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ENERGY STRATEGY

Providence Hill, Bursledon

Prepared for: Vested Outsourcing Partners

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This document was produced by

Andrew Galea
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Andrew Galea, Sustainability Lead

2. CONTENTS

1. ISSUE REGISTER	2
2. CONTENTS	3
3. EXECUTIVE SUMMARY	4
4. INTRODUCTION	5
5. ENERGY SECTOR CONTEXT	6
6. PLANNING POLICY CONTEXT	7
7. ENERGY STRATEGY METHODOLOGY	9
8. 'BE LEAN'	10
9. 'BE CLEAN'	11
10. 'BE GREEN'	12
11. SUMMARY OF RESULTS	14

3. EXECUTIVE SUMMARY

This Energy Strategy document reports on the Providence Hill Site, Bursledon. It reflects the design at RIBA Stage 2. It is situated within the Local Authority of Eastleigh. The document responds to planning policy in respect to Energy Consumption and Carbon Emissions.

The development is mixed-use, consisting of both residential and commercial premises. Proposed is a Veterinary Facility of circa 650m², and 16 dwellings ranging from 2 to 4 bedrooms.

The development looks to implement a 'Be Lean, Be Clean, Be Green' approach to carbon savings.

Applying the 'Be Lean, Be Clean, Be Green' methodology to reduce carbon emissions, the development achieves a 19.32% improvement over Part L regulations. The saving over and above Part L requirements is achieved using Low and Zero Carbon (LZC) Technologies.

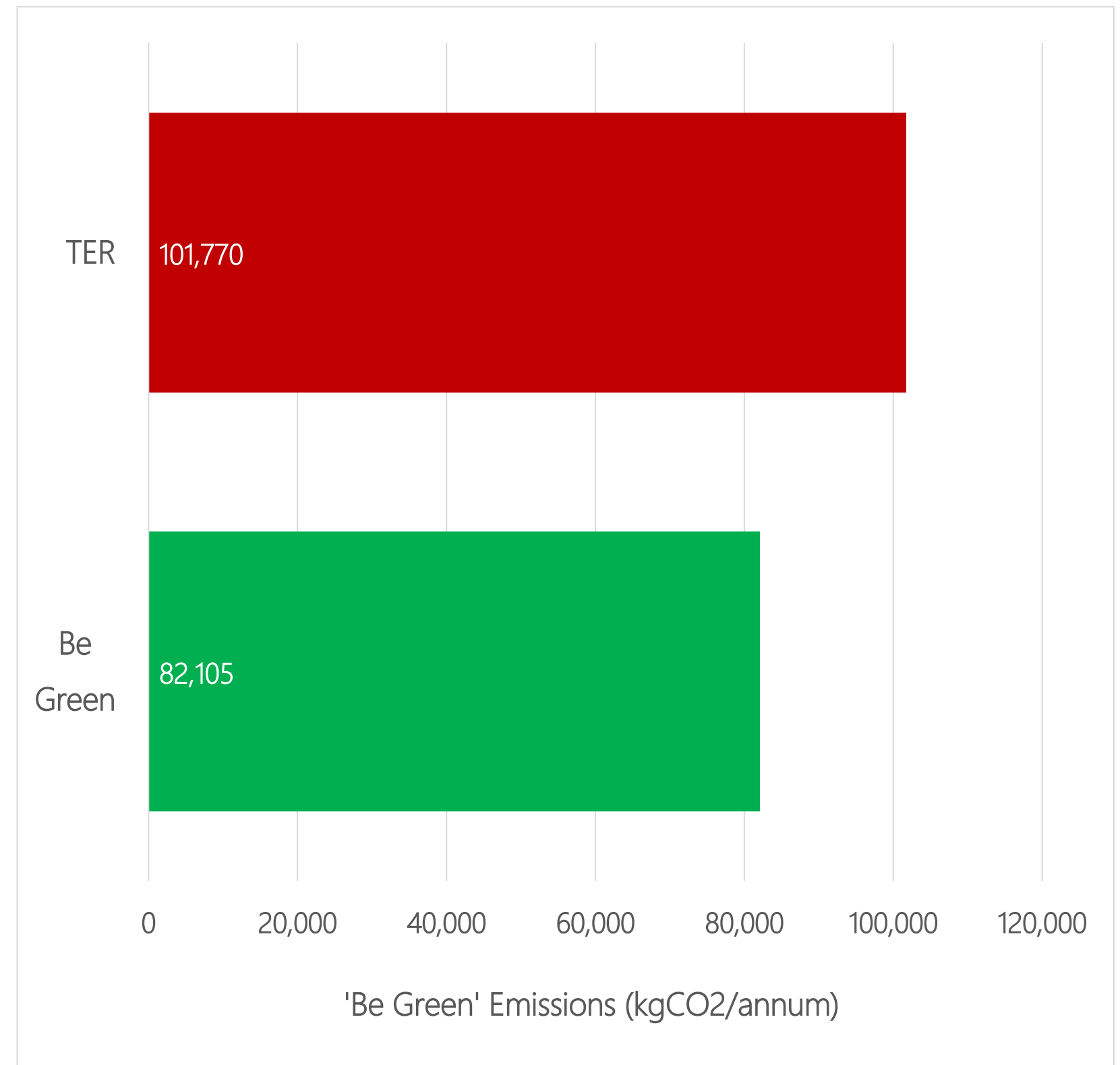
This is in excess of the 15% LZC carbon reduction targets set for new build development in the Eastleigh planning documentation.

Renewable Energy Technology Contribution

We can see the development makes large improvements over Part L Target Emissions Rates (TER) using passive measures, energy efficient specification and LZC technology. This has been modelled using Part L modelling methodology.

The Low and Zero Carbon technologies employed on the development contribute a reduction in carbon emissions of over 15% for the development.

The Part L performance for the development can be seen in the graph to the right:



4. INTRODUCTION

The Development

This Energy Strategy document reports on the Providence Hill Site, Bursledon. It reflects the design at RIBA Stage 2. It is situated within the Local Authority of Eastleigh. The document responds to planning policy in respect to Energy Consumption and Carbon Emissions.

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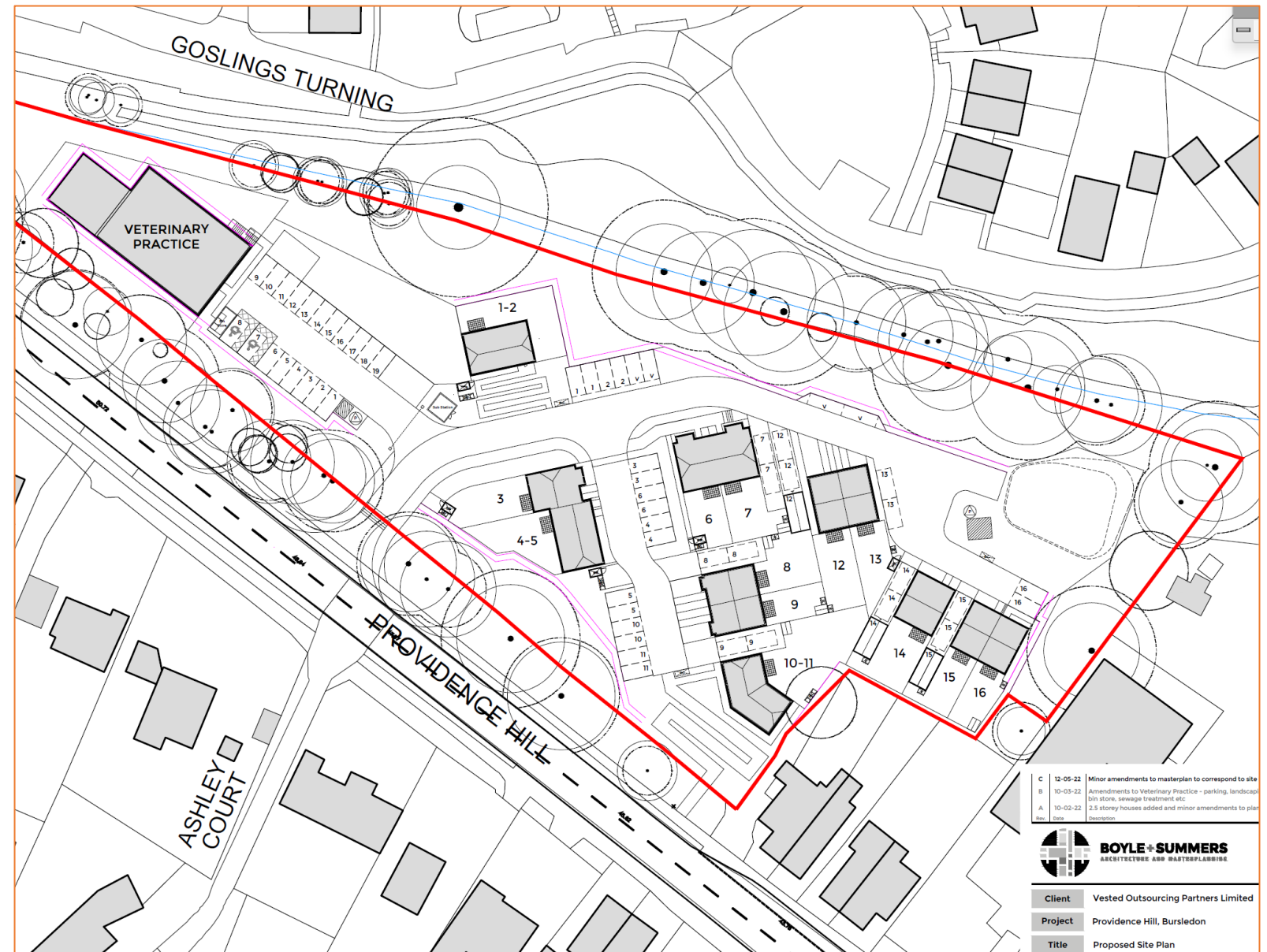
Aim of the Analysis

This report forms part of the planning application for the Providence Hill proposal.

The aim of this report is to document the development of the Energy Strategy for the project.

This report will look at the energy, planning and site context of the development, and summarises the design process leading to the design options taken, and the impact on the energy consumption and carbon emissions of the site, according to the Part L compliance process.

This report details the investigations undertaken so far to RIBA Stage 2. Design is ongoing, and the Energy Strategy will continue to develop through Stage 3 and 4.



5. ENERGY SECTOR CONTEXT

The Energy Sector in the UK is currently going through a large amount of change. The mix of sources from which our electricity is generated is rapidly changing to one with an ever-increasing amount of Renewable and Low Carbon sources.

Renewable sources are grouped as Solar, Wind and Hydro, and added to this are Biomass and Nuclear to make up the Low Carbon electricity sources.

As the headlines to the right elude to, the last few years have proved a breakthrough in terms of provision of green energy. Whilst this has been on the agenda for the last decade or so, it is only recently massive infrastructure projects such as the Thames Array wind farm are functional after years of planning and construction, and thus are now contributing to the change in national energy provision.

2017 saw the first ever coal free days in electricity generation, and the amount coal provides to the generation mixed

continues to fall dramatically, a pattern accelerated recently by the Covid-19 crisis and war in Ukraine.

Whilst progress is being made, there is further to go, and the energy sector is moving closer and closer to a low carbon electricity grid, with the aim of carbon neutrality by 2050.

Power generation will come from increasingly greener but more variable power sources, with a larger proportion of micro generation. This means the grid will need to work in a smarter fashion, employing battery storage and intelligent control.

Ultimately, this leads to the carbon cost of electricity production falling, and a new way in which the national grid and power generation must function; both important factors when considering the design of developments, most importantly that electricity is the choice supply of energy for a building to lock in future carbon reductions from the decarbonisation of the grid.

Renewables beat fossil fuels on 137 days in greenest year for UK energy

75% of the UK's electricity came from coal in 1990, last year, it had fallen to just 2.1%

Climate crisis: UK hits coal-free record for power generation amid coronavirus lockdown

Closure of fossil-fuel plants and fall in demand due to Covid-19 sees CO2 emissions cut by one-third

Home > Business

UK sets new renewable energy record as wind and solar surge



Covid-19 crisis will wipe out demand for fossil fuels, says IEA

Renewable electricity may be only source to withstand biggest shock in 70 years

6. PLANNING POLICY CONTEXT

6.1. National Policy

Climate Change Act 2008

The Climate Change Bill became law on 26 November 2008. The two key aims of the Act are as follows:

- Improve carbon management, helping the transition towards a low-carbon economy in the UK.
- Demonstrate UK leadership internationally, signalling we are committed to taking our share of responsibility for reducing global emissions in the context of developing negotiations on a post-2012 global agreement at Copenhagen in December 2009.

The key provision of the Act is a legally binding target of at least an 80% cut in greenhouse gas emissions by 2050, to be achieved through action in the UK and abroad, including a reduction in emissions of at least 34% by 2020.

Both targets are against a 1990 baseline. This provision is to be

achieved over five-year carbon budgets, with three budgets set at a time. The first three Carbon budgets run from 2008-12, 2013-17 and 2018-22, and were set in May 2009.

Net Zero Carbon by 2050

Building on the 80% target reduction by 2050, In 2019, the Committee on Climate Change recommended the UK become a net zero carbon emitter by 2050. This was adopted into UK legislation in June 2019. Any emissions must be balanced by negative emissions policy.

National Planning Policy Framework (NPPF)

NPPF states that planning should support the 'transition to a low carbon future in a changing climate' (Paragraph 152).

155. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for collocating potential heat customers and suppliers.

157. In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant,

having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

158. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the

proposed location meets the criteria used in identifying suitable areas.

Part L Building Regulations

Part L of the Building Regulations refers to the Conservation of Fuel and Power. Part L1 relates to residential development and Part L2 to non-residential. The suffix A relates to new construction and B to existing buildings.

The proposed works are the new build construction of a veterinary facility and 16 residential dwellings.

6.2. Local Policy

The targets and guidelines for carbon emissions reduction for Eastleigh Local Authority are contained within the Supplementary Planning Document – Environmentally Sustainable Development. The Policy relating to carbon emissions is this:

Essential Requirements: ESD 6

Carbon Dioxide Reduction (Small Scale zero/low carbon technologies)

The Council requires all buildings in new residential development of 10 dwellings or more to achieve:

- Up to the end of 2011 at least one Code Ene 7 credit (10% carbon dioxide emissions reductions via local low/zero carbon energy)

- from January 2012 two Code Ene 7 credits (15% carbon dioxide emissions reductions via local low/zero carbon energy)

The Council requires all new non-residential and multi-residential development (over 1000 sqm of external floorspace) to achieve:

- at least two BREEAM Ene 5 credits (10% carbon dioxide emissions reductions via local low/zero carbon energy)

- from January 2012 all three BREEAM Ene 5 credits (15% carbon dioxide emissions reductions via local low/zero carbon energy)

From January 2011 when a planning application is submitted the thresholds for this essential requirement will change to all residential development (1 unit and above) and to non-residential and multi-residential development above 500 sq m of external floor space.

Since January 2012 the target has been to achieve a 15% reduction in carbon via local low/zero carbon energy sources.

6.3. Implications for the Providence Hill development

The Policies detailed above, as of January 2011, are applicable to all residential development, and non-residential development of 500 sqm and above.

As such the targets apply to both the residential and commercial aspects of the Providence Hill development.

7. ENERGY STRATEGY METHODOLOGY

In order to establish the carbon emissions associated with the new development, a Part L compliance modelling exercise was undertaken.

This was then used to inform the design strategy, to provide quantitative analysis on the impact of the options and measures under consideration to help improve the energy and carbon performance of the site.

7.1. Energy Hierarchy

This report draws on the information and approach set out in national, and local policy, which recommends a 3-step process; “Be Lean, Be Clean, Be Green”. The aim of the study is to reduce carbon dioxide emissions, whilst providing an efficient and cost-effective energy strategy site wide.

‘Be Lean’

This step is to look at, as a priority, how energy consumption can be reduced using passive measures. As such this

looks at improving building fabric performance and recovery of energy, among other strategies.

This is discussed in Section 8 of this report.

‘Be Clean’

Once we have reduced the amount of energy required as much as possible, the next step is to provide the energy that is needed as efficiently as possible.

This is covered in Section 9 of this report.

‘Be Green’

This step then considers the application of LZC technologies for the development to further reduce carbon emissions.

For details, please see Section 10.

7.2. Energy Modelling

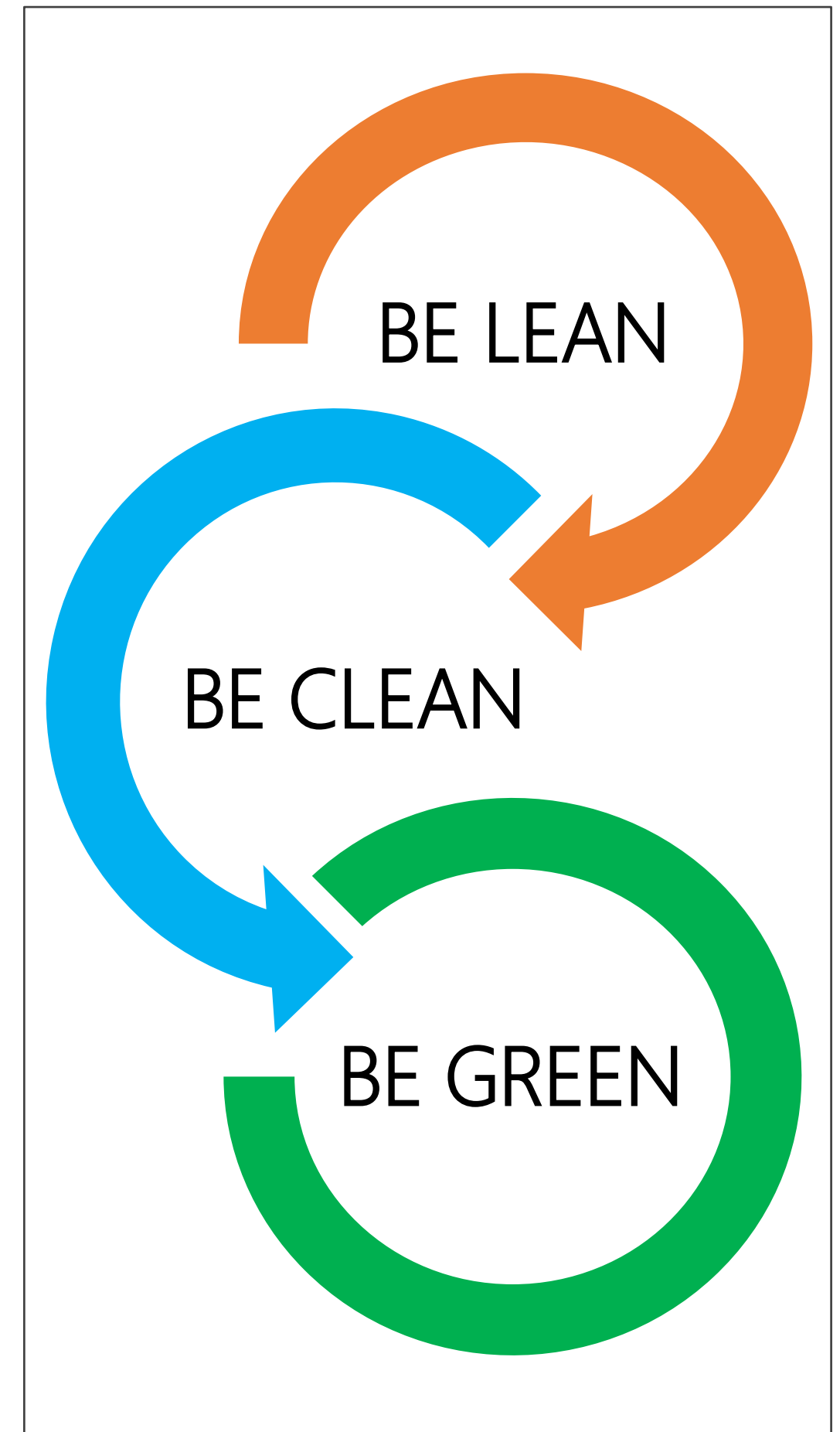
A Part L compliance modelling exercise was undertaken for the Providence Hill development.

SAP 2012 Assessments using Elmhurst Energy software have been undertaken for the residential units on the development. This is a compliance software used to assess dwelling carbon emissions against Part L of Building Regulations.

A Dynamic Software Modelling (DSM) was undertaken using EDSL TAS software to perform the same task for the veterinary facility.

These tools provide a Target Emission Rate (TER) to meet and exceed. The building modelling methodology follows the guidance for Part L, which is the standard metric in England to measure carbon emissions.

The modelling work is ongoing and will continue to develop through detailed design.



8. 'BE LEAN'

This section of the report sets out how we can look at reducing energy consumption for the development.

8.1. Passive Measures

The development looks to minimise energy consumption by implementing best practice building fabric standards.

Mechanical Ventilation with Heat Recovery provides energy efficiency, and openable windows avoids the need for comfort cooling, passing the SAP overheating tests.

For the purposes of the 'Be Lean' phase, the SAP modelling was done using basic Heat Pump inputs.

The exhaustive list of input data used for the "Be Lean" stage of the development is presented to the right:

8.2. Results

As a result of the application of the Be Lean measures listed here, both the residential and commercial elements of the development meet the Part L regulations Target Emission Rate without the application of any Low or Zero Carbon technologies.

As such, integration of these technologies into the Energy Strategy of the development to meet the Local Authority emission reduction target of 15% will show at least the same improvement over the requirements of Part L building regulations.

Residential Modelling Inputs	Values and Units
Building Fabric	
Wall U-value and Construction	Traditional Construction, U-value 0.15 W/m2K
Ground Floor U-value and Construction	Insulated Slab on Ground construction, U-value 0.12W/m2K
Roof U-value and Construction	Pitched Roof, Insulation at flat ceiling level, U-value 0.12W/m2K
Intermediate Floor Construction	Lightweight party floor construction
Glazing U-value (complete unit) and g-value	U-value 1.4 W/m2K, g-value 0.76
Skylights U-value and g-value	U-value 1.4 W/m2K, g-value 0.76 (where applicable)
Front Door U-value and Construction	Solid Construction, 1.8 W/m2K
Air Permeability	Designed q50: 3 m3/(h.m2) @ 50 Pascals
Party Wall construction (dwelling to dwelling)	Solid Construction
Thermal Bridging	Y-value 0.15 W/mK
Lighting	100% Low Energy Light fittings (LED)
Ventilation Systems	
Unit	Mechanical Ventilation with Heat Recovery

Veterinary Facility Modelling Inputs	Values and Units
Building Fabric	
Wall U-value and Construction	Lightweight construction, U-value 0.15 W/m2K
Ground Floor U-value and Construction	Insulated Slab on Ground construction, U-value 0.12W/m2K
Roof U-value and Construction	Flat roof lightweight construction, U-value 0.14W/m2K
Intermediate Floor Construction	Lightweight party floor construction
Glazing U-value (complete unit) and g-value	U-value 1.4 W/m2K, g-value 0.58
Skylights U-value and g-value	N/A
Air Permeability	Designed q50: 5 m3/(h.m2) @ 50 Pascals
Thermal Bridging	Y-value 0.15 W/mK
Lighting	100% Low Energy Light fittings (LED) Minimum Efficacy of 90 Luminaire Lumens/cW
Lighting Control	Presence detection to circulation, ancillary and office areas No presence detection to operative and prep/surgical support areas Daylight Control to Office and Office ancillary areas
Ventilation Systems	
Unit	Mechanical Ventilation with Heat Recovery

9. 'BE CLEAN'

This section of the report looks at whether district or communal systems are applicable for the development.

9.1. District Energy Networks

Given the national energy context discussed in section 5, the best solution for the new development is to employ heat pumps, allowing a fully electric energy supply to the new units, and aligning with national energy policy.

This is achieved by implementing an electric Heat Pump system, thus future proofing the buildings and enabling them to take advantage of further carbon reductions as the grid continues to decarbonise. This will be discussed further in the next section.

The Carbon cost of electricity is decreasing rapidly. Whilst this is not currently reflected in carbon factors used for Part L compliance, the reality is that the greenest solution over the lifetime of the proposed development

is for design is to move to all electric systems.

The Southampton District Energy Scheme is a Geothermal DEN, but serves a 2km radius in Southampton, and so is not feasible for the Providence Hill Development.

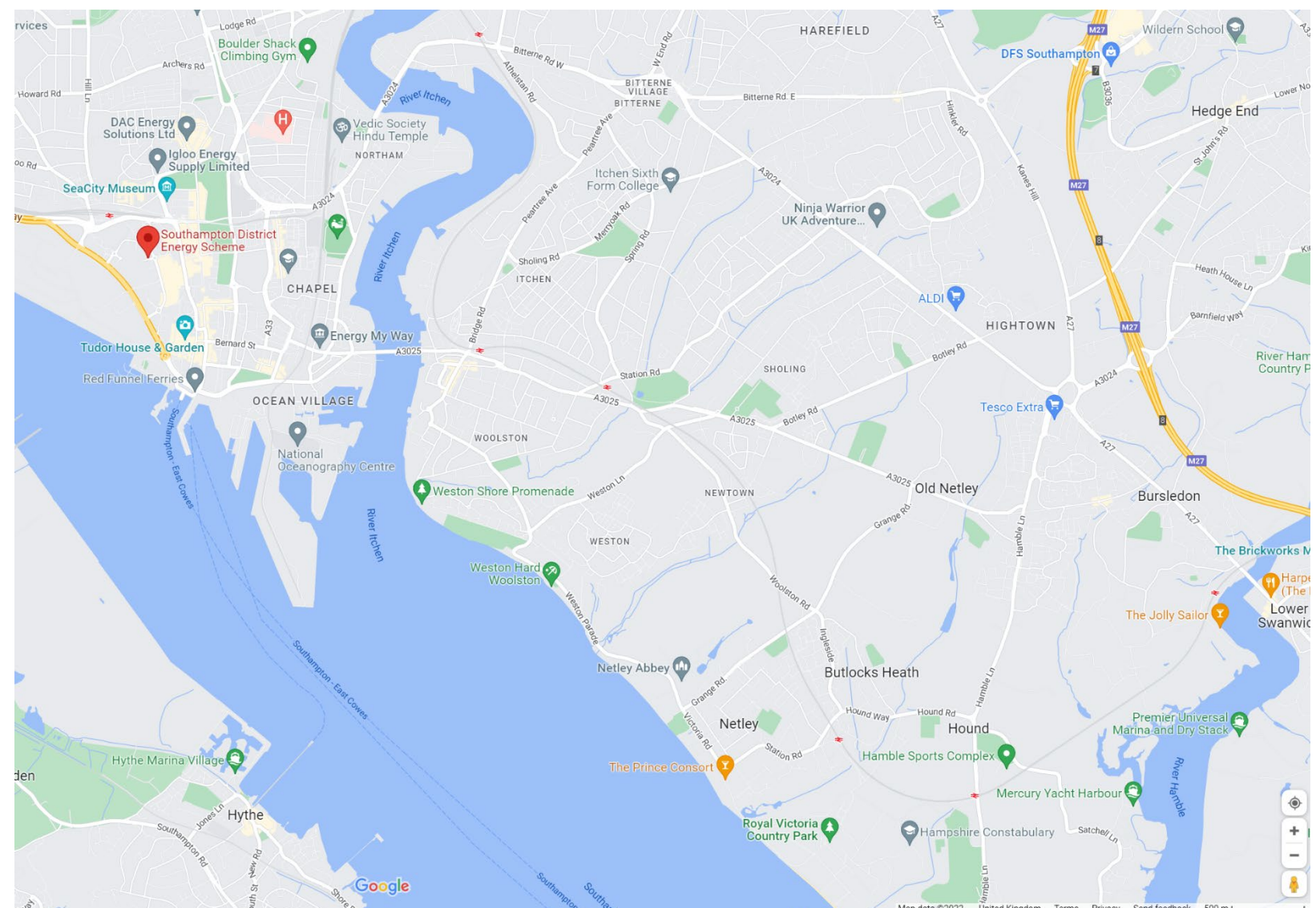
9.2. Lighting

Lighting is often the largest consumer of energy in buildings designed to modern standards, and so specification and of lighting systems is a major factor in reducing carbon emissions.

Full LED lighting systems are proposed throughout the proposed development, with daylight control and occupancy control where applicable.

District Energy Networks (DENs)

With the ongoing and future decarbonisation of the grid, District Energy Networks only make sense if using low carbon technologies and electricity as a fuel. This is not available locally, so the development will use a heat pump solution for heating.



10. BE GREEN

This section of the report is aimed at identifying and summarising the applicable Low and Zero Carbon technologies for the development.

The report has discussed in the previous section the aim to move the proposal towards all electric energy provision.

10.1.Air Source Heat Pumps (ASHP)

The current and future decarbonisation of the electricity grid has made Air Source Heat Pumps the sensible choice to provide heating.

The system uses heat pump technology to provide heating to the development, thus providing energy from a low carbon source.

It means the new buildings can be run as all-electric units, thus locking in future carbon savings as the grid

further decarbonises, with carbon neutrality by 2050 the end goal.

The savings realised by the technology can be seen in the results below. In reality, the savings are in fact greater, as the Part L methodology being used for the modelling exercise uses out of date carbon factors for grid electricity; it is now less than half of the figure used by the Part L methodology.

Air Source Heat Pumps (ASHP)



Heat Pump technology provides an energy efficient source of heating for the development. It also allows the development to be all electric, thus aligning with the direction of national policy, and enabling the development to benefit from future grid decarbonisation.

Residential Modelling Inputs	Values and Units
Heating System	
Unit	-Air Source Heat Pumps
Data source	Manufacturer Database – Daikin Altherma Units (Units selection not yet complete, Daikin used in modelling for illustration)
Size	5kW, 11kW and 14 kW units used in modelling depending on unit MCS Installation Certificate Required
Pump	Pump in Heated Space
Flow temperature	>45 oC
Heating Controls	Programmer and at least 2 Room Thermostats
Hot Water System	
Source	From main heating system
Water Use	<125 l/person/day
Hot Water Cylinder	Volume - 200 litres Standing Heat Loss – 1.7 kWh/day Fully Insulated Primary Pipework
Thermal Store	None

Veterinary Facility Modelling Inputs	Values and Units
Heating System	
Heating and Cooling System	-VRF system (Air Source Heat Pumps in Heating)
Heating Efficiency (EER)	4.0 (400%)
Cooling Efficiency (CoP)	5.5 (550%)
Heating Controls	Zonal (room by room)
Distribution Efficiency	95.6%
Hot Water System	
Source	From main heating system
Hot Water Cylinder (Illustrative for modelling, hot water system specification to be determined)	Volume - 1000 litres Insulation Conductivity – 0.02 W/mC Insulation thickness – 100mm Fully Insulated Primary Pipework
Thermal Store	None

10.2. Results

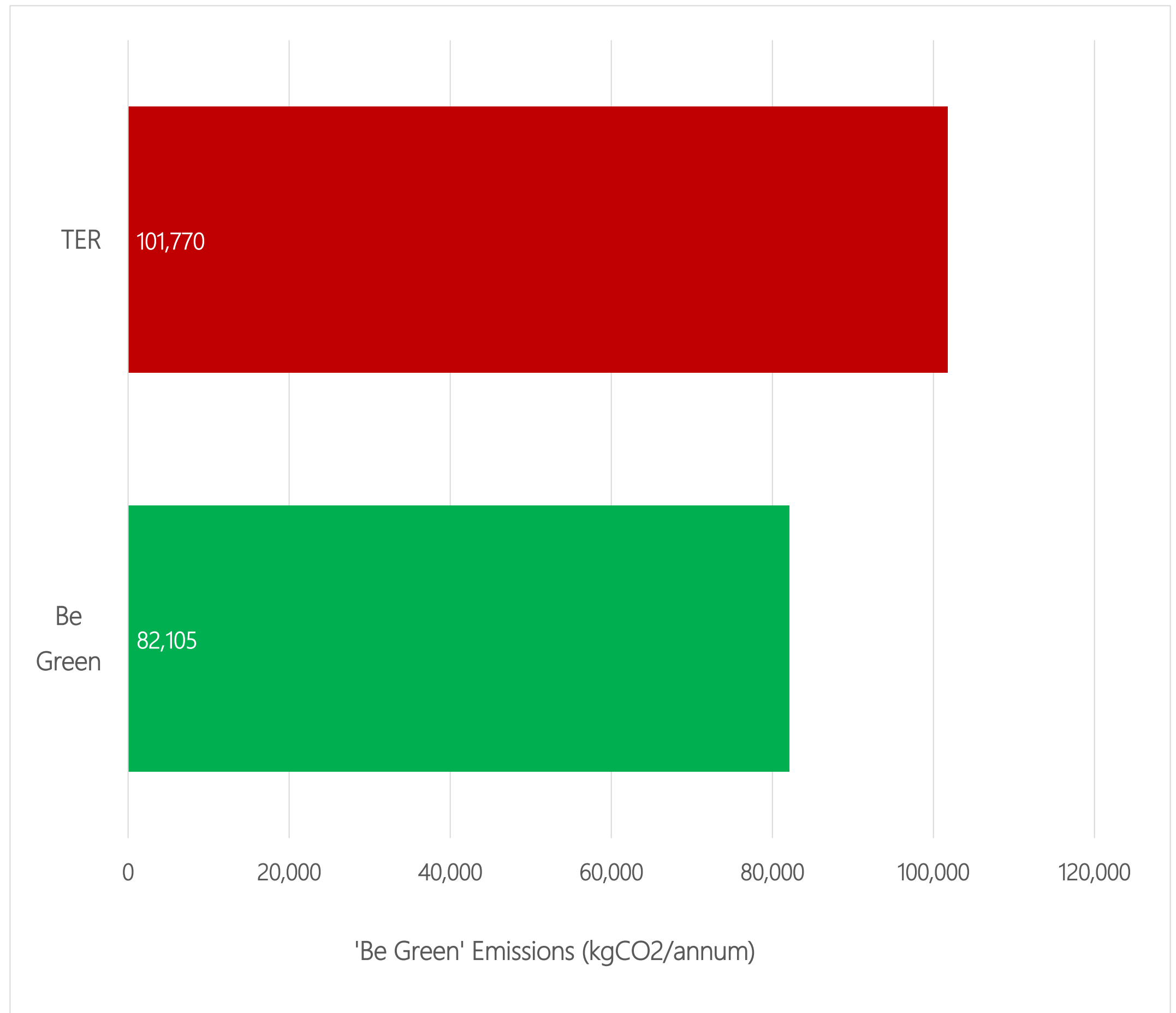
The results from the 'Be Green' stage calculation are presented in the graph to the right.

They are as follows:

The TER for the 16 new dwellings is 36,628 kgCO₂/annum. The TER for the veterinary facility is 65,142 kgCO₂/annum. This comes to a total of 101,770 kgCO₂/annum.

The Emission Rate for the development with 'Be Lean, Be Clean Be Green' measures introduced is 28,293kgCO₂/annum for the dwellings and 53,812 kgCO₂/annum. This comes to a total of 82,105 kgCO₂/annum.

This means the dwellings see an emissions reduction of 22.76%, and the veterinary facility sees a reduction of 17.39%. This equates to an overall reduction for the site of 19.32%.



11. SUMMARY OF RESULTS

11.1. Part L Performance

The performance, as measured using Part L methodology, for the development can be seen in table and graph to the right:

Overall, a reduction in carbon emissions of 19.32% is achieved over the Part L Target Emission Rate (TER) calculated for the site.

Low/zero Carbon Technology Contribution

The 'Be Lean' measures implemented in the 1st stage of the Energy Strategy process saw the units achieve Part L compliance, i.e. match the Target Emissions Rate. Be Clean measures, using District Energy, were not available for the site.

Therefore the 19.32% reduction in carbon emissions seen over the TER is essentially the contribution in reduction in carbon emissions presented by

employing Low/zero Carbon technologies, in this case the use of Air Source Heat Pumps for heating the development.

Moreover, the use of this technology allows the site to become all-electric, and therefore future-proofed to take advantage of further carbon emissions reductions as the grid de-carbonises.

