewable technologies photovoltaic panels included on the development.	Future PV could be added if required	
10. Other			
10.1	We have used a Y-Value of 0.08 for thermal bridging until form of construction is known.	Specialist thermal bridging to be reviewed by Contractor and their design team	
10.2	Low energy (LE) lights are installed throughout.	All lighting must be specified with efficacy of 120 lumens/circuit watt or more.	
10.3	Lighting – All areas identified in point 7.1 will have occupancy dimming controls All areas identified in point 7.2 will have movement detection		

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