# Energy & Sustainability Statement

Miller Homes Limited

March 2022

# Land at Shurdington Road, Leckhampton

*31/03/2022*

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# Contents

# 1.0 Introduction

## 1.1 Context

This Statement was prepared by Energy & Design Ltd on behalf of Miller Homes Limited to support a planning application for the proposed 350 dwelling development of Land at Shurdington Road, Leckhampton.

This energy and sustainability statement shows that the requirement will be met to comply with Gloucester, Cheltenham and Tewkesbury Joint Core Strategy, adopted in November 2017 covering the period 2011-2031 policy SD3: sustainable Design and Construction as follows:

**Policy SD3: Sustainable Design and Construction**

1. *Development proposals will demonstrate how they contribute to the aims of sustainability by increasing energy efficiency, minimising waste and avoiding the unnecessary pollution of air, harm to the water environment, and contamination of land or interference in other natural systems. In doing so, proposals (including changes to existing buildings) will be expected to achieve national standards*
2. *All development will be expected to be adaptable to climate change in respect of the design, layout, siting, orientation and function of both buildings and associated external spaces. Proposals must demonstrate that development is designed to use water efficiently, will not adversely affect water quality, and will not hinder the ability of a water body to meet the requirements of the Water Framework Directive;*
3. *All development will be expected to incorporate the principles of waste minimisation and re-use. Planning applications for major development must be accompanied by a waste minimisation statement, which demonstrates how any waste arising during the demolition, construction and subsequent occupation of the development will be minimised and sustainably managed*
4. *To avoid unnecessary sterilisation of identified mineral resources, prior extraction should be undertaken where it is practical, taking into account environmental acceptability and economic viability relating both to extraction of the mineral(s) and subsequent implementation of the non-minerals development of the site*
5. *Major planning applications must be submitted with an Energy Statement that clearly indicates the methods used to calculate predicted annual energy demand and associated annual Carbon Dioxide ($CO_2$) emissions.*

*This policy contributes towards achieving Objectives 5, 6 and 9.*

## 1.2. Description of Development

Land at Shurdington Road, Leckhampton proposes 350 plots. These plots comprise of a range of detached, semi-detached, terraced housing & apartments.

The current site is shown below.

## 1.3. Project Brief

The development is being designed to achieve a % reduction above the Target Emission Rate (TER) as set out in Part L of the Building Regulations (2013).

For the purpose of this energy statement, we will be basing all the plots on using L1a2013 however some of the site will need to be built to L12021 which will pass by default as this is equivalent to 31%.

# 2.0 Methodology

## 2.1 Assessment Methodology

Energy & Design Ltd have modelled sample types using SAP 2012 methodology to calculate the energy demand of the dwellings.

This will allow us to show compliance in two steps.

1) Baseline Energy Demand – this will be calculated and given in Total $CO_2$ emissions ($kgCO_2$/year). SAP uses the Target Emission Rate (TER = $CO_2$ kilograms, per $M_2$ of total useful floor area, per year) to create the baseline for compliance with the approved document Part L1a2013. This is then multiplied by the total useful floor area to give the overall $CO_2$ emissions.
2) Improved Fabric with Low and Zero Carbon (LZC) technologies – various fabrics & technologies will be looked at to get the reduction of $CO_2$ emissions (kgCO2/year) of 31% in total.

# 3.0 Baseline Energy Demand

## 3.1 The Development Baseline

To evaluate the proposed energy strategy, it is important to determine firstly the base line. In this case it is the Target Emission Rate for $CO_2$ emissions per year.

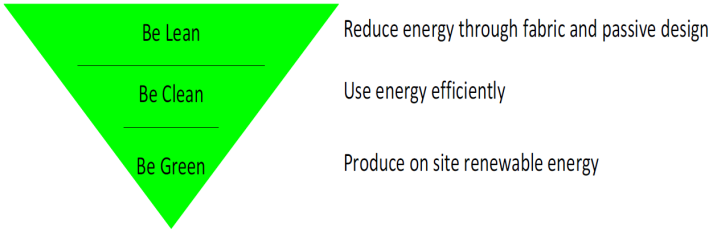
The proposed dwellings have been modelled in SAP L1a2013 and the total maximum $CO_2$ emissions permitted to comply with L1a2013 are 576,582.06 $kgCO_2$/year.

The base line energy demand is shown below:

| Target Emission Rate: Compliant with AD L 2013 | |
|---|---|
| Total $CO_2$ emissions – $kgCO_2$/year | 576,582.06 |

# 4.0 $CO_2$ Reduction Strategy - Fabric First Approach

## 4.1 Energy Hierarchy




The proposed dwellings have been designed in accordance with the 'energy hierarchy', which aims to reduce energy demand through passive design measures and a fabric first approach before utilising low carbon energy and the production of on-site renewable energy.

Most importantly to the delivery of low carbon and energy efficient buildings is the 'Fabric First' principle which recognises the most effective way of minimising carbon emissions is to reduce the demand for heat and power through a well-insulated, energy efficient building fabric and services.

Reducing the primary energy demand of a building using an efficient fabric and services is widely regarded as best practice and is promoted by the Zero Carbon Hub so this should be the first and most important step to reducing carbon emissions.

This 'fabric first' approach has several benefits including:

- Little to no reliance on an occupier's behaviour to deliver carbon reductions. Achieving carbon savings from renewable energy technologies requires education, awareness and often, behavioural changes from occupants.
- Virtually no maintenance and/or replacement costs to maintain carbon reductions through improved fabric; and
- Carbon savings delivered are 'locked-in' for the lifetime of the building (60 years or more) rather than the much shorter lifespan (around 25 years) of a renewable energy technology.

## 4.2 Efficiency Measures

The proposed design will aim to reduce thermal energy demand by targeting improved insulation levels, air leakage and fabric u-values in line with current Building Regulations requirements.

The following measures to reduce energy use and carbon emissions have been included in the design of the new dwellings:

- Design of new homes to optimise natural daylight in all the habitable spaces with suitable window sizes relative to living spaces and bedrooms;
- Design and layout to promote passive solar gains, maximise natural daylight, sunlight and ventilation, with the majority of homes orientated to the South;
- Development which balances minimising the direct adverse impact of shading from other buildings and landscape features and improving access to passive solar gains;
- High performance glazing with appropriate window u-values and g-values to reduce heat loss and optimise positive solar gain while reducing the potential for overheating.
- 100% low energy lighting.
- Bespoke individual PSI values - these have been calculated and used, this assists in Fabric Energy Efficiency by designing out the cold bridges which may occur, if using the Approved details.
- TMP – the TMP (Thermal Mass Perimeter) has now been calculated rather than using default figures, this now gives a more accurate reflection of the actual as built dwelling, closing the gap between design and as built performance.
- Boilers – The Baxi Assure range of boilers has been used, these can give improvements of approx. 5% over other manufacturers L1a2013 compliant boilers.

## 4.3 Proposed Fabric First Specification

The following is the values of the proposed fabric.

| Element | Limiting Average Values - Part L1a 2013 | Proposed Average Values |
|---|---|---|
| Ground Floor U-Value ($W/m^2K$) | 0.25 | 0.19 |
| External Wall U-Value ($W/m^2K$) | 0.30 | 0.27 |
| Party Wall U-Value ($W/m^2K$) | 0.20 | 0.00 (fully filled & sealed) |
| Roof - Insulated at ceiling U-Value ($W/m^2K$) | 0.20 | 0.07 |
| Roof - Insulated at Slope U-Value ($W/m^2K$) | 0.20 | 0.13 |
| Window U-Value ($W/m^2K$) | 2.00 | 1.30 |
| Door U-Value ($W/m^2K$) | 2.00 | 1.50 |
| Design Air Permeability $m^3/h.m^2$ at 50 Pa | 10.00 | 4.50 |

# 5.0 Low and Zero Carbon (LZC) technologies

## 5.1 Technologies

The following technologies will be assessed for the appropriateness in the development.

- Combined Heat and Power (CHP)
- Air Source Heat Pumps (ASHP)
- Ground Source Heat Pumps (GSHP)
- Wind Power
- Biomass Technology
- Solar Hot Water (SHW) Technology
- Photovoltaic (PV) Technology

## 5.2 Combined Heat and Power (CHP)

District Heating Networks (DHN) comprise a centralised heat generator, typically a gas fired Combined Heat and Power (CHP) engine. CHP systems generate electricity and waste heat which can be fed into a network of insulated pipes which deliver low carbon heat to buildings to provide heating and hot water via individual heat transfer units.

DHNs and CHP are suited to development with high thermal demand, typically provided by sufficient density or a large anchor load, i.e., high-density flats, leisure centres and industrial process with different heat demand profiles.

There are no DHN's around the proposed development.

For a development of highly insulated, low density and high efficiency homes such as those proposed limits the heating demand of development and therefore the feasibility and viability of the installation of CHP and district heating.

For these reasons, CHP & DHN are considered **not suitable** for this development.

## 5.3 Air Source Heat Pump (ASHP)

ASHP technology extract heat from the external air and condense this energy to heat a smaller space within a dwelling or non-domestic building. A pump circulates a refrigerant through a coil to absorb energy from the air. This refrigerant is then compressed to raise its temperature which can then be used for space heating and domestic hot water.

**Advantages**

- Mature technology
- Can assist in cooling
- Approx. 250% efficient using electricity

**Disadvantages**

- Hot water cylinder required
- Either oversized radiators or underfloor heating is required
- Currently CO2 carbon factors for electricity are high compared to a gas system
- Can be noisy

**Conclusion**

Due to the potential of high CO2 emissions, ASHP has been deemed **not suitable for this development.**

## 5.4 Ground Source Heat Pump (GSHP)

GSHP technology exploits seasonal temperature differences between the ground and air. Fluid is pumped through pipes laid in the ground, taking up heat which is then extracted by the heat pump and released at a higher temperature to drive a space heating system. The pipework is placed either horizontally or vertically in the ground.

**Advantages**

- More efficient than ASHP
- Mature technology
- Can assist in cooling
- Approx. 320% efficient using electricity

**Disadvantages**

- Costly to install
- Hot water cylinder required
- Either oversized radiators or underfloor heating is required
- Currently CO2 carbon factors for electricity are high compared to a gas system
- Can be noisy

**Conclusion**

Due to the cost and the potential of high CO2 emissions, GSHP has been deemed **not suitable for this development.**

## 5.5 Wind Power

Wind turbines are available in various sizes from large rotors able to supply whole communities, small roof or wall-mounted units for individual dwellings.

**Advantages**

- Generation of clean energy

**Disadvantages**

- Costly to install
- Maintenance costs
- Can be noisy (hum of generator)

**Conclusion**

The http://www.renew-reuse-recycle.com/ predictor suggest that the wind speed is 4.4m/s at 10 meters above ground. This is below the minimum of 5.0m/s for a technical viability.

| Wind speed at 10m above ground level (m/s) | | |
|---|---|---|
| 4.5 | 4.5 | 4.4 |
| 4.5 | **4.4** | 4.4 |
| 4.4 | 4.4 | 4.5 |

Due to it being below 5.0, Wind power has been deemed **not suitable for this development.**

## 5.6 Biomass Technology

Biomass boilers work on the principle that the combustion of wood chip or pellets can create heat for space heating and hot water.

**Advantages**

- Considerable reduction in $CO_2$ emissions

**Disadvantages**

- Can be costly to run compared to a gas boiler
- Space for a plant room to store fuel and plant
- Regular maintenance may be required
- A local source of fuel (reduce transport emissions)

**Conclusion**

Due to the cost and the requirement of space for plant and fuel storage, Biomass has been deemed **not suitable for this development.**

## 5.7 Solar Hot Water (SHW) Technology

Solar thermal technology harnesses solar energy to generate heated water.

**Advantages**

- Mature Technology
- Approx. 50% of hot water demand can be met
- Low maintenance

**Disadvantages**

- Not always aesthetically pleasing
- The benefit of installation is limited to the water heating demand
- A Large hot water cylinder is required
- If system oversized can contribute to overheating
- Access for maintenance
- Not as many installers as previously
- Benefits not as good as similar technologies

**Conclusion**

SHW has been deemed **suitable for this development on dwellings with suitable roof orientations.**

## 5.8 Photovoltaic (PV) Technology

Photovoltaic (PV) technology involves the conversion of the sun's energy into electricity.

**Advantages**

- Mature Technology
- Low maintenance
- Easily integrated

**Disadvantages**

- Not always aesthetically pleasing
- Poor design can lead to lower-than-expected yields
- Access for maintenance

**Conclusion**

Due to the benefits gained from this technology, for appropriate plots with suitable roof orientations, PV has been deemed **suitable for this development.**

## 5.11 Conclusion

The following technologies have been deemed suitable for this development.

- Photovoltaic (PV) Technology
- Solar Hot Water (SHW) Technology

## 5.12 Proposed fabric & LZC Results

Photovoltaics (PV) has been chosen as the preferred technologies for this development.

To achieve the required 31% reduction in $kgCO_2$/year it has been calculated that the following is required:

- 316KWp of PV in an unshaded position at 45-degrees is required across the site

After incorporating the improved fabric and PV, the total site demand is 392,572.90$kgCO_2$/year a 31.91% saving on the base line

| Target & Design Emission Rate: Compliant with AD L 2013 | | |
|---|---|---|
| Target Total $CO_2$ emissions – $kgCO_2$/year | 576,582.06 | |
| Design Total $CO_2$ emissions – $kgCO_2$/year | 392,572.90 | |
| **Total achieved reduction** | **184,009.17** | **31.91%** |

*The proposed specification may change but will achieve a minimum of 19% reduction in carbon emissions (kg $CO_2$/year) using L1a2013 methodology.*

# 6.0 Water Conservation

## 6.1 Water Calculator

In line with 'Policy SD3 Sustainable Design and Construction'. Policy SD3 encourages all new development to be designed to use water efficiently.

The water consumption will be under 110 Litres per person per day by means of low water use fixtures and water restrictors, compared to the Part G building regulations which is 125 Litres per person per day. An example of how this can be done is below.

CSH Wat tool May 09

breglobal

| | |
|---|---|
| Job no: | |
| Date: | 01/04/2022 |
| Assessor name: | Matthew Hurd |
| Registration no: | BREAM-900 |
| Development name: | Shurdington Road, Leckhampton |


**PRINTING:** before printing please make sure that in "Page Setup" you have selected the page to be as "Landscape" and that the Scale has been set up to 70% (maximum)

**WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)**

| | House Type: | Type 1 | | Type 2 | | Type 3 | | Type 4 | | Type 5 | | Type 6 | | Type 7 | | Type 8 | | Type 9 | | Type 10 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Description: | Sample | | | | | | | | | | | | | | | | | | | |
| Installation Type | Unit of measure | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day | Capacity/ flow rate | Litres/ person/ day |
| Is a dual or single flush WC specified? | | Dual | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Click to Select | | Click to Select | | Click to Select | |
| WC | Full flush volume | 4 | 5.84 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| | Part flush volume | 2.6 | 7.70 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Taps (excluding kitchen and external taps) | Flow rate (litres / minute) | 5 | 9.48 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Are both a Bath & Shower Present? | | Bath & Shower | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | |
| Bath | Capacity to overflow | 181 | 19.91 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Shower | Flow rate (litres / minute) | 8 | 34.96 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Kitchen sink taps | Flow rate (litres / minute) | 6 | 13.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Has a washing machine been specified? | | No | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | |
| Washing Machine | Litres / kg | | 17.16 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Has a dishwasher been specified? | | No | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | | Select option: | |
| Dishwasher | Litres / place setting | | 4.50 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| Has a waste disposal unit been specified? | | No | 0.00 | Select option: | 0.00 | Select option: | 0.00 | Select option: | 0.00 | Select option: | 0.00 | Select option: | 0.00 | Select option: | 0.00 | Select option: | 0.00 | Select option: | 0.00 | Select option: | 0.00 |
| Water Softener | Litres / person / day | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 | | 0.00 |
| | Calculated Use | | 112.5 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| | Normalisation factor | | 0.91 | | 0.91 | | 0.91 | | 0.91 | | 0.91 | | 0.91 | | 0.91 | | 0.91 | | 0.91 | | 0.91 |
| Code for Sustainable Homes | Total Consumption | | 102.4 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| | Mandatory level | | Level 3/4 | | - | | - | | - | | - | | - | | - | | - | | - | | - |
| Building Regulations 17.K | External use | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | 5.0 | | 5.0 |
| | Total Consumption | | 107.4 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 | | 0.0 |
| | 17.K Compliance? | | Yes | | - | | - | | - | | - | | - | | - | | - | | - | | - |

# 7.0 EV Charging

## 7.1 Electric Vehicle Charging

The following strategy has been previously agreed with GCC Highways.

EV charging point will be provided to every dwelling with an allocated parking space, and for those dwellings with unallocated parking an EV charging point will be provided per 10 dwellings.

The charging points supplied will be provided with a 16AMP external plus socket on a separate circuit, with a separate RCD and earth rod to comply with BS7671:2018 18th Edition

Further details and locations will be supplied as the site progresses.

See appendix C for the proposed EV Charging Strategy Plan

# 8.0 Resource Efficiency

In line with 'Policy SD3 Sustainable Design and Construction'. Policy SD3 encourages all new developments to be designed to be efficient with resources both during construction and in operation of the development

## 8.1 Household Waste

Cheltenham Borough Council currently operate a household collection service through which households can along with garden waste recycle materials including metal foils, tins, paper, plastic bottles, cardboard, and glass. Residents will be provided with an information pack detailing the Council's current collection arrangements for waste and recycling and advising of the nearest recycling.

## 8.2 Construction Waste

Site Waste will have best practise target benchmarks for resource efficiency. Where possible materials will be diverted from landfill using various methods

## 8.3 Materials

Material choices will be made to mitigate impacts on the environment including but not limited to the following:

- Have a Global Warming Potential (GWP) of < 5 in manufacture and installation
- Obtain certification where possible to confirm it is responsibly sourced
- Materials will be preferred with a low Environmental impact as per the BRE green Guide
- Design Buildings where possible to use less energy and reduce resources

# 9.0 Conclusion

## 9.1 Carbon Reduction (Plots to L1a2013)

By use of enhanced fabric specifications and PV it is shown that the required reduction of 20% from the Target Emission Rate (TER) as set out in Part L of the Building Regulations (2013) has been met by achieving a **reduction of 31.91% carbon emissions ($kgCO_2$/year) using L1a2013**

## 9.2 Carbon Reduction (Plots to L12021*)

By use of enhanced fabric specifications and PV the target to meet L12021 should be met by achieving a **reduction of 31% carbon emissions ($kgCO_2$/year) compared to L1a2013**

## 9.3 Water consumption

The water consumption will be under 110 Litres per person per day by means of low water use fixtures and water restrictors

## 9.4 Electric Vehicle Charging

EV charging point will be provided to every dwelling with an allocated parking space, and for those dwellings with unallocated parking an EV charging point will be provided per 10 dwellings

**** The L12021 regulations software is not yet finalised as such specifications may change to achieve the final Approved Document requirements**.*

# Appendix A – Site Layout



North Eastern Crossing Point Extract


North Western Crossing Point Extract

## LAND AT SHURDINGTON ROAD, LECKHAMPTON, CHELTENHAM

### SCHEDULE OF DWELLINGS 350

| REF | NAME | DESCRIPTION | PERSONS | HT | SQM | SQFT | NO | TOTAL |
|---|---|---|---|---|---|---|---|---|
| PRIVATE | | | | | | | | |
| 5 BED | | | | | | | | 2% |
| CK | CH KORD | 5 BEDROOM HOUSE | 9 | 2 | 198 | 2130 | 3 | 4260 |
| IR | IR ONSFORD | 5 BEDROOM HOUSE | 9 | 2 | 172 | 1885 | 3 | 5655 |
| 4 BED | | | | | | | | 19% |
| KI | KINGWOOD | 4 BEDROOM HOUSE | 8 | 2 | 142 | 1534 | 6 | 9144 |
| OA | OAKWOOD | 4 BEDROOM HOUSE | 8 | 2 | 139 | 1388 | 8 | 11104 |
| PE | PEARWOOD | 4 BEDROOM HOUSE | 7 | 2 | 115 | 1235 | 5 | 6175 |
| HT.A | HT.A | 4 BEDROOM HOUSE | 7 | 2 | 142 | 1534 | 17 | 26078 |
| HT.G | HT.G | 4 BEDROOM HOUSE | 7 | 2 | 132 | 1423 | 4 | 5692 |
| 3 BED | | | | | | | | 55% |
| CV | CV ERTON | 3 BEDROOM HOUSE | 5 | 2 | 76 | 819 | 7 | 5733 |
| KG | KNIGHTON | 3 BEDROOM HOUSE | 5 | 2 | 81 | 869 | 5 | 4345 |
| BA | BATON | 3 BEDROOM HOUSE | 5 | 2 | 94 | 1016 | 17 | 17272 |
| TY | TYBERTON | 3 BEDROOM HOUSE | 5 | 2 | 89 | 956 | 17 | 16252 |
| RU | RUSHMYKE | 3 BEDROOM TOWNHOUSE | 6 | 2.5 | 108 | 1162 | 8 | 9296 |
| HT.C | HT.C | 3 BEDROOM HOUSE | 5 | 2 | 93 | 1005 | 23 | 23115 |
| HT.H | HT.H | 3 BEDROOM HOUSE | 5 | 2 | 92 | 985 | 2 | 1970 |
| HT.D | HT.D | 3 BEDROOM HOUSE | 5 | 2 | 83 | 897 | 37 | 33189 |
| 2 BED | | | | | | | | 23% |
| MA | MARCHMONT | 2 BEDROOM HOUSE | 4 | 2 | 68 | 737 | 18 | 13266 |
| FA | FAIRMONT | 2 BEDROOM HOUSE | 4 | 2 | 59 | 636 | 9 | 5724 |
| HT.E | HT.E | 2 BEDROOM HOUSE | 4 | 2 | 63 | 678 | 23 | 14238 |
| 2BCH | 2BCH | 2 BEDROOM COACH HOUSE | 4 | 2 | 71 | 761 | 1 | 761 |
| SUB TOTAL | | | | | | | 210 | 211269 |
| AFFORDABLE * | 40% | | | | | | | |
| 5BRF | 5BRF | 5 BEDROOM HOUSE | 8 | 2 | 127 | 1372 | 1 | 1371 |
| 5BRF | 5BRF | 5 BEDROOM HOUSE | 8 | 2 | 121 | 1303 | 1 | 1303 |
| 4BTP/2 | 4BTP M4(2) | 4 BEDROOM HOUSE M4(2) | 7 | 2 | 121 | 1303 | 1 | 1303 |
| 4BTP | 4BTP | 4 BEDROOM HOUSE | 7 | 2 | 118 | 1274 | 6 | 7644 |
| HT.3BC | HT.3BC | 3 BEDROOM HOUSE | 6 | 2 | 95 | 1021 | 4 | 4084 |
| 3BHA | 3BHA | 3 BEDROOM HOUSE | 6 | 2 | 93 | 1005 | 2 | 2010 |
| 3BAF | 3BAF | 3 BEDROOM HOUSE | 6 | 2 | 93 | 1001 | 10 | 10010 |
| A300 | GIBSON | 3 BEDROOM HOUSE M4(2) | 5 | 2 | 93 | 1001 | 3 | 3003 |
| HT.3B | HT.3B | 3 BEDROOM HOUSE | 5 | 2 | 84 | 908 | 7 | 6356 |
| 3BSF | 3BSF | 3 BEDROOM HOUSE | 5 | 2 | 83 | 893 | 15 | 13395 |
| A203 | EDMOND | 2 BEDROOM HOUSE M4(3) | 4 | 2 | 79 | 850 | 14 | 11900 |
| A201 | CLAR EMOND | 2 BEDROOM BUNGALOW M4(2) | 4 | 1 | 72 | 779 | 4 | 3116 |
| 2BAF | 2BAF | 2 BEDROOM HOUSE | 4 | 2 | 71 | 764 | 30 | 22920 |
| 2BCHA | 2BCHA | 2 BEDROOM COACH HOUSE | 4 | 2 | 71 | 764 | 4 | 4584 |
| 1BB/2 | 1BB M4(3) | 1 BEDROOM BUNGALOW M4(3) | 2 | 1 | 60 | 647 | 4 | 2588 |
| 1BH | 1BH | 1 BEDROOM HOUSE | 2 | 2 | 51 | 549 | 4 | 2196 |
| 1BB | 1BB M4(3) | 1 BEDROOM BUNGALOW M4(2) | 2 | 1 | 50 | 539 | 4 | 2156 |
| 1BF | 1BF M4(2) | 1 BEDROOM FLAT M4(2) | 2 | 2/3 | 51 | 544 | 34 | 13056 |
| SUB TOTAL | | | | | | | 140 | 112996 |
| GRAND TOTAL | | | | | | | 350 | 336265 |

Scale @ A1:
0 10 20 30 40 50m
Scale 1:1000
NORTH

| Rev | Date | Drawn | Checked |
|---|---|---|---|
| P | 01.11.21 | KJM | BB |

FOOTPATH ADJACENT LAP EXTENDED

| Rev | Date | Drawn | Checked |
|---|---|---|---|
| R | 09.11.21 | TDT | BB |

PARKING REVISED FOR MORE TREES. ROAD AMENDED FRONTING PLOTS 276-284. XREF'S UPDATED.

Date: JULY 2019

Drawn by : TDT Checked by : BB

Drg No: CB_70_064_001 Rev: R

Project:
LAND AT SHURDINGTON ROAD, LECKHAMPTON, CHELTENHAM

Title:
OVERALL PLANNING LAYOUT

Client:
miller homes

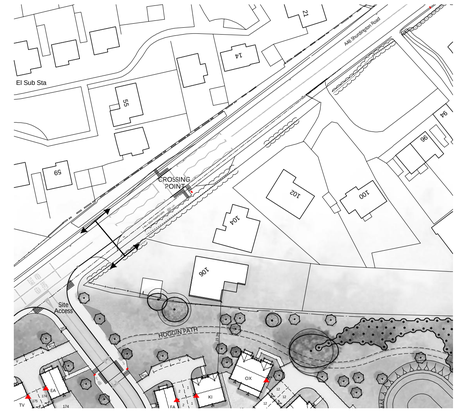
COOPERBAILLIE

Cooper Baillie Limited - Connaught House, 24 Guildford Road, Bagshot, Surrey GU19 5JN - Telephone 01276 450039 - www.cooperbaillie.co.uk

# Appendix B – Solar Analysis Plan


Cooper Baillie Limited - Connaught House, 24 Guildford Road, Bagshot, Surrey GU19 5JN - Telephone 01276 450039 - www.cooperbaillie.co.uk

# Appendix C – EV Charging Strategy Plan


North Eastern Crossing Point Extract


North Western Crossing Point Extract

## Key

- Indicative Location of EV Charging Points = 192

Scale @ A1:

0 10 20 30 40 50m

Scale 1:1000

NORTH

| Rev | Date | Drawn | Checked |
|---|---|---|---|
| E | 10.11.21 | KJM | BB |

UPDATED TO MATCH LATEST OVERALL LAYOUT

Date: MAY 2021

Drawn by : KJM Checked by : BB

Drg No: CB_70_064_016 Rev: E

Project:
LAND AT SHURDINGTON ROAD, LECKHAMPTON, CHELTENHAM

Title:
EV CHARGING STRATEGY PLAN

Client:
miller homes

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# Appendix D – Results

Shurdington Road, Leckhampton | Proposed Fabric | REV - | 31/03/2022

| | | | | L1a2013 Pass | | | | Proposed Specification | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | kg $CO_2$/year | | kg $CO_2$/year | | kg $CO_2$/year | | kg $CO_2$/year | | | | kg $CO_2$/year | | | kg $CO_2$/year | | |
| **House Type** | | **Built Form** | **TFA** | **Total *** | **No plots / type** | **Total Types*** | | **Total **** | **No plots / type** | **Total Types**** | | **Technology** | **KWp** | **Energy Saved Per KWp **, !!** | | | **Energy Saved** | | **Total % savings** |
| 200C Fairmont - Semi | 200C Fairmont - Semi | Semi | 59.12 | 1197.45 | 21 | 25146.45 | | 1105.91 | 21 | 23224.11 | | | | | | | | | |
| 203C Marchmont - Sem | 203C Marchmont - Sem | Semi | 68.46 | 1313.09 | 42 | 55149.78 | | 1209.33 | 42 | 50791.86 | | | | | | | | | |
| 302C Overton - Semi | 302C Overton - Semi | Semi | 76.04 | 1423.82 | 19 | 27052.58 | | 1309.14 | 19 | 24873.66 | | | | | | | | | |
| 305T Kingston Semi | 305T Kingston Semi | Semi | 80.79 | 1536.18 | 13 | 19970.34 | | 1379.69 | 13 | 17935.97 | | | | | | | | | |
| 307M Tiverton - Det | 307M Tiverton - Det | Detached | 88.76 | 1665.54 | 44 | 73283.76 | | 1535.87 | 44 | 67578.28 | | | | | | | | | |
| 309T Eaton 19 | 309T Eaton 19 | Detached | 94.43 | 1811.67 | 44 | 79713.48 | | 1678.79 | 44 | 73866.76 | | | | | | | | | |
| 410T Pearwood 19 | 410T Pearwood 19 | Detached | 114.74 | 1982.79 | 14 | 27759.06 | | 1836 | 14 | 25704 | | | | | | | | | |
| 415C Oakwood 19 | 415C Oakwood 19 | Detached | 128.99 | 2175.37 | 18 | 39156.66 | | 1996.24 | 18 | 35932.32 | | | | | | | | | |
| 420M Kingwood 19 | 420M Kingwood 19 | Detached | 141.52 | 2246.52 | 15 | 33697.8 | | 2198.67 | 15 | 32980.05 | | | | | | | | | |
| 504C Bridgeford 19 | 504C Bridgeford 19 | Detached | 175.11 | 2663.93 | 3 | 7991.79 | | 2574.4 | 3 | 7723.2 | | | | | | | | | |
| 505M Oxford 19 | 505M Oxford 19 | Semi | 198 | 2785.09 | 4 | 11140.36 | | 2654.88 | 4 | 10619.52 | | | | 443.46 | | | | | |
| A201 Semi Bungalow | A201 Semi Bungalow | Semi | 72.34 | 1553.69 | 9 | 13983.21 | | 1400.64 | 9 | 12605.76 | | | | | | | | | |
| A203 Semi | A203 Semi | Semi | 78.92 | 1494.69 | 31 | 46335.39 | | 1381.16 | 31 | 42815.96 | | | | | | | | | |
| A300 Semi | A300 Semi | Semi | 93.02 | 1628.88 | 37 | 60268.56 | | 1477.68 | 37 | 54674.16 | | | | | | | | | |
| A201 Semi Bungalow (used for 1bed) | A201 Semi Bungalow | Semi | 72.34 | 1553.69 | 36 | 55932.84 | | 1400.64 | 36 | 50423.04 | | | | | | | | | |
| | | | | | | | | | Total | **531748.65** | | | | | | | | | |
| | | | | | | | | | | | | PV S (45deg) | 280 | 443.46 | | | 124168.8 | | |
| | | | | | | | | | | | | PV SE/SW (45deg) | 36 | 416.86 | | | 15006.96 | | |
| | | | | | | | | | | | | PV E/W (45deg) | 0 | 354.18 | | | 0 | | |
| | | | | Total | 350 | | | Total | 350 | | | | | | | | | | |
| | | | | | **Total site Demand** | **576582.06** | | | **Total Fabric Saving** | **44833.41** | | **Total Site PV KWp** | **316** | | | **Total PV Saving** | **139175.76** | **Combined Saving** | **184009.17** |
| | | | | | | | | | **Percent Saving** | **7.78%** | | | | | | **Percent Saving** | **24.14%** | **Combined Saving** | **31.91%** |

* = Data taken from TER SAP worksheet Section 12a box 272 (L1a2013 SAP 9.92)
** = Data taken from DER SAP worksheet Section 12a box 272 (L1a2013 SAP 9.92)

# = Data assumed