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BUILDINGS AND BUILT ENVIRONMENT

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The Newcombe Estates Company Ltd
Rookery Farm, Watery Lane
Coventry

ENERGY & SUSTAINABILITY STRATEGY

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Notice

CONTENTS

1. INTRODUCTION 4
2. MANDATORY ENERGY REDUCTION REQUIREMENTS 5
Planning Policy - NPFF 5
Planning Policy - Local Plan 5
3. ENERGY STRATEGY METHODOLOGY 7
4. PASSIVE DESIGN 9
5. LOW OR ZERO CARBON TECHNOLOGIES 11
Wind Turbine 11
Solar Thermal 11
Photovoltaic Panels 12
Biomass 13
Heat Pumps 13
Ground Water Cooling 14
Combined Heat and Power 16
6. ENERGY STRATEGY FOR THE SITE 17
7. ELECTRIC VEHICLE CHARGING 20
8. SUSTAINABILITY 21
Materials 21
Contaminated Land 21
Travel 22
Waste and Recycling 22
Water 22
Air Quality 22
9. CONCLUSION 24

APPENDICES

APPENDIX A: SAP Summary
APPENDIX B: Water Consumption Calculator

1. INTRODUCTION

1.1 Rookery Farm, Watery Lane is a new residential development in Coventry. The schedule of accommodation for the site is unknown at this outline stage, however, the indicative masterplan for the site allows for up to 40 dwellings of mixed sizes, which typically could be translated into a breakdown such as that indicated below:

1.2 This document sets a framework for the Energy and Sustainability Strategy for the development site to support the outline planning application. It summarises the key planning policy which is pertinent at the time of the planning application and is aimed at satisfying the energy related requirements. Discipline-specific reports supplement this Outline Planning Application and provide further detail on sustainable aspects of this scheme.

1.3 The energy framework sets out the predicted energy consumption for the site to allow flexibility for delivery, whilst complying with pertinent planning policy.

2. MANDATORY ENERGY REDUCTION REQUIREMENTS

Planning Policy - NPFF

2.1 At a national level, the National Planning Policy Framework (NPPF) sets out that planning plays a key role in delivering reductions to greenhouse gas emissions, minimising vulnerability and providing resilience to climate change. The NPPF also notes that planning supports the delivery of renewable and low carbon energy and associated infrastructure.

2.2 Paragraph 35 states developments should be located and designed where practical to 'incorporate facilities for charging plug-in and other ultra-low emission vehicles'. The incorporation of facilities for charging plug-in and other ultra-low emission vehicles is noted as one means of achieving this.

Planning Policy - Local Plan

2.3 The Coventry Local Plan 2016 (adopted December 2017) includes policies relating to environmental management and planning for climate change.

2.4 SPD Delivering a More Sustainable City 2009 provides additional guidance and refers to the West Midlands Sustainability Checklist, which has now been superseded, and to Code for Sustainable Homes. As this scheme has been withdrawn by the government it is not considered a requirement for this scheme.

2.5 The SPD does, however, require sustainable design to be considered in all developments, including:

i. Energy
ii. Materials
iii. Contaminated Land
iv. Travel
v. Waste and Recycling
vi. Water
vii. Air Quality

2.6 Regarding the energy strategy for a major development, section 4.9 of the SPD states:

> *'In all major developments, a minimum of 10% of the development's energy requirements should be provided through the on-site generation of renewable energy.'*

2.7 The Planning Technical Advice Note: Renewable/Low Carbon Energy Requirement for New Development 2012 provides detailed guidance on how to achieve this target.

2.8 The Technical Note confirms that the renewable energy target applies to both renewable technologies and low carbon technologies, including emerging technologies.

2.9 The low or zero carbon technology (LZCT) target can either be applied individually to each dwelling or as a whole development, subject to the phasing strategy. At this stage it is envisaged that this site will be developed as a single phase and the LZCT target will be applied as a whole development.

2.10 The term 'energy requirements' includes both regulated loads, as determined by the energy associated with Building Regulations Part L1A Target Emission Rate (TER), and unregulated loads, which includes the energy used to run appliances and equipment including cooking. The TER should be achieved independently of meeting the 10% LZCT target.

2.11 Although the LZCT target relates to energy, the carbon emissions reduction should be considered when determining the final LZCT strategy.

2.12 There is no specific policy guidance regarding electric vehicle charging points.

3. ENERGY STRATEGY METHODOLOGY

3.1 The energy strategy for the development is being established to achieve a baseline for energy consumption. All options considered in preparation of the energy strategy and subsequent detailed development of the scheme will ensure that the baseline energy consumption target is achieved.

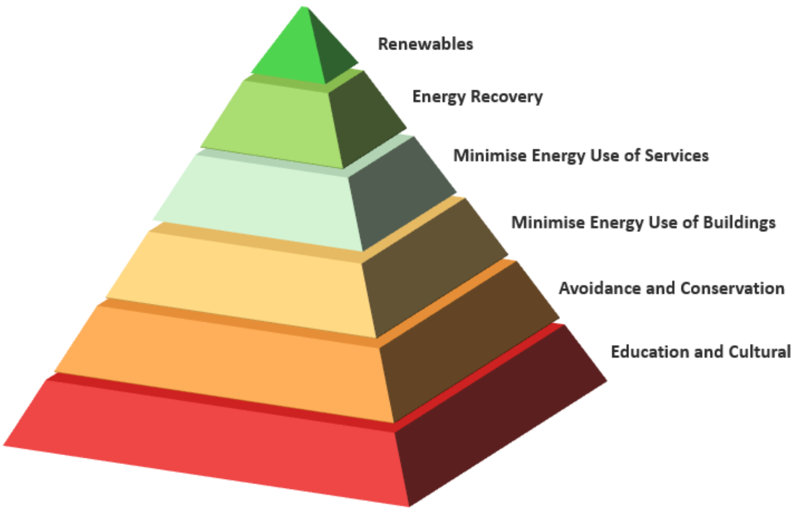
3.2 The key energy target is for the development to achieve Part L 2013 compliance and to offset 10% of the residual regulated and unregulated energy demands using low or zero carbon technologies.

3.3 The first step in assessing compliance and resolving the optimum energy strategy is to understand the baseline energy consumption; this is the compliance with Part L1A 2013 Building Regulations.

3.4 The site will comprise a number of house types and at this Outline stage the house type layouts are not yet determined. Energy benchmarks from typical 2, 3 and 4 bed houses are used to determine the predicted energy loads for the site. These have been calculated using the typical house type drawings from similar schemes and using the Standard Assessment Procedure (SAP). The results have been extrapolated to include 5 bed houses.

3.5 The regulated and unregulated loads have been determined using the SAP calculations. The Dwelling Emission Rate (DER) reflects the regulated loads and the appliances and cooking gains from the DER worksheet reflect the unregulated loads.

3.6 By following the energy hierarchy, the incumbent energy is reduced before using low carbon technologies.



3.7 Once the energy consumption benchmark has been determined, energy saving measures are encouraged, following the Fabric First Approach. This will reduce energy demand and consequently the residents' energy bills by investing in improving the building fabric's thermal properties and using efficient building services. This is often referred to as 'Be Lean'.

3.8 The fabric first approach provides protection against fluctuations in both gas and electricity supply tariffs by inherently reducing energy consumption and expands the number of suitable energy generation and delivery options.

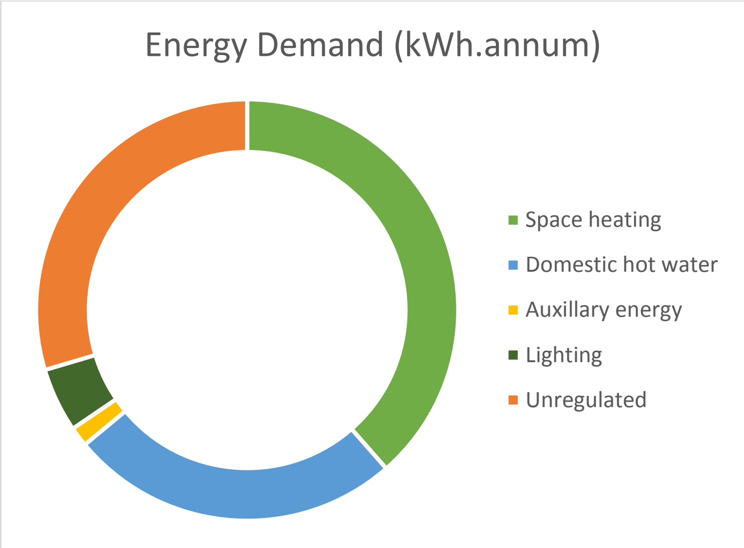
3.9 Further improvements in building fabric and building services, over and above the minimum requirements to comply with Building Regulations Part L, can reduce energy demand further and are described in the SAP calculations as 'Be Clean'. These are options which can be applied to the final design of a project to help achieve the Part L1A TER.

3.10 Finally, the use of renewable or low or zero carbon technologies (LZCT's) is assessed to offset the development's energy demand, often referred to as 'Be Green'. The use of the energy hierarchy will help to reduce the size of any LZCTs required by ensuring that energy consumption is driven out of the scheme by the fabric first approach. The LZCTs will be sized to offset 10% of the regulated and unregulated energy demand.

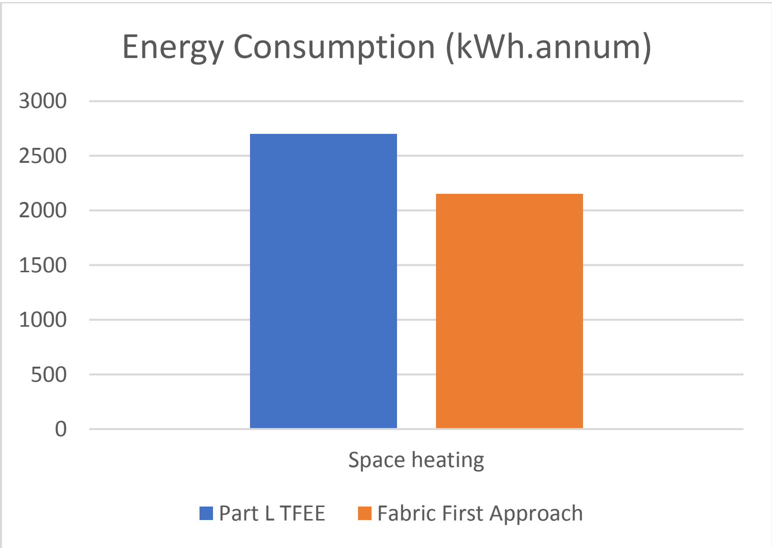
4. PASSIVE DESIGN

4.1 The strategy for 'Be Lean' focusses on regulated energy use and follows the Fabric First approach to reduce energy consumption before looking to use renewable technologies. Suitable passive design options which can be applied to this project are listed below; these should be adopted to ensure each building type can achieve Part L1A 2013 compliance.

4.2 The primary energy demand in a typical residential property is the thermal or heating demand, both space heating and domestic hot water as shown below, followed by the unregulated loads.



4.3 The high thermal demand encourages the Fabric First approach to be adopted as this can have one of the largest impacts on energy demand as shown below in a typical 2-bedroom house. The savings are more pronounced in a larger house.



4.4 The following table highlights the potential passive design opportunities for the residential development within the site.

Design Consideration	Commentary
Glazing	Concurrently, the daylighting and solar gain should be balanced to provide a comfortable environment which will be achieved through a suitable window to wall ratio. The window specification should also be balanced to achieve trickle ventilation for comfort, good U-Value to limit heat loss and careful selection of the G-Value to reduce solar gain in summer whilst encouraging useful solar gain in winter.
U-Values	In detached 4-bedroom properties, the wall U-Value has the most influence over the house's thermal performance and should be carefully selected. In smaller 2-bedroom properties the U-Values generally need to be better performing due to the higher wall to floor area ratio and care should be taken to meet the Target Fabric Energy Efficiency.
Thermal bridging	The detailing of the houses should be carefully designed to reduce thermal bridging which helps to limit the house's heat loss.
Air permeability	An air tightness test should be carried out for the homes to encourage low air permeability targets to be achieved. However, the air tightness is to be balanced with the opening window provision to ensure each house limits the risk of summertime overheating.
Lighting	Low energy lighting should be used throughout.
Space heating	Gas fired condensing boilers should be used in houses, with space heating provided by radiators or underfloor heating. Heating controls to each house shall allow user control and be simple to use.
Domestic hot water	Where the hot water demand is higher due to the number of bathrooms in larger houses, domestic hot water storage should be considered with adequate insulation to reduce the standing thermal losses. An optional waste water heat recovery unit could help to improve the efficiency of the hot water system further by pre-heating the incoming cold water to the shower or bath.
Ventilation	As the site is not known to be in an area of poor air quality or noise, natural ventilation should be used where possible using trickle vents on the windows for background ventilation and opening windows for boost ventilation. To assist with maximising the natural ventilation potential, the houses should be set back from the main road to reduce any noise and air quality issues. Generally, the bathrooms and kitchens should be fitted with local extract fans and meet the ventilation requirements of Building Regulations Part F.

5. LOW OR ZERO CARBON TECHNOLOGIES

5.1 The use of renewable or low or zero carbon technologies (LZCT's) is assessed to meet the final carbon reduction required if the baseline energy consumption target has not been achieved by using the passive design options alone. The use of the energy hierarchy will help to reduce the size of any LZCTs required by ensuring that energy consumption is driven out of the scheme by the fabric first approach.

5.2 An initial renewable energy options assessment has been undertaken using the Renewable Energy Sources Estimation Tool (RESET) which accompanies the CIBSE TM38 'Renewable Energy For Buildings' guidance document. This toolkit is intended for use at the earliest stages of design, when ideas are being considered and the outline direction of the design is developed, to identify the most promising renewable technology options for a given development or building. This is the key stage for some of the most important decisions relating to overall appearance, orientation, building mass and ventilation strategy, which can also influence decisions about renewable energy sources. The assessment has been undertaken to judge the feasibility of renewable energy technologies from the outset, enabling viable technologies to be promoted and others to be ruled out from further consideration. The following sections provide an overview of the assessment for each principal renewable technology considered.

Wind Turbine

5.3 The efficiency of wind turbines increases with capacity. An array of turbines could be connected to the grid, enabling excess power generated during periods of little or no load within the building to be exported to the national grid and an income received. However, given the location and density of the site, the turbines would need to be large and would cause noise concerns to the local residents. Therefore, wind turbines are not considered further in this study.

Solar Thermal

5.4 Solar water heating systems use the energy from the sun to heat water, most commonly in the UK for domestic hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. The systems work very successfully in all parts of the UK, as they can work in diffuse light conditions.

5.5 There are two types of collectors used for solar water heating applications - flat plate collectors and evacuated tube collectors. The flat plate collector is the predominant type used in domestic systems as they tend to be cheaper. Evacuated tube collectors are generally more expensive due to a more complex manufacturing process (to achieve the vacuum) but manufacturers generally claim better winter performance.

5.6 Ideally the collectors should be mounted on a south-facing roof, although south-east/south-west will also function successfully, at an elevation of between 10 and 60°. The panels can be bolted onto the roof or integrated into the roof with lead flashings. Solar water heating systems are suitable for any building type that has sufficient yearround hot water needs (ideally during the day). They require small amount of maintenance.

5.7 Solar thermal panels do not create a nuisance from noise, vibration, odour or fumes and do not impact on air quality. There may be some impact on visual amenity, and this should be considered in the Reserved Matters application if this technology is adopted.

5.8 Solar thermal may be suitable for this development and is explored in further detail.

Photovoltaic Panels

5.9 Photovoltaic panels (PV) utilise energy in the form of rays of light from the sun and are therefore required to be mounted on either a south facing roof or wall to ensure energy output is maximised.

5.10 Photovoltaic systems convert energy from the sun into electricity through semiconductor cells. Systems consist of semi-conductor cells connected and mounted into modules. Modules are connected to an inverter to turn their direct current (DC) output into alternating current (AC) electricity for use in buildings. Photovoltaics supply electricity to the building they are attached to or to any other load connected to the electricity grid. Excess electricity can be sold to the national grid when the generated power exceeds the local need. PV systems require only daylight, not sunlight to generate electricity (although more electricity is produced with more sunlight), so energy can still be produced in overcast or cloudy conditions.

5.11 Photovoltaic panels come in modular panels which can be fitted to the top of roofs and in slates or shingles which are an integral part of the roof covering (looking like normal roof tiles). Photovoltaic cells can be incorporated into glass for atria walls and roofs or used as cladding or rain screen on a building wall. They require small amount of maintenance.

5.12 Ideally photovoltaics should face between south-east and south-west, at an elevation of about 30-40°. However, in the UK even flat roofs receive 90% of the energy of an optimum system.

5.13 PV arrays do not create a nuisance from noise, vibration, odour or fumes and do not impact on air quality. There may be some impact on visual amenity, and should be considered in the Reserved Matters application if this technology is adopted.

5.14 PV may be suitable for this development and is explored in further detail.

5.15 The effectiveness of PV can be maximised with battery technology at a community level and within an individual house. By storing the energy generated in the day rather than exporting unused electricity back to the national grid, the electricity can be used when it is needed, avoiding distribution losses. The technology is currently cost prohibitive but is improving and becoming more cost effective.

Biomass

5.16 Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and nowadays is used commercially in the form of wood chips or pellets, although traditional logs are also used.

5.17 Biomass is normally considered a carbon neutral fuel, as the carbon dioxide emitted on burning has been (relatively) recently absorbed from the atmosphere by photosynthesis and no fossil fuel is involved. The wood is a by-product of other industries and the small quantity of energy for drying, sawing, pelleting and delivery are discounted. Biomass from coppicing is likely to have some external energy inputs, for fertiliser, cutting, drying etc. and these may need to be considered in the future.

5.18 Biomass heating is theoretically applicable to any building requiring heat; however practical constraints suggest that it is currently most applicable to lower density situations due to fuel supply and storage issues. The most common application of biomass is as one or more boilers in a sequenced (multi-boiler) installation particularly where there is a communal i.e. block or district heating system.

5.19 There must be a local and adequate supply of appropriate biomass fuel (normally wood chips or pellets) and room for delivery and storage. Biomass boilers replace conventional boilers and have no aesthetic impact.

5.20 Given the scale and density of this development biomass boilers are not considered feasible due to the fuel deliveries onto the residential development and the low density heating demand. Therefore, biomass boilers are not considered further in this study.

Heat Pumps

5.21 Ground source heat pumps are used to extract heat from the ground to provide space and water heating to either individual houses or any type of non-domestic building. Heat pumps take in heat at a certain temperature and release it at a higher temperature, using the same process as a refrigerator. As the ground stays at a fairly constant temperature throughout the year heat pumps can use the ground as the source of heat.

5.22 Air source heat pumps (ASHP) operate in a similar manner to ground source heat pumps, but use the heat in external air rather than the ground to release heat at a higher temperature. As ASHPs aren't as efficient at heating to the higher temperatures needed for domestic hot water supplementary plant is often required. Due to the duplication of plant ASHPs are not considered suitable for this development.

5.23 The ground temperature is not necessarily much higher than ambient air temperature in winter but it is more stable whereas air has a vast temperature range. This makes system design more robust.

5.24 Water or another fluid is circulated through pipes buried in the ground and passes through a heat exchanger in the heat pump that extracts heat from the fluid. The heat pump then raises the temperature of the fluid via the compression cycle to supply hot water to the building as from a normal boiler.

5.25 Most heat pumps are electrically driven but other systems can use waste heat or burn fossil fuel such as gas. The measure of efficiency of a heat pump is given by the Coefficient of Performance (CoP), which is defined as the ratio of the heat output, divided by quantity of energy put in. A CoP of 4 or more should be achievable with both ground and air source heat pump systems, giving good energy and running cost savings.

5.26 The heat pump can replace the boiler in a single house but in larger non-domestic buildings it is likely to be one of a number of modular boilers, depending on what proportion of the heat demand it is designed to satisfy. The optimal use of the heat pump system is with under floor heating as this is run at lower temperatures making the operation of the heat pump more efficient. Electrically driven heat pumps should be very reliable but require maintenance to keep to full CoPs.

5.27 For ground source systems the ground pipe system can be horizontal or vertical. For horizontal systems, a coiled or linear pipe network is buried at around two metres depth below ground level, thus requiring a large area of open space depending on the size of the system.

5.28 For vertical systems, the pipes are placed in holes bored straight into the ground to a depth of 80 to 150 metres depending on ground conditions and size of system. Vertical systems thus require very little ground space but do require access for the drilling rig at the construction stage, though this is unlikely to be greater than for normal construction vehicles.

5.29 Whilst a heat pump is clearly not a wholly renewable energy source as it uses electricity, the renewable component is considered as the heat (and coolth) extracted from the ground or air, measured as the difference between heat output, less the primary electrical energy input.

5.30 Ground source heat pump systems can be used in almost any size of non-domestic building. A particular use is where natural gas is not available making the ground source heat pump more economic. Ground source heat pumps cannot be seen from the outside of the building, so aesthetic design is not an issue.

5.31 Ground source heat pumps are cost prohibitive for this scheme and will not be exploded further.

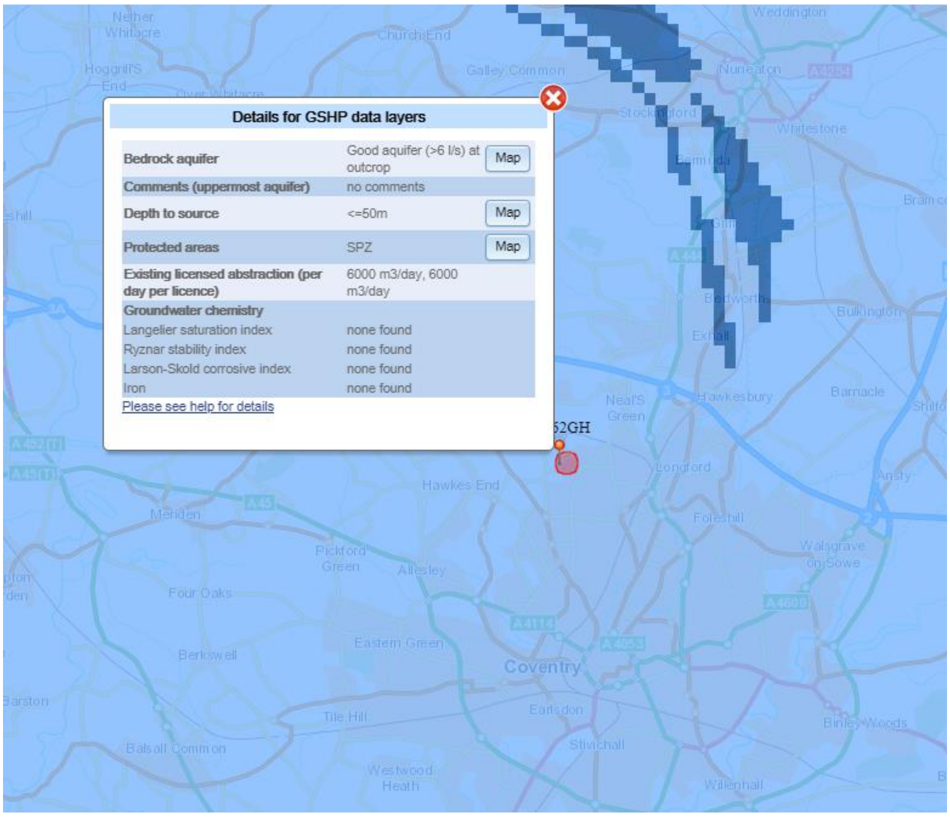
Ground Water Cooling

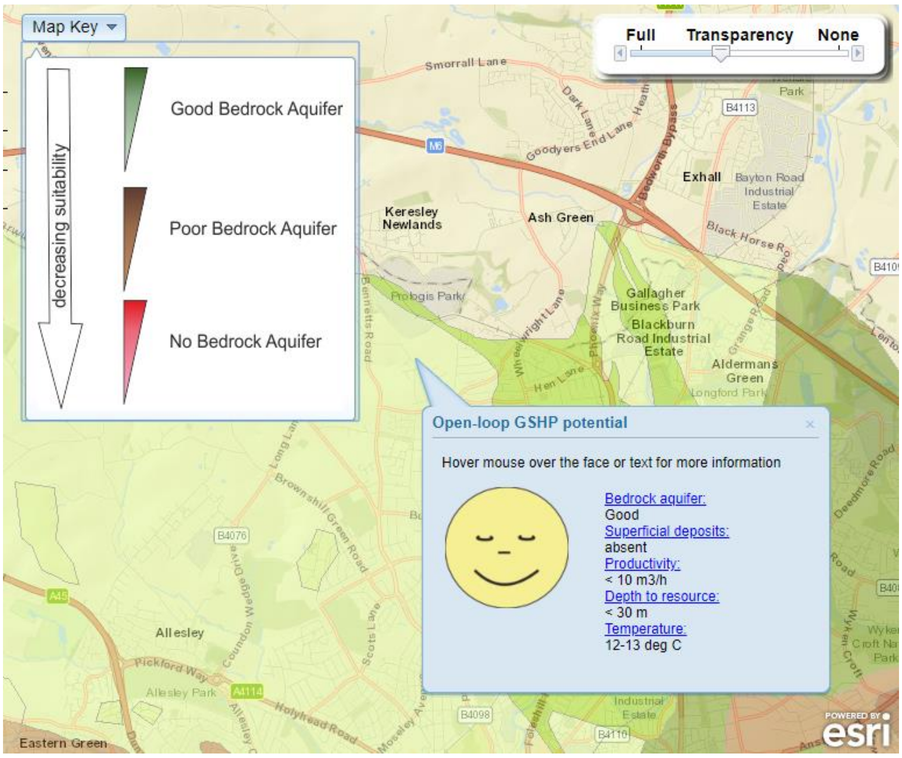
5.32 Ground source heat pumps can also be used in an open loop arrangement. The British Geological Society (BGS) published information of the local area shows the ground conditions be suitable for open loop systems.

5.33 On the first image below, taken from the BGS, the darker blue represents areas unsuitable for open loop systems due to their ground conditions. The site is shown to suitable for open-loop heat pumps.

5.34 The second image below, taken from the BGS, shows more detailed information for the West Midlands. It can be seen that in the site's location the bedrock aquifer is good with few superficial deposits and a source of less than 30m; it is considered is suitable for open-loop heat pumps.

5.35 An open-loop cooling system would be suitable for use with a district heating system. However, given the site has potential for 40 houses this does not provide an adequate base heating load and district heating is not feasible. Therefore ground water cooling will not be explored further.





Combined Heat and Power

5.36 Combined heat and power (CHP) is usually referred as cogeneration of usable heat and power within a single process. CHP makes more efficient use of the primary fuel for producing heat and power than conventional methods.

5.37 The power generated can be used for driving mechanical plant including compressors and fans. In a standard CHP system, the prime mover is a heat engine, which provides the energy to drive the electricity generator and produce the heat. The heat from the fluid is used to do the mechanical work. Once the work is done, heat remains in the fluid which dissipates into the surroundings or can be recovered and reused. CHP is defined as the recovery and use of waste heat from power generation.

5.38 The heat generated during this process is supplied to an appropriately matched heat demand which would otherwise be met by a conventional boiler. CHP systems are highly efficient, making use of the heat which would otherwise be wasted when generating electrical or mechanical power. This allows heat requirements to be met that would otherwise require additional fuel to be burnt.

5.39 CHP requires significant capital investment in plant and resources. However, the high capital outlay is balanced by lower costs from energy bills and number of proposed schemes like the reduction of exemptions from climate change levy, an enhanced Capital allowance and the business rates exemptions.

5.40 A CHP can provide cost effective energy solutions for a site with a large and continuous demand. This site does not provide the large and continuous thermal and power loads. Therefore, CHP is not considered suitable for this development and is not considered further within this study.

6. ENERGY STRATEGY FOR THE SITE

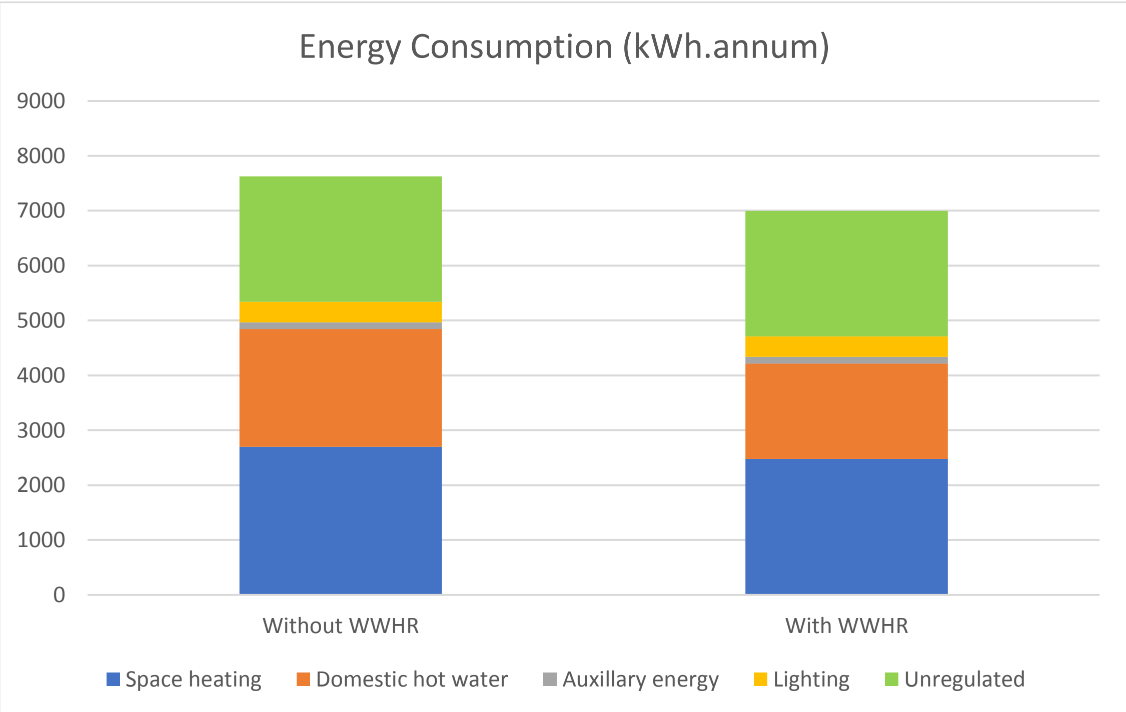
6.1 The energy strategy has been developed using the housing mix described in the Introduction and is intended to provide a framework for which the residential properties will be designed. Through the next design stage each phase should be finalised in accordance with this strategy and 10% of the site's regulated and unregulated energy demand should be met with low or zero carbon technologies.

6.2 Where calculations show that an improvement on the 10% energy target can be achieved, this is intended to show that design development has been allowed for and changes may occur throughout the design process. This ensures that the 10% target can be met at detailed design stage.

6.3 In addition to the regulated loads detailed below, users will be encouraged to reduce their unregulated loads. These loads are excluded from Part L assessments and are generally unaffected by the development's construction. Where the developers influence the unregulated loads, the energy consumption will be reduced where feasibly possible.

6.4 As discussed above the prominent energy demands in a residential property are the space heating and domestic water loads. Before looking at active technologies, ie those which require an energy supply to generate energy, passive technologies are reviewed as these offer carbon savings without requiring additional energy to be consumed.

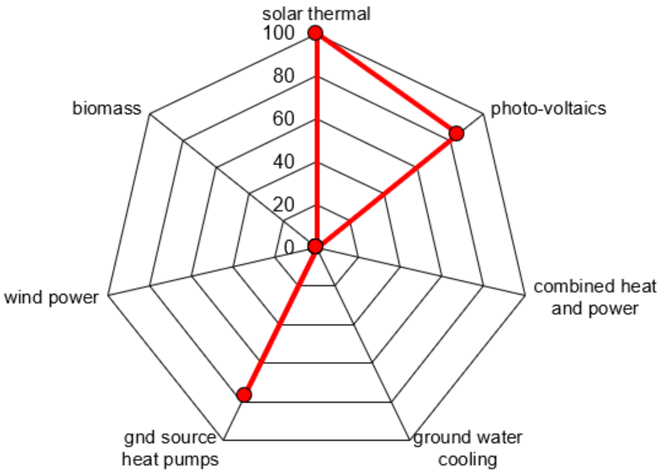
6.5 Waste water heat recovery can offer energy savings by using waste water from showers or baths to pre-heat the incoming cold water to the taps or shower heads. This can offer energy savings of around 7% of the annual energy demand of a 2-bedroom house. The energy reduction is shown below.



6.6 The payback period depends on the number of bedrooms in the house, but they can vary between 9 and 18 years. For a passive piece of equipment this is considered a good investment and is recommended for installation within each home and contributes to the low carbon technology target.

6.7 The domestic water system should be designed to not exceed 125 litres per person per day. In addition to reducing water consumption, this will reduce the domestic hot water demand for each property. The strategy is shown in further detail in Appendix B.

6.8 The LZCT assessment shown below demonstrates that solar thermal, photovoltaic panels or ground source heat pumps are all feasible technologies for a residential application, although ground source heat pumps have been discounted due to commercial feasibility.



6.9 Calculations have been undertaken to understand the capacity required for PV and solar thermal should they be used in isolation to achieve the energy contribution target, for both a smaller 2-bedroom house, a medium 3-bedroom house and a larger 4-bedroom house using sample SAP calculations. The results have been extrapolated for a 5-bedroom house.

6.10 The LZCT study has demonstrated that both PV and solar thermal are viable technologies. However, if the shower waste water heat recovery unit is installed the solar thermal technology would not be as effective.

6.11 PV is suitable for the site; the calculations in Appendix A show the likely minimum number of solar panels required for each house type, ie between 3 and 6 depending on the house type and size and when using good quality panels with an output of around 240Wp each. If the insulation standards within the house were relaxed the installed area of photovoltaic panels would be increased, generating an additional carbon emission reduction using on site electrical generation. Likewise, if shower waste heat recovery (a low carbon technology) was installed, the capacity of PV required is reduced to meet the LZCT target.

6.12 The Feed in Tariffs are available for PV, both for generation and exporting, and it is likely that some power will be exported as not all homes will be occupied throughout the day when on-site electrical generation is highest. The simple payback period is unlikely to be met through the life of the technology as a result of the lower Feed in Tariff now paid by the Government, as shown by the Energy Saving Trust's online calculator[1].

6.13 Solar thermal panels are an option for the residential development, particularly if the shower waste heat recovery system isn't used, with 2 efficient panels being required for the larger houses. Renewable Heat Incentives are available for onsite domestic hot water generation. The Energy Saving Trust published figures suggest the simple payback period to be in the region of 12 years[2].

6.14 Using shower heat recovery, PV and solar thermal all have the potential to meet 10% of the houses' energy demand as shown below. An approximate capacity is shown for each suitable technology.

	House Type			
	2 Bed	3 Bed	4 Bed	5 Bed
Option 1 - PV				
PV area (m2)	4	5	6	6
Option 2 - Solar Thermal				
Solar thermal area (m2)	2	3	3	4
Option 3 - PV & WWHR				
PV area (m2)	2	3	4	4

6.15 In summary, 10% of the energy demand of the houses on the site can be delivered through low or zero carbon technologies, which may include shower waste heat recovery systems, PV panels or solar thermal panels.

[1] http://www.energysavingtrust.org.uk/scotland/tools-calculators/solar-energy-calculator
[2] http://www.energysavingtrust.org.uk/renewable-energy/heat/solar-water-heating

7. ELECTRIC VEHICLE CHARGING

7.1 The Good Practice Air Quality Planning Guidance 2014 published by the West Midlands Low Emissions Towns & Cities Programme recommends one electric vehicle charging point is provided per house with a dedicated parking space. This policy is supported by the NPPF in paragraph 35.

7.2 The government offers grants to support the wider use of electric and hybrid vehicles via the Office of Low Emission Vehicles (OLEV). More information is available at https://www.gov.uk/government/collections/government-grants-for-low-emission-vehicles.

7.3 There are three types of electric vehicle charger which are appropriate for different applications, depending on the length of time available to charge each vehicle:

- Slow chargers – up to 3kW, take 6-8 hours to fully charge. Best for overnight charging on residential streets or on residential drives.
- Fast/Standard chargers – 7–22kW, take 3-4 hours to fully charge. Now commonly being put both on residential streets, sometimes combined with slow chargers, and in commercial settings.
- Rapid chargers – 43–50kW, provides 80% of charge in around 30 minutes. Suitable for commercial settings such as public car parks or hospitals with short-stay car parking.

7.4 An external vehicle charging point should be provided adjacent to at least one parking space per dwelling. As the charging points are located at dwellings it is considered that a slow charger is appropriate. This will encourage the power demand to be at night and will have less of an impact on the National Grid and the local power infrastructure.

8. SUSTAINABILITY

8.1 A sustainable approach to design is incorporated into the scheme. This report addresses the key sustainability topics highlighted in the Delivering a More Sustainable City SPD 2009. The Code for Sustainable Homes has since been withdrawn by the Government and consequently this scheme will not undergo a formal assessment process.

8.2 At this outline stage, the details of the approach to construction have not yet been realised. It is envisaged that a Construction Environmental Management Plan (CEMP) will be required to be submitted under a condition attached to the outline planning permission, which will address construction-related environmental concerns including:

i. Air quality
ii. Waste and recycling
iii. Ground conditions
iv. Noise and vibration
v. Highways and transportation

Materials

8.3 The construction-related materials strategy will be developed in the CEMP referred to above. At this outline stage, the materials to be used for construction have not yet been developed.

8.4 The materials should be selected to provide energy efficient homes, with the Target Fabric Energy Efficiency (TFEE) being met for each dwelling. This helps to reduce heating demand and bills, and associated carbon emissions.

Contaminated Land

8.5 A Phase 1 Environmental Assessment has been undertaken for the site, refer to report RFC-BWB-ZZ-XX-RP-YE-0001-Ph1 for full details. The report confirms limited contamination sources have been identified with the potential to pose a risk to the site. Contaminated soils may be present associated with potential chemical/fuel storage in former sheds along the western boundary. The site is considered to pose a low risk to identified receptors.

8.6 Two potable groundwater abstraction bores are located at a pumping station adjacent to the east of the site and the site is subsequently located within the inner catchment of the associated Source Protection Zone (Zone 1).

8.7 The following recommendations are made within the Phase 1 report which will be addressed throughout the design period for the project:

i. A drainage strategy may be required given the presence of the groundwater abstraction boreholes adjacent to the site.
ii. A ground investigation should be undertaken at the site to confirm ground conditions and allow for in-situ and laboratory testing to inform foundation

design and an earthworks specification as well as determine the presence and extent of any potential contamination which may be present.

Travel

8.8 Within the surrounding vicinity of the site there is suitable sustainable infrastructure to accommodate travelling on-foot, by cycle or by bus public transport to/from the proposed development. A footway is provided adjacent to the southern side of Watery Lane opposite the site frontage, which provides direct access to the suburban area of Holbrooks where local facilities are available. There are designated cycle routes approximately 2.5km east of the site which can be accessed via the existing road network which route to the centre and surrounding areas of Coventry. Furthermore, the nearest bus stops are located 500m to the south-east of the site, that provide a frequent service to Coventry City Centre. The existing highway infrastructure within the vicinity of the site therefore provides good opportunity for future residents/visitors of the proposed development to travel by sustainable modes of transport.

8.9 In addition, the proposed electric vehicle charging points encourages residents to use electric vehicles which reduce emissions and helps to improve air quality.

Waste and Recycling

8.10 The construction related waste and recycling strategy will be developed in the CEMP. Future occupants of the houses will be encouraged to recycle at home. Coventry City Council encourages recycling with the provision of recycling bins to each house.

Water

8.11 Each house should be designed to limit water consumption to 125litres per person per day through the use of efficient sanitaryware. The water consumption calculator is shown in Appendix B.

8.12 The Flood Risk Assessment demonstrates that the proposed development is at an acceptable level of flood risk subject to the recommended flood mitigation strategies being implemented. The proposed development is located within Flood Zone 1 (Low Probability) of the River Soar, on the Environment Agency's Flood Map for Planning. The adjacent Hall Brook also poses low fluvial risk. Other sources of flood risk assessed include pluvial flooding which is found to pose a low risk, and sewers, groundwater and reservoirs which were all considered to pose a residual low risk.

8.13 Sustainable Urban Drainage Systems (SUDS) should be incorporated into the scheme. Refer to the Drainage Strategy for more details.

Air Quality

8.14 The development has been set back from the road to limit the effects of air quality. The houses are proposed to be heated via gas fired condensing boilers which has limited impact on local air quality.

8.15 The proposals for electric vehicle charging points help to mitigate air quality and is supported by the Good Practice Air Quality Planning Guidance 2014.

9. CONCLUSION

9.1 This document sets a framework for the Energy and Sustainability Strategy for the residential development site. It summarises the key planning policy and is aimed at satisfying the energy related requirements.

9.2 The energy framework sets out the predicted energy consumption for the site, domestic water consumption and electric car charging points. This allows flexibility for delivery at detailed design stage, whilst complying with pertinent planning policy.

9.3 The energy strategy for the site follows the energy hierarchy, with a focus on passive design to reduce the incumbent energy prior to applying low or zero carbon technologies.

9.4 In summary, a target of 10% of the regulated and unregulated energy demand of the houses on the site should be delivered through low or zero carbon technologies, which may include shower waste heat recovery systems, PV panels or solar thermal panels.

9.5 The development will incorporate sustainable design features which are summarised in this report. Discipline-specific reports which supplement this Outline Planning Application provide further information of how this will be achieved, with detail to be added at the Reserved Matters stage.

APPENDIX A: SAP Summary

Typical House SAP Calculations
Midlands Region
25th June 2018

Area (m2)	2 Bed 2 Storey
Ground Floor	31.4
First Floor	31.4
Second Floor	N/A
Total	62.8

		Be Lean	Be Clean 2 - WWHR	Be Green 1 - PV	Be Green 2 - Solar Thermal	Be Green 3 - PV & WWHR
		2 Bed, 2 Storey Semi	2 Bed, 2 Storey Semi	2 Bed, 2 Storey Semi	2 Bed, 2 Storey Semi	2 Bed, 2 Storey Semi
Construction Efficiency	Glazing to Wall Ratio (%)	14%	14%	14%	14%	14%
	Thermal bridging - Type	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited
	Thermal bridging Value	13.9	13.9	13.9	13.9	13.9
	External Wall U-Value	0.15	0.11	0.11	0.11	0.11
	Ground U-Value	0.13	0.10	0.10	0.10	0.10
	Roof U-Value	0.09	0.09	0.09	0.09	0.09
	Windows U-Value	1.20	1.20	1.20	1.20	1.20
	Door U-Value	1.20	1.00	1.00	1.00	1.00
	Air Permeability	4	4	4	4	4
	Thermal Mass	Low	Low	Low	Low	Low
Building Services Efficiency	Domestic Water Heating	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler
	Waste water heat recovery	No	Yes	No	No	Yes
	Space Heating	89.70%	89.70%	89.70%	89.70%	89.70%
	DHW	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation
	Percentage of Low Energy Lighting	100	100	100	100	100
	Ventilation Type	Local extract	Local extract	Local extract	Local extract	Local extract
	Ventilation-SPF	0.2	0.2	0.2	0.2	0.2
	Ventilation Unit Name	N/A	N/A	N/A	N/A	N/A
LZCTs	PV Output (kWp)	N/A	N/A	0.80	N/A	0.40
	PV Area (m2)	N/A	N/A	5.29	N/A	2.64
	PV - Number of Panels	N/A	N/A	4	N/A	2
	Ground source heat pump	N/A	N/A	N/A	N/A	N/A
	Solar Thermal Area (m2)	N/A	N/A	N/A	2	N/A
	Solar Thermal - Number of Panels	N/A	N/A	N/A	1	N/A
Overheating	Overheating risk	Medium	Medium	Medium	Medium	Medium
Results	TFEE (kWh.annum)	49.00	49.00	49.00	49.00	49.00
	DFEE (kWh.annum)	48.60	47.70	47.70	47.70	47.70
	Pass/Fail Part L1A Compliance	Pass	Pass	Pass	Pass	Pass
	TER (kgCO2/m2.annum)	18.63	18.63	18.63	18.63	18.63
	DER (kgCO2/m2.annum)	20.77	18.61	17.37	17.29	15.72
	Pass/Fail Part L1A Compliance	Fail	Pass	Pass	Pass	Pass
	Regulated & Unregulated Energy Demand (kWh/m2.annum)	113.2	104.5	102.9	99.4	104.5
	LZCT Energy Contribution (kWh/m2.annum)	0.0	5.5	10.2	10.6	10.7
	Percentage Improvement over Part L	-11%	0%	7%	7%	16%
	Percentage Renewables Contribution	0%	5%	10%	11%	10%
	Meets LZCT target - Carbon	No	No	Yes	Yes	Yes

Typical House SAP Calculations
Midlands Region
25th June 2018

Area (m2)	3 Bed 2 Storey
Ground Floor	39
First Floor	39
Second Floor	N/A
Total	78

		Be Lean 1 - FFE compliant	Be Clean 2 - WWHR	Be Green 1 - PV	Be Green 2 - Solar Thermal	Be Green 3 - PV & WWHR
		3 Bed, 2 Storey Semi	3 Bed, 2 Storey Semi	3 Bed, 2 Storey Semi	3 Bed, 2 Storey Semi	3 Bed, 2 Storey Semi
Construction Efficiency	Glazing to Wall Ratio (%)	14%	14%	14%	14%	14%
	Thermal bridging - Type	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited
	Thermal bridging Value	13.9	13.9	13.9	13.9	13.9
	External Wall U-Value	0.15	0.11	0.11	0.11	0.11
	Ground U-Value	0.13	0.10	0.10	0.10	0.10
	Roof U-Value	0.09	0.09	0.09	0.09	0.09
	Windows U-Value	1.20	1.10	1.10	1.10	1.10
	Door U-Value	1.20	1.00	1.00	1.00	1.00
	Air Permeability	4	4	4	4	4
	Thermal Mass	Low	Low	Low	Low	Low
Building Services Efficiency	Domestic Water Heating	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler
	Waste water heat recovery	No	Yes	No	No	Yes
	Space Heating	89.70%	89.70%	89.70%	89.70%	89.70%
	DHW	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation
	Percentage of Low Energy Lighting	100	100	100	100	100
	Ventilation Type	Local extract	Local extract	Local extract	Local extract	Local extract
	Ventilation-SPF	0.2	0.2	0.2	0.2	0.2
	Ventilation Unit Name	N/A	N/A	N/A	N/A	N/A
LZCTs	PV Output (kWp)	N/A	N/A	1.10	N/A	0.60
	PV Area (m2)	N/A	N/A	7.27	N/A	3.97
	PV - Number of Panels	N/A	N/A	5	N/A	3
	Ground source heat pump	N/A	N/A	N/A	N/A	N/A
	Solar Thermal Area (m2)	N/A	N/A	N/A	2.5	N/A
	Solar Thermal - Number of Panels	N/A	N/A	N/A	2	N/A
Overheating	Overheating risk	Medium	Medium	Medium	Medium	Medium
Results	TFEE (kWh.annum)	51.10	51.10	51.10	51.10	51.10
	DFEE (kWh.annum)	50.10	46.50	46.50	46.50	46.50
	Pass/Fail Part L1A Compliance	Pass	Pass	Pass	Pass	Pass
	TER (kgCO2/m2.annum)	17.95	17.95	17.95	17.95	17.95
	DER (kgCO2/m2.annum)	19.93	17.81	16.97	16.09	14.52
	Pass/Fail Part L1A Compliance	Fail	Pass	Pass	Pass	Pass
	Regulated & Unregulated Energy Demand (kWh/m2.annum)	108.5	99.9	104.9	92.1	99.9
	LZCT Energy Contribution (kWh/m2.annum)	0.0	5.1	11.3	13.5	11.4
	Percentage Improvement over Part L	-11%	1%	5%	10%	19%
	Percentage Renewables Contribution	0%	5%	11%	15%	11%
	Meets LZCT target - Carbon	No	No	Yes	Yes	Yes

Typical House SAP Calculations
Midlands Region
25th June 2018

Area (m2)	4 Bed 2 Storey
Ground Floor	55.9
First Floor	55.9
Second Floor	N/A
Total	111.8

		Be Lean	Be Clean 2 - WWHR	Be Green 1 - PV	Be Green 2 - Solar Thermal	Be Green 3 - PV & WWHR
		4 Bed, 2 Storey Semi	4 Bed, 2 Storey Semi	4 Bed, 2 Storey Semi	4 Bed, 2 Storey Semi	4 Bed, 2 Storey Semi
Construction Efficiency	Glazing to Wall Ratio (%)	14%	14%	14%	14%	14%
	Thermal bridging - Type	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited	Enhanced/Accredited
	Thermal bridging Value	13.9	13.9	13.9	13.9	13.9
	External Wall U-Value	0.11	0.11	0.11	0.11	0.11
	Ground U-Value	0.10	0.10	0.10	0.10	0.10
	Roof U-Value	0.09	0.09	0.09	0.09	0.09
	Windows U-Value	1.10	1.10	1.10	1.10	1.10
	Door U-Value	1.00	1.00	1.00	1.00	1.00
	Air Permeability	4	4	4	4	4
	Thermal Mass	Low	Low	Low	Low	Low
Building Services Efficiency	Domestic Water Heating	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler	Gas fired system boiler
	Waste water heat recovery	No	Yes to 1 bathroom	No	No	Yes to 1 bathroom
	Space Heating	89.70%	89.70%	89.70%	89.70%	89.70%
	DHW	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation	115 litres with 100mm insulation
	Percentage of Low Energy Lighting	100	100	100	100	100
	Ventilation Type	Local extract	Local extract	Local extract	Local extract	Local extract
	Ventilation-SPF	0.2	0.2	0.2	0.2	0.2
	Ventilation Unit Name	N/A	N/A	N/A	N/A	N/A
LZCTs	PV Output (kWp)	N/A	N/A	1.30	N/A	0.80
	PV Area (m2)	N/A	N/A	8.59	N/A	5.29
	PV - Number of Panels	N/A	N/A	6	N/A	4
	Ground source heat pump	N/A	N/A	N/A	N/A	N/A
	Solar Thermal Area (m2)	N/A	N/A	N/A	3	N/A
	Solar Thermal - Number of Panels	N/A	N/A	N/A	2	N/A
Overheating	Overheating risk	Medium	Medium	Medium	Medium	Medium
Results	TFEE (kWh.annum)	51.90	51.90	51.90	51.90	51.90
	DFEE (kWh.annum)	44.80	44.80	44.80	44.80	44.80
	Pass/Fail Part L1A Compliance	Pass	Pass	Pass	Pass	Pass
	TER (kgCO2/m2.annum)	16.13	16.13	16.13	16.13	16.13
	DER (kgCO2/m2.annum)	16.78	15.98	9.81	14.33	12.92
	Pass/Fail Part L1A Compliance	Fail	Pass	Pass	Pass	Pass
	Regulated & Unregulated Energy Demand (kWh/m2.annum)	92.3	89.2	92.3	82.5	89.2
	LZCT Energy Contribution (kWh/m2.annum)	0.0	3.1	9.3	11.1	9.0
	Percentage Improvement over Part L	-4%	1%	39%	11%	20%
	Percentage Renewables Contribution	0%	3%	10%	13%	10%
	Meets LZCT target - Carbon	No	No	Yes	Yes	Yes

APPENDIX B: Water Consumption Calculator

Installation type	Unit of measure	1 Capacity/ flow rate	2 Use factor	3 Fixed use (litres/ person/ day)	4 Litres/ person/day = [(1) x (2)] + (3)
WCs (multiple fittings)	Average effective flushing volume (litres)	4.66	4.42	0	20.6
Taps (excluding kitchen/utility room taps)	Flow rate (litres/minute)	6.00	1.58	1.58	11.1
Bath (where shower also present)	Capacity to overflow (litres)	150.00	0.11	0	16.5
Shower (where bath also present)	Flow rate (litres/minute)	12.00	4.37	0	52.4
Kitchen/utility room sink taps	Flow rate (litres/minute)	6.00	0.44	10.36	13.0
Washing machine	Litres/kg dry load	5.00	2.1	0	10.5
Dishwasher	Litres/place setting	1.50	3.6	0	5.4
Waste disposal unit	Litres/use If present = 1 If absent = 0	0	3.08	0	0.0
Water softener	Litres/person/day	0.00	1	0	0.0
	5	Total calculated use = (Sum column 4)			129.5
	6	Contribution from greywater (litres/person/day)			0
	7	Contribution from rainwater (litres/person/day)			0
	8	Normalisation factor			1
	9	Total water consumption = ((5) – (6) – (7)) x (8)			118
	10	External water use			5
	11	**Total water consumption = (9) + (10) (litres/person/day)**			**123**

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