Great Places Housing Association

Environmental Standards & Energy Statement

Downley Drive, Manchester, M4

16 August 2023

Daniel Watt
CIBSE Accreditation Nos:
LCCSIM084077
LCCD084077
LCEA084077

Watt Energy & Consulting Engineers Ltd
40 King Street, Manchester, M2 6BA

t. 0161 43 43 103
w. www.wece.co.uk

watt
Energy & Consulting Engineers

Issue Status

Director	Daniel Watt 
Energy and Sustainability Consultant	Jack Sewell

First Issue Date	Revision Issue Date	Issue Revision	Issued By
12th April 2021			*DW*
	May 6, 2021	*A*	*BS*
	July 24, 2023	*B*	*JD*
	Aug 16, 2023	*C*	*JD*

Index

Section

1. Executive Summary
2. Planning Statement
   - 2.1. The Site and Proposed Development
   - 2.2. Relevant Policies and Guidance
     - 2.2.1. Local Planning Policy
       - 2.2.1.1. Manchester Core Strategy
       - 2.2.1.2. Guide to Development in Manchester, Supplementary Planning Document
       - 2.2.1.3. Manchester Residential Quality Guide
       - 2.2.1.4. Manchester's Great Outdoors
       - 2.2.1.5. Manchester Climate Change Framework 2020-25
     - 2.2.2. Sustainable Design Definitions
     - 2.2.3. Manchester City Council's Planning Document Targets
     - 2.2.4. National Planning Policy
     - 2.2.5. Future Homes Standard
   - 2.3. Sustainable Design Strategy
     - 2.3.1. Energy and Carbon Emissions
     - 2.3.2. Choice and Impact of Clean Energy and Renewable Technologies
     - 2.3.3. Energy and CO_2 Reduction Summary
     - 2.3.4. Manchester City Council' Policy and Targets Summary
   - 2.4. Adaptation to Climate Change
     - 2.4.1. Grid Decarbonisation and SAP
     - 2.4.2. Flood Risk Zone
     - 2.4.3. Green Blue Infrastructure
       - 2.4.3.1. Sustainable Drainage Systems (SUDs)
       - 2.4.3.2. Biodiversity
     - 2.4.4. Internal Water Efficiency
     - 2.4.5. Waste Management
       - 2.4.5.1. Occupational Waste
       - 2.4.5.2. Construction Waste
     - 2.4.6. Materials
     - 2.4.7. Pollution Control
     - 2.4.8. Health and Wellbeing
     - 2.4.9. Sustainable Transport
3. Feasibility Assessment of Renewable Energy and Low Carbon Technologies
4. Conclusion

Appendices

A - Reference
B - Energy Demand Assessment Spreadsheet
C - Example SAP Compliance Report (2 Bed Flat / 5 Bed End Terrace House)
D - Example PEA (2 Bed Flat / 5 Bed End Terrace House)
E - Example SAP Input (2 Bed Flat / 5 Bed End Terrace House)
F - Example Improved SAP Calculation Worksheet (2 Bed Flat / 5 Bed End Terrace House)
G - Example Baseline SAP Calculation (2 Bed Flat / 5 Bed End Terrace House)

1. Executive Summary

This Environmental Standards & Energy Statement has been prepared by Watt Energy on behalf of Great Places Housing Association to support a planning application for the development of Downley Drive. This report is an update to the report prepared in 2021 to support planning application 130390/FO/2021. The previous application was for 23 townhouses and 45 apartments and was granted planning application on 30 July 2021. This statement supports a new application for a revised scheme. Further details can be found in section 2.1.

The statement specifically addresses the following Manchester City Council approved climate change action plans in addition to planning policies, as stipulated in the Manchester Core Strategy (July 2012):

- Guide to Development in Manchester SPD (2007)
- Our Manchester Strategy 2016-2025
- Manchester: A Certain Future (2013)
- Manchester Climate Change Board – The Zero Carbon Framework 2020-2038
- Climate Change and Low Emissions Implementation Plan 2016-2020
- Meeting Our Objectives and Targets – Manchester Climate Change Framework – 2020-25
- Manchester Residential Quality Guidance 2017
- Core Strategy Policy DM 1 - Development Management
- Core Strategy Policy EN 4 - Reducing CO2 Emissions by Enabling Low and Zero Carbon Development
- Core Strategy Policy EN 6 - Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies
- Core Strategy Policy EN 8 – Adaptation to Climate Change
- Core Strategy Policy EN 9 – Green Infrastructure
- Core Strategy Policy EN 14 – Flood Risk
- Core Strategy Policy EN 15 – Biodiversity and Geological Conservation
- Core Strategy Policy T 1 – Sustainable Transport

The statement details how the development will incorporate sustainable design and resource efficiency in line with the Energy Hierarchy, so to meet the policy requirements and council targets whilst reducing its overall environmental impact. The methodology and calculations are consistent with the MCC Appendix A EN6 Energy Target Explanation and all figures used within this report have been based on the most recent issue of drawings and modelled using SAP 2012 to accurately predict Energy Usage and CO_2 reductions.

In relation to the planning documents and policies outlined above, the development is required to achieve a 10% reduction in carbon emissions over Part L 2013 of the Building Regulations and also aim for a status of Carbon Neutral[1].

In order to achieve compliance the development has been designed with a holistic low energy design concept involving a fabric first approach. The U-values, design air permeability and ventilation targets

all aspire to Passive House design standards along with the consideration and application of low zero carbon renewable technologies.

Following the LZC feasibility assessment, it is proposed that the development will also benefit from air source heat pumps (ASHPs) supplying hot water only to flats and both heating and water to houses. These are in addition to an **8kWp PV array** located on the roof of the block of flats which equates to a **7.6%** contribution. The inclusion of ASHPs provides **40.7%**, **54.4%** and **71.2%** emission reductions when using SAP 9.0, SAP 10.0 and SAP 10.1 carbon factors respectively.

As a result of the above the predicted site wide reduction in CO_2 over Part L 2013 of the Building Regulations can be summarised as:

- **61.7%** with SAP 9 carbon factors (current Building Regulations standard)
- **71.7%** with SAP 10.0 carbon factors (initial update to the carbon factors because of increased grid decarbonisation)
- **82.9%** with SAP 10.1 carbon factors (proposed future homes and updated Part L standard)

Note that the SAP 10.0 and 10.1 carbon figures are projected emission factors taking into account the increasing decarbonisation of the electrical distribution network as the fuel mix moves toward a greater proportion of renewable energy (wind, solar, hydro-electric power) and away from the largely coal and natural gas dominated national grid of the past. The figures above demonstrate that the annual carbon emissions will reduce significantly in the forthcoming years as a result of this shift in the source of the nation's electrical energy toward a cleaner, renewable-led mix. Refer to section 2.4.1 for further details.

The **61.7%** reduction surpasses the relevant Manchester City Council planning document requirements by more than 50%. This, in addition to the total on-site energy being provided by a 100% renewable energy electricity provider allows the development to be classified as both **Low Carbon**[2] and **Carbon Neutral**[1].

In addition, the proposed development complies with the Government's proposed future home standard, which stipulates a **20-31%** carbon reduction target (depending on the final design specification option chosen by the Government.) In addition, Downley Drive will prioritise a high efficiency thermal envelope to achieve very low U-values and air permeability aspiring to Passivhaus levels, as well as introducing low carbon hot water heating in the form of air to water heat pumps. Both of which align with the aspirations of the standard as detailed in the Government's preferred specification option 2. Future Homes details are provided in section 2.2.5 of this report.

This statement also examines how the design, specification and characteristics of the proposal will contribute to sustainability and meet the relevant objectives outlined within the National Planning Policy Framework (NPPF) 2019, in addition to the Manchester City Council approved climate change action plans and core strategy planning policies outlined above. The sustainability measures assessed included:

- Flood Risk Zone

- Green and Blue Infrastructure
- Sustainable Drainage Systems (SUDs)
- Biodiversity / Ecology
- Internal Water Efficiency
- Waste Management
- Materials
- Pollution Control
- Health and Wellbeing
- Sustainable Transport

A table detailing how the proposed scheme meets all the Manchester City Council's sustainability targets can be viewed in section 2.2.3. The development therefore complies with all Manchester City Council's current and future policy requirements relating to creating a sustainable development.

In relation to the planning target centred around carbon emissions reduction, the proposed development is achieving a **61.7%** reduction in these emissions, over the Part L1A 2013 of the Building Regulations. This surpasses all of Manchester City Council's planning targets by **more than 50%** and therefore allows compliance to be reached. In addition, this CO_2 reduction exceeds the target in the Governments Future Homes Standard, preferred option 2 of **31%,** demonstrating that the development design is future-proofed to comply with both current and planned legislation and local planning targets.

2. Planning Statement

The following statement relates to the proposed development at Downley Drive, Manchester M4.

2.1 The Site and Proposed Development

The site is located northeast of the centre of Manchester, along St Vincent Street and occupies approximately 0.69 hectares of land. A site location plan, with the site's extents denoted by the red outline, can be seen in Figure 1 (shown later in this subsection).

The site is bounded by the Rochdale Canal to the north-east, green space to the north-west, Kingham Drive to the south-east and houses to the south-west which are being delivered under planning application number 130390/FO/2021.

The site formally comprised of grassland with a limited number of trees. An unadopted path cut through the site from St Vincent Street to the north, to Downley Drive to the south. The site has since been cleared as part of the application mentioned above.

The proposed scheme is a design development of the approved apartment block in planning application number 130390/FO/2021. Due to the location of an unchartered United Utilities (UU) manhole, a redesign has been required to provide free access to it. Through discussions with UU, it was established that no oversailing or cantilevers would be accepted over the manhole and free space to the sky would be required. As such, approximately 87sqm of the proposed building's footprint has been removed to the south-west corner. Due to the loss of four 2B4P apartments on the upper floors, an additional floor providing a further 11 apartments is proposed. This results in a net gain of 7 apartments, totalling 52 overall. The design principles and architectural language will remain largely the same, with the main changes being the overall height and articulation of the south south-west corner

The Proposed Development will deliver seventy-five Affordable Homes, comprising of twenty-three houses and fifty-two apartments within a four-storey building, alongside associated landscaping, boundary treatment, car parking, and cycle parking. The scheme has been split into three zones. Zone a will deliver 12 no. three bed, three-storey terraced houses. Zone B will comprise a further 8 no. three bed, three storey terraced houses, in addition to 3 no. two bed, two-storey terraced houses. Finally, Zone C will provide 27 no. one bed apartments and 25 no. two bed apartments (All Use Class C3).



Figure 1: Site Location/ Ground Floor Plan

Table 1 below sets out a schedule of the accommodation.

Area Use	Quantum
Residential Units (Use Class C3)	1 Bed Apartments: 27 2 Bed Apartments: 25 2 Bed Terraced Houses: 3 3 Bed Terraced Houses: 20 Total: 75

Table 1: Schedule of Accommodation

2.2 Relevant Policies and Guidance

2.2.1 Local Planning Policy

2.2.1.1 Manchester Core Strategy

Manchester's Core Strategy (CS) was adopted on 11th July 2012 and is the key Development Plan Document (DPD) guiding the measures assessed in this report.

CS Policy DM 1 - Development Management: Stipulates that all new development should have regard for several development principles relevant to sustainability, including: waste management, designing for health, flood risk, green infrastructure, biodiversity. Additionally, subject to scheme viability, developers will be required to demonstrate that new non-domestic development will achieve a BREEAM Rating of 'Very Good' or for domestic development to achieve the Code for Sustainable Homes standard.

CS Policy EN 4 – Reducing CO2 Emissions: This policy targets the reducing of CO2 emissions through the following of the energy hierarchy; firstly reducing the need for energy through efficient design measures, followed by clean energy and lastly, the application of renewable or LZC technologies. In addition to this point, MCC state within this policy all new development is required to use building materials that have low embodied carbon.

CS Policy EN 6 - Target Framework for CO2 Reductions from Low or Zero Carbon Energy Supplies: This Policy requires electricity intense residential development of 10 or more units to meet, as a minimum, a 15% reduction in domestic CO2 emissions over Part L of the 2010 Building Regulations, unless proven to be unviable. As Part L 2013 of the Building Regulations represents a 6% improvement on 2010 levels, this target is subsequently equivalent to a 9% improvement in CO2 emissions over Part L 2013. Section 2.3 provides evidence of how this target is achieved.

CS Policy EN 8 – Adaptation to Climate Change: Expects all new development to be adaptable to climate change in terms of its design, layout, siting, and function of both building associated external spaces.

CS Policy EN 9 – Green Infrastructure: Requires new developments to maintain existing green infrastructure whilst using every opportunity, in accordance with current Green Infrastructure Strategies, to enhance the quality and quantity of green infrastructure, improve the performance of its functions and create and improve linkages to and between area of green infrastructure.

CS Policy EN 14 – Flood Risk: This policy expects all new developments to minimise surface water run-off through the use of SUDs and Green Infrastructure.

CS Policy EN 15 – Biodiversity and Geological Enhancement: Developers will be expected to identify and implement reasonable opportunities to enhance, restore or create new biodiversity, either on or adjacent to the proposed site.

CS Policy T 1 – Sustainable Transport: Policy aims to deliver sustainable, high quality, integrated transport systems to encourage a shift away from car travel to public transport, cycling and walking.

2.2.1.2 Guide to Development in Manchester, Supplementary Planning Document 2007

The Development Guide in Manchester Supplementary Planning Documents (SPD) establish and set out the ongoing generation of the City by providing a set of set principles which will guide developers, architects, and residents in the design of the city. The MCC Core Strategy stipulates that all new residential developments should comply with the design guidance set out in the SPDs. These principles include the following environmental standards relevant to this report: energy strategy, water consumption, drainage management, weather resilience, waste management, construction management, biodiversity, and waterways.

2.2.1.3 Manchester Residential Quality Guide 2017

The Manchester Residential Quality Guide has been developed to help shape the creation of new homes and communities across the Greater Manchester city region, beginning with the Centre and its immediate surroundings. This document outlines the considerations, qualities, and opportunities that will help to deliver high quality residential development as part of successful and sustainable neighbourhoods across Manchester. The guidance includes the following nine components:

Make it Manchester – developers must understand the city's unique character, heritage old and new, density and scale in various parts of the city and appreciate how new homes will fit in to what's already there.

Make it bring people together – new homes must encourage a sense of community and neighborliness, offering a mix of tenures to promote a mix of people.

Make it animate streets and spaces – understand the relationship between new homes and its environment and create public space.

Make it easy to get around – make sure developments have good transport links, along with good walking and cycling provision.

Make work with the landscape – development should improve the connection with the local environment with improved biodiversity, as well as greening and water schemes.

Make it practical – dealing with waste, car parking, bike storage and visitors should be made as easy as possible.

Make it future proof – design must anticipate the impacts of climate change and extreme weather with efficient design and adaptability.

Make it a home – sufficient space, natural light, privacy and storage are essential for people to settle down and flourish.

Make it happen – ensuring proposals are delivered, to a high quality, with high design standards and high sustainability.

2.2.1.4 Manchester's Great Outdoors 2015-25

A Green and Blue Infrastructure Strategy for Manchester aims to invest to date in the city's Green and Blue infrastructure over the next 10 years (by 2025). Four objectives have been established to enable the vision to be achieved: 1. Improve the quality and function of existing green and blue Infrastructure, to maximize the benefits it delivers. 2. Use appropriate green and blue infrastructure as a key component of new developments to help create successful neighborhoods and support the city's growth. 3. Improve connectivity and accessibility to green and blue infrastructure within the city and beyond. 4. Improve and promote a wider understanding and awareness of the benefits that green and blue infrastructure provides to residents, the economy, and the local environment.

2.2.1.5 Manchester Climate Change Framework 2020-25

Following the declaration of a climate emergency by MCC In July 2019, this framework was adopted and is an in-depth strategy to accompany the Draft Manchester Zero Carbon Framework 2020-38, which was published in February 2019. It is a framework that will continue to develop over the next five years, in line with changes in policy, climate science, rate of progress and other factors. The framework has set out four objectives to facilitate this:

Objective 1 – Staying within our carbon budgets.

- Direct CO2 emissions: staying within our 15-million-ton carbon budget for 2018-2100, including reducing the CO2 emitted from our homes, workplaces and ground transport by at least 50% during 2020-25.
- Indirect CO2 emissions: understanding and taking action on the things that we consume, and which generate greenhouse gases through their production, transportation and disposal.

Objective 2 – Climate adaptation and resilience

- Increase the amount of urban green infrastructure cover, aiming for a 10% increase by 2038 from 2018 levels, in line with the Greater Manchester aim.
- Respond to these risks by incorporating adaptation and resilience within our plans and strategies, and acting to make necessary changes to our buildings, infrastructure and our natural environment.

Objective 3 – Health and wellbeing

- Adapt the city's built and natural environment and prepare our residents to become more resilient to these changes. Increasing the amount and quality of green space to enable residents to benefit from the improved physical and mental health that will come as a result.
- Improving the energy efficiency of the city's homes and providing access to affordable, secure supplies of renewable energy are essential help get 38,000 Manchester households out of fuel poverty.

Objective 4 – Inclusive, zero carbon and climate resilient economy

- Ensure that Manchester establishes an inclusive, zero carbon and climate resilient economy where everyone can benefit from playing an active role in decarbonising and adapting the city to the changing climate.

2.2.2 Sustainable Design Definitions

As a result of ever changing and improving carbon emission targets, developments are required to take more sustainable approaches to the construction of their buildings which commonly differ from site to site. This results in buildings being explained under many definitions and using various terminology when they incorporate sustainable design to reduce these carbon emissions.

The most common of these terminologies can be summarised as:

- Net Zero Carbon
- Carbon Neutral
- Low Carbon

The below table outlines the formal definitions of each of these terminologies. Refer to Appendix A for the references used to source the below definitions.

Terminology:	Carbon / Energy targets:	Definition:
Net Zero Carbon[3]	Net Zero carbon emissions	Buildings that generate **100%** of their energy needs **on-site** without the need to import energy.
Carbon Neutral[1]	Net Zero carbon emissions	Buildings achieving **net zero** carbon emissions by offsetting through the use of a renewable energy supplier (electricity only) or via a financial contribution.
Low Carbon[2]	Carbon emission % reduction normally over the building regulation standards.	Buildings achieving **reduced** carbon emission through **energy-efficient design**.

Table 2: Overview of Sustainable Design Definitions

2.2.3 Manchester City Council's Planning Document Targets

Manchester City Planning Policy currently uses the following documents to look to establish the carbon reduction targets to be achieved in new developments across the City.

These documents use different terminology to describe achieving the various reduced carbon emissions. Please refer to section 2.4.1 for an explanation of the varying carbon factors.

Please see below a summary of the terminology and targets set out within the current Manchester Planning Policy documents:

Planning Document:	Time of Production or Adoption:	Low Carbon Target:	Sustainable Design Definition and compliance commentary
Manchester Council's Core Strategy 2012-2027	Adopted 2012	Targets a **9%** reduction in carbon emissions over Part L Building Regulations.	**Low Carbon** (9% over Part L 2013) The proposed scheme complies by achieving at least 61.7% over Part L 2013 using the current SAP 9.0 carbon factors
Climate Change and Low Emission Strategies 2016-2020	Adopted 2016	Targets a **48%** reduction in carbon emissions from 1990 - 2020	**Low Carbon** (48% over 1990 emissions) The proposed scheme complies by achieving at least 61.7% over Part L 2013 using the current SAP 9.0 carbon factors
Manchester: A Certain Future	Produced in 2009, updated in 2013	Targets emitting 41% less CO_2 in 2020 than in 2005 – Equates to **10%** over Part L 2013 (if going by Part L requirements)	**Low Carbon** (10% over Part L 2013) The proposed scheme complies by achieving at least 61.7% over Part L 2013 using the current SAP 9.0 carbon factors
Draft Manchester Zero Carbon Framework	February 2019	Targets reducing carbon emissions by **50%** over 2018 levels by 2022 and zero carbon by 2038	**Low Carbon** (50% over Part L 2013) by 2022, and Carbon Neutral by 2038 The proposed scheme complies by achieving at

Planning Document:	Time of Production or Adoption:	Low Carbon Target:	Sustainable Design Definition and compliance commentary
			least 61.7% over Part L 2013 using the current SAP 9.0 carbon factors
HM Government's Future Homes Standard (In Consultation)	Consultation response issued October 2019	Reduction in carbon emissions over Part L 2013: Specification Option 1 – 20% Specification Option 1 – 31%	Low Carbon (20-31% over Part L 2013) by 2025 The proposed scheme complies by achieving at least 82.6% over Part L 2013 when using the proposed future homes standard SAP 10.1 carbon factors

Table 3: Overview of Manchester Planning Documents Carbon Targets

2.2.4 National Planning Policy

The NPPF (February 2019) sets out the Government's planning policies for England and how these are expected to be applied. The overall emphasis of the NPPF is to reiterate the Government's key objectives, including securing sustainable development.

The NPPF defines the purpose of the planning system as being to contribute to the achievement of sustainable development. It explains at Paragraph 8 that there are three dimensions to sustainable development. These are economic, social and environmental and should be pursued simultaneously through the planning system.

Paragraph 10 states that at the heart of the Framework is a presumption in favour of sustainable development.

2.2.5 Future Homes Standard

The Future Homes Standard:2019 is the UK Government's consultation on changes to Part L, which sets out a roadmap for ensuring all new build homes are future-proofed with low carbon heating and world-leading levels of energy efficiency to boost economic growth and meet the UK's targets for carbon reduction. The Standard proposed two is currently in the consultation phase, with two proposals for the uplift to Building regulations Part L considered, as summarised below:

Option 1 - 'Future Homes Fabric' would be a 20% reduction in CO2 from new dwellings, compared to current standards.

Option 2 - ‘Fabric plus technology’ would be a 31% reduction in CO2 from new dwellings, compared to current standards.

Option 2, which is currently the Government’s preferred option, proposes an uplift in thermal performance and prioritises low carbon heating where possible. The proposed specification for the apartments and townhouses at Downley drive are predicted to better the 31% carbon reduction target, as noted above. In addition, the design specification aligns with the Future Homes standard, as the thermal envelope will be designed to achieve very low U-values and air permeability aspiring to Passivhaus levels, as well as introducing low carbon hot water heating in the form of air to water heat pumps.

2.3 Sustainable Design Strategy

2.3.1 Energy and Carbon Emissions

Building Services Strategy

In response to the policy requirements and climate change plan targets set out in section 2.2, developments should aim to assist and achieve the following carbon reduction targets:

1. Achieve a minimum of 10% CO2 reduction over the Part L 2013 Target Emission Rate (TER), as per Target 2 (Electricity intense buildings) in Table 12.1 of Policy EN6.
2. Assist in achieving carbon neutrality by 2038

To achieve the most accurate calculations and estimates, the proposed units have been modelled using *SAP 2012* the governments Standard Assessment Procedure for residential dwellings.

The proposed strategy for minimising energy use and carbon emissions is based on the energy hierarchy described in CIBSE Guide F 2012 (Energy efficiency in buildings). The energy hierarchy has been adopted for the development to ensure that the correct approach to design is taken to promote an energy-efficient low carbon solution (see figure 2). This has ensured that the benefits of effective methods of energy use reduction have been maximised first. The approach adopted is as follows:



Fig 2: Energy Hierarchy

Minimise energy demand – Implement passive design measures and optimise the building envelope in terms of orientation, air tightness, and insulation. For example, the proposal is targeting a low carbon classification through a holistic low energy design concept as it will be designed with a fabric first approach whereby Passive House design standards are aspired to for all fabric U-values and air permeability targets.

Meet demands efficiently – Specification of energy efficient decentralised plant, heating, ventilation, lighting and system controls to facilitate efficient operation. For example, the design has utilised Mechanical Ventilation Heat Recovery (MVHR) systems with high efficiencies to recover heat from all exhaust air.

Particular attention is being paid to the wellbeing of occupants. The ventilation strategy has been developed to minimise noise ingress from the proposed location as far as possible while minimising the risk of overheating.

Additional Renewable Energy/ Low Carbon/ Clean Energy Measures

Opportunities for incorporating low and zero carbon technologies (LZCT) have been considered for this development. The viability of several separate technologies was examined in a LZCT study (see section 3) which helped to identify potential opportunities for the inclusion of PV panels

Roof-mounted PV panels, are to be provided in this project on suitable roof-top areas of the apartment blocks and contribute to the emissions performance of the development.

Air source heat pumps are to be provided individually to the houses and on a communal format providing only the hot water within the apartment block. These will contribute significantly to reducing the emissions produced on site.

In addition, the proposal will be carbon neutral, directly due to obtaining all the energy used on site from a 100% renewable energy electricity supply provider. In recent years, renewable energy providers have come into prominence due to the significantly increased deployment of renewable energy infrastructure throughout the UK and with the shift away from dependency on fossil fuels such as natural gas and coal. Renewable energy suppliers are becoming competitive with more traditional energy suppliers, with examples including *Bulb Energy* and *Octopus Energy*. Homeowners will be provided with the energy supplier's details and credential as part of the handover pack.

Efficient and Sustainable Design Measures

In line with the above Sustainable Design Strategy, the following Energy Efficient design measures are specified.

- Aspiring Passive House design standards
- High levels of insulation throughout with minimal thermal bridges
- Passive solar gains and internal heat sources
- Excellent level of airtightness
- Good indoor air quality by openable windows
- 100% operational energy supplied by a renewable energy provider

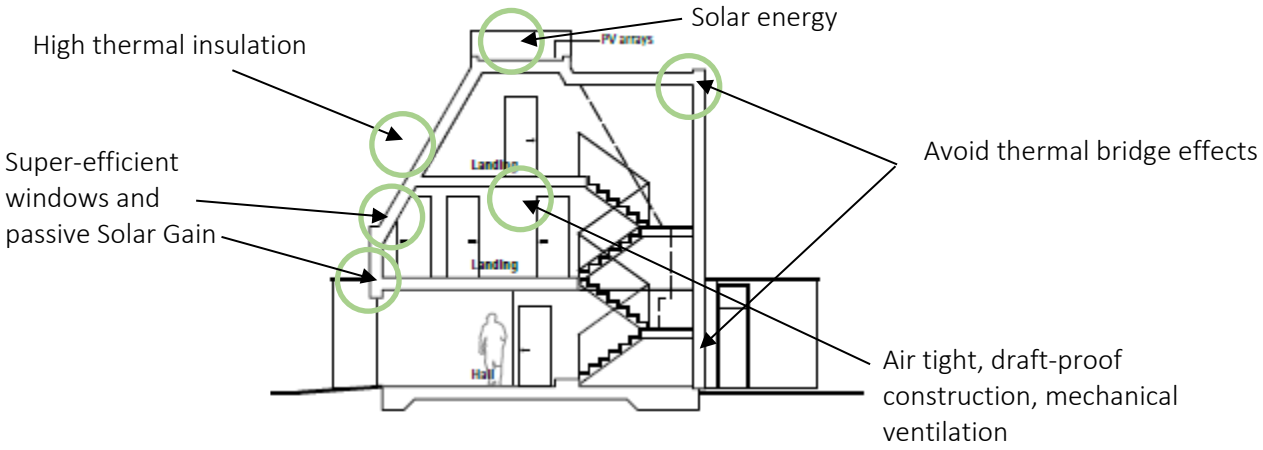


Fig 3. Efficient Design Measure examples

The Proposed specifications and key energy efficient design measures are as follows:

Residential Units:

- Exposed Floor U-values of 0.10 W/m²K
- External Wall U-values of 0.14 W/m²K
- Roof (all types) U-values of 0.10 W/m²K
- Use of ACD's to minimize Thermal Bridging and y Value specifying hi-therm lintels with a PSI of 0.03
- Low Triple Glazed Window U-values of 0.8 W/m^2K
- Low Door U-values of 1.0 W/m^2K
- 100% low energy lighting throughout
- 100% efficient non-fossil fuel Electric Heating to apartments

- Air Permeability Rate of 1m³/hm² in all dwellings, which can be achieved with high levels of workmanship and sealing of all joints and air leakage pathways. This is significantly higher than the Passivhaus target of 0.6ACH but will still need careful attention to sealing the building fabric prior to air permeability tests being carried out.

- MVHR Ventilation to each dwelling – Vent Axia Sentinel Kinetic FH included in the calculations

2.3.2 Choice and Impact of Clean Energy and Renewable Technologies

All reasonable technologies were investigated for their suitability to the site and development; please refer to section 3 for details.

In addition to energy efficiency measures, it is proposed that the development will feature the following clean energy technologies:

- Minimum 170% efficient individual ASHPs providing both heating and hot water to houses
- Dimplex ASHPs providing hot water only in a communal format for the apartment block

The above contribution has provided a **40.7%** reduction in CO2 following Energy Efficiency Measures.

- Energy Saving from onsite clean energy technologies = **145287.2 kWh/Yr**
- CO2 Saving from onsite clean energy technologies = **37194.0 kgCO2/Yr**

In addition to the above clean energy technology, it is proposed that the development will feature the following Low/Zero carbon technologies:

- 8kWp Site Wide PV Array (Approx. 20no. 400W Panels) implemented onto the main flat roof and orientated south.

The above LZC contribution has provided a **7.6%** reduction in CO2 following Energy Efficiency Measures.

- Energy Saving from onsite LZC Technologies = **7993.4 kWh/Yr**
- CO2 Saving from onsite LZC Technologies = **4148.6 kgCO2/Yr**

2.3.3 Energy and CO_2 Reduction Summary

A summary of all stages of the energy demand assessment from baseline figures to final carbon reduction are shown in Figures 1 & 2 below:

Summary of CO2 Emission Reductions	Total CO2 emissions (kgCO2/year)	Total CO2 emissions (kgCO2/year)	Total CO2 emissions (kgCO2/year)
Carbon Factors	**SAP 9.0**	**SAP 10.0**	**SAP 10.1**
Baseline emissions	130916.0	79419.7	76593.7
Improved emissions (after application of energy efficiency measures)	91453.1	53440.0	49327.6
Improved emissions (after incorporation of efficient energy supply)	54259.1	24359.1	14218.2
Improved emissions (after incorporation of renewable energy technology) % CO2 displaced in total	50110.5	22496.6	13131.1
% CO2 displaced in total	61.7%	71.7%	82.9%
% CO2 displaced by energy efficiency measures	30.1%	32.7%	35.6%
% CO2 displaced by efficient supply of energy	40.7%	54.4%	71.2%
% CO2 displaced by renewable energy	7.6%	7.6%	7.6%

Table 4: Summary of CO2 Reductions

	Energy demand (kWh pa)	Energy saving achieved (%)	Regulated CO_2 emissions (kg pa)	Saving achieved on resi dual CO_2 emissions (%)
Building Regulations Part L compliance ("Baseline" energy demand & emissions)	374998.3		130916.0	
Proposed scheme after energy efficiency measures ("Residual" energy demand & emissions)	249832.7	33.4%	91453.1	30.1%
Proposed scheme after clean energy supply (ASHPs)	104545.5	58.2%	54259.1	40.7%
Proposed scheme after on-site renewables (PV)	96552.1	7.6%	50110.5	7.6%
Total savings on energy demand and emissions		**74.3%**		**61.7%**

Table 5. Total Energy and Carbon Emissions Savings Based on SAP 9.0 Carbon Factors

For a full Breakdown of the figures and calculations please see Appendix A – Energy Demand Assessment Spreadsheet.

Baseline energy demand

'Standard Assessment Procedure - SAP 2012' was used to produce example SAP reports to generate the figures used within the calculations.

Baseline energy demand (kWh pa)	348400.3		
Carbon Factors	SAP 9.0	SAP 10.0	SAP 10.1
Regulated emissions (kg pa)	130916.0	79419.7	76593.7

Energy efficiency

The heating and cooling hierarchy has been applied to the design process of the development. It has resulted in large focus on energy efficiency measures and as can be seen in Figure 1.

Energy savings from energy efficient measures (kWh pa)	117977.2		
Carbon Factors	SAP 9.0	SAP 10.0	SAP 10.1
Emission savings from energy efficiency measures (kg pa)	39462.8	25979.8	27266.1
Total regulation emissions after energy efficiency measures (kg pa) ["regulated emissions"]	91453.1	53440.0	49327.6

Efficient energy supply – Be Clean

The heating and cooling hierarchy has been applied to the design process of the development. It has resulted in large focus on energy efficiency measures and as can be seen in Figure 1.

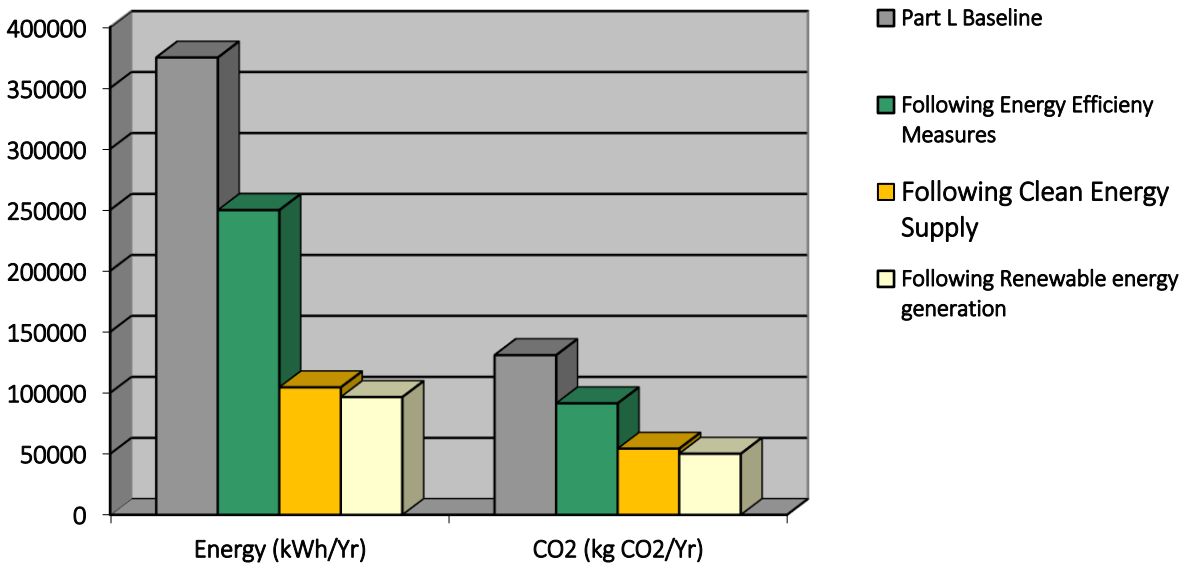
Energy savings from clean energy supply(kWh pa)	132432.9		
Carbon Factors	SAP 9.0	SAP 10.0	SAP 10.1
Emission savings from clean energy supply (kg pa)	37194.0	29080.8	35109.5
Total regulated emissions after clean/communal energy supply (kg pa)	54259.1	24359.1	14218.2

On-site renewables – Be Green

The following table demonstrates how the development achieves the reduction in carbon dioxide emissions from LZC technologies.

Energy savings from renewables	6917.4		
Carbon Factors	SAP 9.0	SAP 10.0	SAP 10.1
Emission savings from the use of renewables (kg CO2)	4148.6	1862.5	1087.1
Savings on emissions from the use of renewables (%)	7.6%	7.6%	7.6%

The chart below illustrates the improvements over the Part L Compliant Baseline:



2.3.4 Manchester City Council Policy and Targets Summary

With regards to the Manchester City Council's planning documents policy and targets (outlined in section 2.2.1 to 2.2.3) the table below details how the Sustainable Design Strategy (outlined in section 2.3.1) achieves the current planning policy requirements and targets.

Planning Document:	Sustainable Design Strategy
Manchester Council's Core Strategy 2012-2027	The Sustainable Design Strategy achieves a **61.7%** reduction in carbon emissions over Part L 2013 when using SAP 9.0 carbon factors - **exceeding** the EN6 documents Low Carbon target of 9% over Part L 2013.
Climate Change and Low Emission Strategies 2016-2020	The Sustainable Design Strategy achieves a **61.7%** reduction in carbon emissions over Part L 2013 when using SAP 9.0 carbon factors – **exceeding** the documents Low Carbon target of 48% over 1990 Emissions.
Manchester: A Certain Future	The Sustainable Design Strategy achieves a **61.7%** reduction in carbon emissions over Part L 2013 when using SAP 9.0 carbon factors – **exceeding** the documents Low Carbon target of 10% over Part L 2013.
Draft Manchester Zero Carbon Framework	Design Strategy fully adheres with the Carbon Neutral definition through the offsetting of operational emissions by procuring the total electricity supply from a **100%** renewable energy provider.
Future Homes Standard (Consultation)	Design Strategy fully adheres with the carbon reduction target of 31% for the Government's preferred option 2 by achieving a **82.6%** reduction; using SAP 10.1 carbon factors.

Table 6. Summary of MCC and Planning Targets

As a result of the sustainable design parameters outlined within section 2.3.1 and the energy and CO2 reduction figures summarised above, the development of 68 residential dwellings at the Downley Drive site achieves a total reduction of **61.7%** in carbon emissions over Part L 2013 based on SAP 9.0 carbon factors, however when SAP 10.0 and SAP 10.1 carbon factors are used, this reduction rises to **71.7%** and **82.9%**, respectively. Whilst the development achieves these significant reductions, it is also supplying 100% of the operational energy from a renewable energy supplier. This therefore allows the development to be regarded as both low carbon and carbon neutral, with regards to its carbon emissions.

The low carbon classification for Downley Drive can be derived from its prioritisation of fabric first carbon reduction through aspiring to achieve, and in some areas exceeding, Passive House design standards, before the incorporation of on-site renewable technologies.

The site can be defined as **Carbon Neutral** because 100% of the carbon emissions produced on-site will be offset by having all of the energy supplied by a renewable energy electricity provider.

2.4 Adaptation to Climate Change

In addition to the primary building design and fabric, many other issues that will influence creating a Sustainable Development, including flood prevention, material use, waste minimisation and transport. All of these issues feature regularly within the separate climate change action plans, outlined within section 2.2, as areas that Manchester is aiming to significantly improve on in order to become a more carbon neutral and clean city.

All of the sections of creating a sustainable development should be taken into consideration from the start of the development and promoted throughout the building construction on site in order to maximise their benefits. Additionally, features which enable more efficient usage should also be specified to encourage the building users to maintain efficient use once construction has been completed.

2.4.1 Grid Decarbonisation and SAP

Currently SAP calculations and subsequent carbon emission reductions are calculated within the FSAP 2012 software and as a result are based on SAP 9.0 carbon factors (0.216 for Gas and 0.519 for Electricity). However, these are now outdated due to the increasing decarbonisation of the electrical distribution network as the fuel mix moves toward a greater proportion of renewable energy (wind, solar, hydro-electric power) and away from the largely coal and natural gas dominated national grid of the past. Therefore, updated values have been proposed in two stages, SAP 10.0 was the initial update which reduced Gas to 0.210 and Electricity to 0.233, however this was never officially announced and then subsequently superseded by the introduction of the Future Homes Standard (see section 2.2.5(and SAP 10.1 which uses the most up to date figure of 0.136 for Electricity.

Notwithstanding the building's carbon footprint reducing over its useful life, carbon factors in SAP 10.0 and SAP 10.1 are more representative of and show that an all-electric energy source for modern, fabric first high-quality buildings is appropriate at reducing reliance on fossil fuels and moving towards use of the ever-decarbonising electricity grid.

Therefore, to be more representative, robust and provide an up-to-date assessment, the emissions in this report have been calculated using SAP 10.0 and SAP 10.1 standards.

The calculations appropriately demonstrate improvement in CO2 emissions in excess of the Building Regulations Part L 2013 and Core Strategy Policy EN6 targets. Using the SAP 10.0 carbon emissions

factor for electricity, the improvement over Part L 2013 is **61.7%**. Using the SAP 10.0 and 10.1 factors, this improvement rises to **71.7%** and **82.9%** respectively.

These improvements are in excess of the Policy EN6 requirements.

Furthermore, the proposed building services strategy will enable the development to track the ongoing carbon reductions being delivered by grid-scale infrastructure. Therefore, the development's carbon footprint will continue to improve over its useful life.

2.4.2 Flood Risk Zone

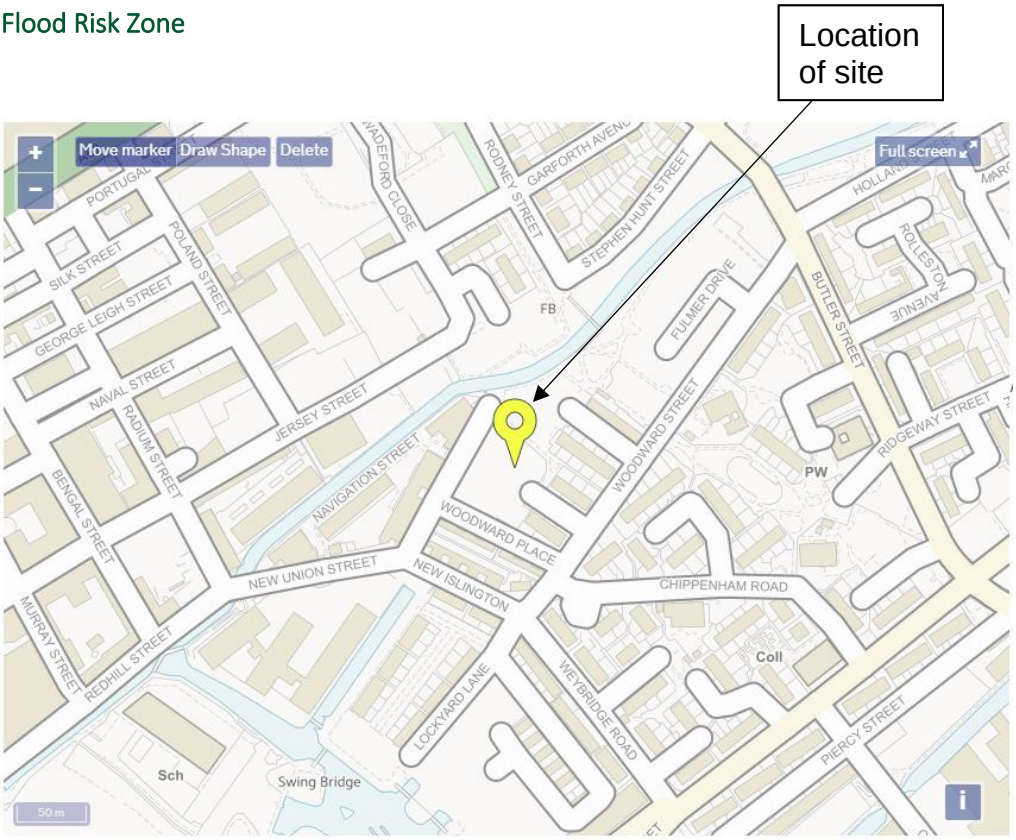


Fig 4: Flood Risk Map

The above map and snippet have been taken from a Government licences flood risk map for central Manchester. It can clearly be seen that the site is located within flood risk zone 1 and therefore has minimal to no risk of flooding.

2.4.3 Green Blue Infrastructure

2.4.3.1 Sustainable Drainage Systems (SUDs)

Even though it has been shown that the proposed scheme is located on a site with a low to zero flood risk, it should not detract from the need to ensure that the levels of surface water run-off do not increase from the existing site to the proposed, especially due to the new scheme having a different footprint and resulting in new areas of impermeable surfacing. Therefore a SUDs strategy should be

determined by a suitably qualified professional at the earliest stage possible and then implemented throughout construction and beyond.

By incorporating SuDs, flood risk can be managed and mitigated. Section 1.1 of the SuDs Manual (Ciria C753) states the following:

"Sustainable drainage systems (SuDS) can deliver multiple benefits.

Surface water is a valuable resource, and this should be reflected in the way it is managed and used in the built environment. It can add to and enhance biodiversity, beauty, tranquillity and the natural aesthetic of buildings, places and landscapes and it can help make them more resilient to the changing climate."

The general concept of SUDs is to manage the flood and pollution risks in developed areas. This is done by efficiently managing surface water run-off by either slowing down the surface water run-off, or by reducing the quantity of surface water run-off. There are different methods to achieve this such as:

- Harvesting – capturing rainwater and facilitate its use within the development
- Infiltrating – rainwater infiltrates into the ground
- Storing – capturing rainwater and control the flow through the means of storing and releasing it slowly i.e. attenuation
- Conveying & treating – capturing rainwater and removing any contaminants, then convey the flow towards a downstream system

The SuDS Manual describes the four pillars of SuDS design as Water Quality, Water Quantity, Amenity and Biodiversity as illustrated in Figure 3 below:

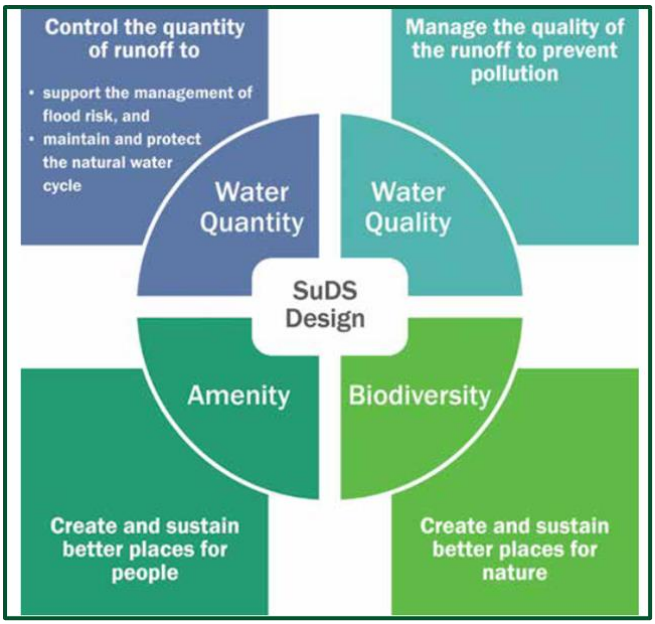


Fig 5. Representation of figure 2.1 of the SUDs Manual

SuDS are increasingly gaining popularity as a holistic solution to a wide range of pressing issues including flood risk, water pollution, groundwater depletion, biodiversity loss and urban decline.

Drainage Hierarchy

To alleviate pressure on existing sewer networks and to address issues of climate change the following hierarchy has been developed and implemented from a planning perspective.

The Planning Practice Guidance, states that:

"generally, the aim should be to discharge surface run-off as high up the following hierarchy of drainage options as reasonable practicably:

1. *Into the ground (infiltration)*
2. *To a surface water body*
3. *To a surface water sewer*
4. *To a combined sewer"*

The "Building Regulations Approved Document H" refer to this discharge hierarchy.

Description	Benefit
Flood risk management	SuDS aim to have an attenuating affect by slowing down and storing surface water run-off
Drainage resilience	Future proofing designed to be resilient against climate change
Natural flow regime protection	Mimic natural drainage arrangements to emulate natural flow
Water quality	Filter out pollutants and discharge cleaner water
Water reuse	Can be strategically placed to clean and capture water for reuse
Biodiversity and ecology	SuDS use vegetation and natural landscape to support biodiversity and ecology
Amenity	Improve visual integrity and desirability of the site by implementing green and blue features
Carbon reduction	SuDS can reduce carbon use throughout the life cycle including construction, maintenance, and demolition
Microclimate	Aim in reducing heat island effects
Education	Educate and engage the general public about surface water management

Table 7. Outline of types of green/blue infrastructure and associated benefit

Note that the Flood Risk & Drainage Statement has been prepared by Carley Daines & Partners Ltd and submitted as part of the planning application.

2.4.3.2 Biodiversity

Similarly, to the previous section on SUDs, the nature of the proposal: including the developing on an unoccupied space, consisting predominantly of greenspace, and therefore a change in area of impermeable surface, there could be adverse impacts on the surrounding ecology as well potential for the enhancement. Therefore, an ecology report should be produced, by a suitably qualified professional, in order to ensure that any existing ecology on or near the site is adequately protected and to determine the possibility of new habitat creation, planting schemes, green wall areas.

2.4.4 Internal Water Efficiency

Part G of the Building Regulations requires all new dwellings to have an internal water consumption of no greater than 110 litres / person / day, unless specified to be less. Therefore, fittings proposed should

have low flow rates, capacities, effective flush volumes etc. Example targets for these to achieve the required internal consumption are as follows:

Appliance	Unit of measure	Amount (litres)
WC (Dual flush)	Full flush volume	4
WC (Dual flush)	Part flush volume	2.6
Taps (excluding kitchen)	Flow rate l/min	5
Kitchen taps	Flow rate l/min	6
Bath	Capacity to Overflow	170
Shower	Flow rate l/min	8
Washing Machine	Litres / kg dry load	8.17
Dishwasher	Litres / place setting	1.25

Table 8. Internal Water Efficiency Flow Rates

The above rates will achieve a total internal water consumption of 106.31 with a bath present and 98.25 with only a shower present.

The specifying of 'A' rated appliances should be prioritised where possible.

2.4.5 Waste Management

2.4.5.1 Occupational Waste

Manchester City Council's Waste Storage and Collection Guidance for New Developments 2017 encourages all new developments to incorporate a waste management strategy into the build at the earliest stage possible.

Each individual apartment block has been provided with a bin store at the ground floor level.

All houses will be provided with the required bins to cover all types of waste and recycling that Manchester City Council provide a free pick up service for.

2.4.5.2 Construction Waste

A target of at least 90% of waste generated on site as per the developer (Greater Places Manchester) target, throughout the construction stage of the development, to be diverted from landfill' will be included as part of a Construction Environmental Management Plan (CEMP) to be agreed with MCC.

The proposal will also endeavour to maximise the use of recycled materials on site, whereby further promoting the minimising of waste production.

2.4.6 Materials

The construction of new buildings and building elements has a large environmental impact in terms of both, energy and embodied carbon of new materials. Therefore, Manchester Council, through Policy E1.6 of the Unitary Development Plan (UDP) have required all new developments to use environmentally friendly materials, where possible, and encourages the use of recycled building materials. This information should also be incorporated into the SWMP mentioned in the previous subsection (Waste Management) as a means of promoting the re-using and recycling of materials.

Where new materials are to be used, careful consideration of their environmental impact should be taken. This can be achieved by ensuring that only materials that score well under The Green Guide to Specification. This useful online tool can be used as a reference that provides guidance on the relative environmental impacts for a wide range of different building specifications. The BRE's Environmental Profile Methodology determines the Life Cycle Assessment (LCA) of materials, which is what the Guide's specifications are based on.

In order to take full advantage of low impact materials, elements key to the scheme should be specified to achieve ratings of between A+ and C under The Green Guide's ratings. Insulation materials that are specified will also have a global warming potential (GWP) of 5 or less, with an ODP of 0. Additionally, 100% of all timber used as part of the scheme will be responsibly sourced from suppliers that are either Forest Stewardship Council (FSC) accredited, Programme for the Endorsement of Forestry Certification accredited, or a similar recognised accreditation body.

To further promote embodied energy and carbon savings, the scheme will first prioritise the reusing of any demolished materials within the site, however if this is not possible secondary priority must be given to the redirecting from landfill; in line with the waste hierarchy.

Finally, in addition to the above policy points, the development is also recommended to register with the Considerate Constructors Scheme, or a similar approved scheme.

2.4.7 Pollution Control

To reduce emissions of gases with high global warming potential (GWP) and nitrogen oxide (NOx) into the atmosphere, new buildings will be specified with insulating materials that have a GWP of less than 5. This will follow throughout the development to reduce the impact that the construction phase has upon climate change.

Additionally, the following measures will be implemented:

- Pollution Prevention Guidance will be adhered to in respects of air (dust) and water (ground and surface) pollution during the demolition and construction phase.

- External light fittings will be controlled through a time switch, or daylight sensor, to prevent operation during daylight hours to limit the impact of artificial lighting for the development's residents and surrounding environment.
- Dust suppression measures will also be put in place as part of the Main Contractor's Environmental Management Plan, this will reduce the potential risk to local watercourses (River Irk) and neighbouring properties.

Sound insulation will be specified to achieve Building Regulation Part E compliance standard (this will be verified by pre-completion testing) in addition to meeting the requirements of the council. This will reduce the impact of sound pollution for the occupants within adjoining dwellings.

2.4.8 Health & Wellbeing

The following measures will be incorporated to improve occupant health and well-being, as below:

- Efficient MVHR Units are to be specified to each individual dwelling which will provide a continuous source of fresh, filtered air to maintain a healthy indoor environment.
- Promoting the green infrastructure of the site by introducing planting wherever possible, therefore improving the physical and mental wellbeing of residents, visitors, and workers.
- Secure by Design accreditation will be sought which will incorporate the adoption of crime prevention measures to further prevent crime and promote a safe environment.

The above findings and technology will all help to promote healthy housing for residents which has been identified by the World Health Organisation (WHO) as an increasingly important factor in increasing quality of life, preventing disease and illness, and mitigating climate change.

2.4.9 Sustainable Transport

A key message from all climate change adaptation plans (as mentioned in section 2.2), specifically Our Manchester Strategy 2016-2025, The Zero Carbon Framework (formulated by the Manchester Climate Change Board) and Manchester City Council's Core Strategy 2012-2027, is the need to increase the proportion of cycling, walking and public transport journeys. This is due to it providing both environmental and social benefits through the reducing of emissions, improving air quality and promoting a more active lifestyle.

The proposed development acknowledges the benefits associated with these forms of sustainable transport and is therefore providing 68 cycle parking spaces provided across the development. A timber cycle store will be provided in the rear gardens of all houses. A dedicated cycle storage room will be provided on the ground floor of the apartment block that will provide 100% cycle parking for residents. The proposal will also only be providing 50% car parking provision for the apartments, thereby encouraging all residents to commute in a sustainable manner. In addition, there will be a 20% provision for Electric Vehicle Charging Outlets with capacity to increase this provision should demand increase and two disabled car parking spaces.

Further to providing significant cycle provision and no car parking spaces, the site is located close to central Manchester and is within walking proximity to Great Ancoats Street and Oldham Road, which both have multiple bus stops. This proximity to a plethora of transports node with such a range of travel possibilities further reduces the reliance on cars and the negative environmental impacts associated.

Transport Links

Further to providing significant cycle provision, the site is located within central Manchester and therefore has excellent sustainable transport links:

- Train: The closest train station to the site is Manchester Piccadilly, which is located approximately 0.8 miles southwest of the site, taking roughly 20 minutes to walk to. This station provides access to both additional Manchester stations, Manchester Airport, Leeds and other regional and national destinations.
- Bus: The nearest bus stops are located on Great Ancoats Street which are roughly 0.4 miles southwest from the site. These will provide frequent services to, Ashton-Under-Lyne, in addition to links to Piccadilly Gardens, where further buses can be caught to more regional destinations.
- Metrolink: The closest Metrolink station to the site is New Islington Tram Stop. This provides an additional means of public transport to locations within central Manchester and also further afield to Altrincham, Bury, Eccles, East Didsbury, Rochdale, Ashton-Under-Lyne and Manchester Airport.

Local Amenities

- Victoria Mill Park is situated within a 10-minute walk from site; providing excellent recreational space for residents, visitors and workers.
- The site is also only 0.5 miles from the centre of Manchester where a multitude of shops and amenities can be accessed.
- Manchester Metropolitan and Manchester University are both less than 2 miles from the proposed development providing good access to higher education. In addition, there are several schools and colleges within a 15-minute walk from the site, including: The King of Kings School, New Islington Free School, Chetham's School of Music.
- Due to its proximity to the centre of Manchester, the site has excellent access to music, theatre and art venues, places of religion and Manchester's City Library.

Solar Hot Water (Thermal)

Solar water heating systems are one of the more familiar renewable technologies used at the moment. They use the energy from the sun to heat water, most commonly for hot water needs. Solar heating systems use a heat collector that is usually mounted on a roof in which the sun heats a fluid. This fluid is used to heat water that is stored in either a separate hot water cylinder or in a twin-coil hot water cylinder (the second coil is used to provide additional heating from a boiler or other heat source).

Solar hot water panels could be used however, PV will provide slightly better savings and avoid the need for water storage cylinders when compared.

Renewable Technology Not Chosen.

Photovoltaic Panels (PV)

Photovoltaic modules convert sunlight directly to DC electricity. The solar cells consist of a thin piece of semiconductor material, in most cases of silicon. Through a process called doping, very small amounts of impurities are added to the semiconductor, which creates two different layers called n-type and p-type layers.

Certain wavelengths of light are able to ionize the silicon atoms, which separates some of the positive charges (holes) from the negative charges (electrons). The holes move into the positive or p-layer and the electrons into the negative or n-layer. These opposite charges are attracted to each other, but most of them can only re-combine by the electrons passing through an external circuit, due to an internal potential energy barrier. This flow of electrons produces a DC current.

A PV array can be mounted on the suitable roof space. The amount proposed at this stage is **8.0kWp Site Wide PV Array (Approx. 20no. 400W Panels) implemented onto the main roof areas of each apartment block.**

Chosen Renewable Technology

Ground Source Heat pumps

A heat pump is a device that takes up heat at a certain temperature and releases it at a higher temperature. The essential components of a heat pump are heat exchangers (through which energy is extracted and emitted) and a means of pumping heat between the exchangers. The effectiveness of the heat pump is measured by the ratio of the heating capacity to the effective power input, usually known as the coefficient of performance (COP). Ground-source heat pumps (GSHP) extract heat from the ground. They are classified as either water-to-air or water-to-water units depending on whether the heat distribution system in the building uses air or water. Ground source heat pumps either use long shallow trenches or deep vertical boreholes to take low grade heat from the ground and then compress it to create higher temperatures.

Ground source heat pumps would not be suitable due to the lack of land space around the properties and the associated costs.

Renewable Technology Not Viable

Air Source Heat pumps

Air source heat pumps absorb heat from the outside air. This is usually used to heat radiators, underfloor heating systems, or warm air convectors and hot water in your home. An air source heat pump extracts heat from the outside air in the same way that a fridge extracts heat from its inside.

The system performs down to air temperatures of -20°c which means that they are more than suitable for installations within the UK. Hot water and Heating can be provided 365 days a year. The hot water is produced without the aid of electrical immersions and at 55°c is more than hot enough for baths and showers.

There are two main types of air source heat pump system:

- An air-to-water system distributes heat via your wet central heating system. Heat pumps work much more efficiently at a lower temperature than a standard boiler system would. So they are more suitable for under-floor heating systems or larger radiators, which give out heat at lower temperatures over longer periods of time.
- An air-to-air system produces warm air which is circulated by fans to heat your home. They are unlikely to provide you with hot water as well.

Air Source heat pumps are a good option to provide heating and cooling and therefore are being provided to all houses and flats. This technology will be utilized for both the heating and hot water requirements of the houses. Whereas it will only provide the water heating for the apartments.

Chosen Renewable Technology

Biomass Heating

Biomass is any plant-derived organic material that renews itself over a short period.

Biomass energy systems are based on either the direct or indirect combustion of fuels derived from those plant sources. The most common form of biomass is the direct combustion of wood in treated or untreated forms. The use of biomass is becoming increasingly common in some European countries.

The environmental benefits relate to the significantly lower amounts of energy used in biomass production and processing compared to the energy released when they are burnt. This can range from a four-fold return for biodiesel to an approximate 20-fold energy return for woody biomass. Biomass-fuels can be used to produce energy on a continuous basis (unlike renewables such as wind or solar energy) and it can be an economic alternative to fossil fuels as it is a potential source of both heat and electricity.

However, Biomass systems have particular design management and maintenance requirements associated with sourcing, transportation and storage and are therefore more commonly used in commercial developments rather than domestic installations. It can be less convenient to operate than mains-supplied fuels such as natural gas and are more management intensive and require expertise in facilities management. Sources of biomass can also fluctuate, so boilers should be specified to operate on a variety of fuels without risk of overheating or tripping out.

A communal biomass system would not be feasible for this development due to the expense associated with the necessary output to heat all dwellings on the site.

Renewable Technology Not Chosen

Wind

Wind turbines convert the kinetic energy in wind into mechanical energy that is then converted to electricity. Turbines are available in a range of sizes and designs and can either be free-standing, mounted on a building or integrated into a building structure.

The wind speed in the area is under the advised minimum and the built-up area means that a wind turbine wouldn’t be feasible.

Renewable Technology Not Viable

4. Conclusion

This statement has assessed the proposed development at the Downley Drive site against the relevant climate change and sustainability policies and targets, as outlined within: the Manchester City Council Core Strategy (July 2012), Our Manchester Strategy, Manchester: A Certain Future and The Zero Carbon Framework, through the following of the energy hierarchy, the modelling of apartments in the FSAP 2012 software and addressing all aspects of a sustainable development. In addition, the proposal has been assessed against national sustainable design definitions to determine how it can be classified as well as demonstrating compliance with the Government's Future Homes Standard, both by exceeding the carbon reduction target of 31% and aligning closely with the proposed build specification, prioritising a high efficiency thermal envelope and low carbon sources for heating and hot water.

Finally, the development meets all the relevant planning policies in the planning documents including:

- Manchester Council's Core Strategy 2012-2027. (**9%** reduction in CO_2 reduction over Part L 2013).
- Climate Change and Low Emission Strategies 2016-2020. (**48%** reduction in CO_2 reduction over emissions from 1990-2020).
- Manchester: A certain future. (**10%** reduction in CO_2 reduction over Part L 2013).
- Manchester Zero Carbon Framework. (**50%** reduction in CO_2 reduction over 2018 levels).

As part of this process, the development was designed with a fabric first approach; with U-values, design air permeability and ventilation targets all aspiring to Passive House design standards and therefore significantly exceeding Building Regulations Part L 2013 standards. Following on from this, efficient MVHR systems were proposed for each apartment and house, in order to further reduce the total energy demands whilst simultaneously providing each dwelling with healthy internal environments. This approach demonstrates a holistic low energy design concept, involving very low limiting values and thus led to high-energy performance targets and being defined as a low carbon development.

Furthermore, an LZC feasibility assessment was carried out, with all suitable technologies investigated for their suitability to the site and development. The assessment determined that a 8kWp system can be proposed at this stage, which would equate to 20No panels and would provide an additional 10.4% reduction in carbon emissions over the residual emissions: bringing the total carbon reduction to **61.7%**, when using SAP 9.0 carbon factors. However, this reduction rises further to **71.7%** and **82.9%** when using SAP 10 and 10.1 carbon factors. In addition to this renewable technology provision, the development can also be defined as carbon neutral because it will have net zero carbon emissions. This is to be achieved by obtaining all the energy used on site from a 100% renewable energy electricity supply provider.

The development will also be adapting to climate change by incorporating sustainable drainage measures; including permeable pavements and drains, into the design, protecting existing ecology, enhancing biodiversity where possible and providing cycle storage provision to residents.

In addition to the following of the energy hierarchy through the efficient design and renewable technology measures mentioned, and meeting all relevant Manchester City Council carbon targets the proposal will include a large number of sustainability measures throughout construction and once completed, which will contribute heavily to the development's sustainability performance and accord with the requirements of the NPPF. The key measures to be included and therefore can be taken from this report include:

- The proposal sits within Flood Risk Zone 1 and therefore has low risk of flooding.
- Post development surface water run-off rates will not exceed those of predevelopment. All surface water and foul will be discharged via the surrounding adopted network.
- Internal water efficiency will be prioritised by ensuring that efficient water fixtures are proposed so that each dwelling achieves less than 110L per person per day and 'A' rated appliances will be specified where possible.
- Waste minimisation will be targeted from throughout construction. It is targeted that at least 90% of construction waste will be diverted from landfill.
- In addition to targeting Secure by Design accreditation through adoption crime prevention measures, the site layout promotes busy spaces and routes and facilitates natural surveillance. These will therefore reduce the fear of crime and subsequently improving mental health of residents, visitors and workers.
- Prioritising reusing existing materials and locally sourced materials for construction to reduce waste and transportation to landfill in addition and promote a low embodied carbon development.
- When new materials are specified that are not locally attainable then only those that score well on the BRE: The Green Guide to Specification are to be used; to further encourage the use of sustainable materials and reductions in embodied carbon.
- Highly efficient MVHR systems are being proposed to each flat individually to provide a continuous source of fresh air and maintain healthy indoor environments. These will promote healthy housing and subsequently boost physical and mental wellbeing of residents.
- The proximity of the Manchester City Centre to the proposed site is highly sustainable in terms of transport and local amenities as it is in close proximity to a number of public transport nodes including: Manchester Piccadilly, New Islington, multiple bus stops and additional Metrolink stations, as well as a multitude of shops and other local amenities.
- The development will also include significant cycle storage provision.

As a result of all the above, the proposed sustainable design and energy strategy allows the development to comply with Manchester City Council's planning policy requirement and is in line with all targets put forward in their planning documents.

Appendix A – References

1. European Parliament, “What is carbon neutrality and how can it be achieved by 2050?” European Parliament News, 08/10/2020.
2. HM Government. “Low Carbon Construction – Innovation and Growth. Final Report.” Autumn 2010.
3. UK GBC. “Net Zero Carbon Buildings. A framework definition.” April 2019.

Appendix B – Energy Demand Assessment – Downley Drive, Manchester, M4.

Apartment Type	House - 3Bed-F5 End Tce x10	House - 3Bed-F5 Mid Tce x10	House - 2Bed-F4 End Tce x2	House - 2Bed-F4 Mid Tce x1	Flat - 2Bed x23	Flat - 1Bed x22	TOTAL (kWh/yr)		TOTAL (kgCO2/yr)
Frequency	10	10	2	1	25	27	75		
BASELINE Dwelling Emission Rate (DER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
Main Heating Fuel Requirement (DER)	4955.88	4182.18	5003.21	4437.99	1620.4	984.05	172904.4	0.216	57888.4
Secondary Main Heating Fuel Requirement (DER)	0	0	0	0	0	0	0.0	0.519	0.0
Secondary Heating Fuel Requirement (DER)	0	0	0	0	0	0	0.0	0.216	0.0
Water Fuel Requirement (DER)	2528.99	2538	2386.13	2391.59	2283.3	2149.76	172959.8	0.216	57906.9
Electricity Pumps Fans Requirement (DER)	75	75	75	75	75	75	5625.0	0.519	2919.4
Electricity Lighting Requirement (DER)	435.73	435.73	364.11	364.11	288.89	240	23509.2	0.519	12201.3
TOTAL PER DEVELOPMENT							374998.3		130916.0
AFTER ENERGY SAVING MEASURES Dwelling Emission Rate (DER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
Main Heating Fuel Requirement (DER)	1530.32	746.18	1758.19	1202.72	115.73	21.4	30955.2	0.216	10363.8
Secondary Main Heating Fuel Requirement (DER)	0	0	0	0	0	0	0.0	0.519	0.0
Secondary Heating Fuel Requirement (DER)	0	0	0	0	0	0	0.0	0.519	0.0
Water Fuel Requirement (DER)	2561.29	2593.12	2406.99	2425.74	2340.94	2191.68	176482.7	0.216	59086.4
Electricity Pumps Fans Requirement (DER)	397.66	397.66	338.91	338.91	215.09	188.38	19433.4	0.519	10086.0
Electricity Lighting Requirement (DER)	424.09	424.09	354.41	354.41	282.9	234.96	22961.5	0.519	11917.0
TOTAL PER DEVELOPMENT							249832.7		91453.1
FINAL Dwelling Emission Rate (DER)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Total Energy Demand (kWh/yr)	Carbon Emission Factor	Associated Total CO2 (kgCO2/yr)
Main Heating Fuel Requirement (DER)	553.59	269.93	636.02	435.08	201.34	49.54	16313.4	0.519	8466.7
Secondary Main Heating Fuel Requirement (DER)	0	0	0	0	0	0	0.0	0.519	0.0
Secondary Heating Fuel Requirement (DER)	0	0	0	0	0	0	0.0	0.519	0.0
Water Fuel Requirement (DER)	1213.67	1213.67	1146.27	1146.27	462.44	425.89	50772.2	0.519	26350.8
Electricity Pumps Fans Requirement (DER)	352.66	352.66	293.91	293.91	140.09	113.38	14498.4	0.519	7524.7
Electricity Lighting Requirement (DER)	424.09	424.09	354.41	354.41	282.9	234.96	22961.5	0.519	11917.0
TOTAL PER DEVELOPMENT							104545.5		54259.1
PV Energy Produced (DER)					-153.7	-153.7	-7993.4	0.519	-4148.6
TOTAL PER DEVELOPMENT							96552.1		50110.5