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DATE
15 MARCH 2022

RENEWABLE ENERGY ASSESSMENT
LAND WEST OF STATION ROAD, LINGFIELD

INTEGRATION CONSULTANCY LIMITED
REGISTERED IN ENGLAND NO. 7573777

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CONTENTS

EXECUTIVE SUMMARY

This Renewable Energy Assessment has been prepared by Integration Consultancy Limited in support of the outline planning application for the proposed development of 99 new-build residential dwellings on the Land West of Station Road, Lingfield.

The proposed scheme achieves very high standard of sustainability responding directly to the Climate Emergency declared by the UK government who amended the Climate Change Act in June 2019 to set a legally-binding carbon emission target for the UK of net zero carbon by 2050. Information from the government's consultation process leading up to the Future Homes Standard, which will replace Building Regulation in 2025, was announced in January 2021. The proposed scheme will meet this standard of 75% below Part L and as such this development will be an important precedent to show how low carbon developments can be achieved.

A summary of key sustainability aspects of the development is given below:

Carbon: The proposed UK government's **Future Homes Standard** will be met: **75%** below Part L1A, 2013 (compared to policy target of 20% below Part L from renewable energy)

Water: Water use target of **105 l/p/d** (excluding external water 5 l/p/d) and **rainwater harvesting**.

Overheating: **CIBSE TM59** overheating design standard will be exceeded for typical homes.

Air quality: **100% fossil fuel free** combustion for heating / hot water.

Transport: **Electric car charging and cycle storage across the site**

As demonstrated by the carbon modelling carried for this scheme (see the appendix for more details) the proposed carbon target will be met by:

1. **Fabric First Approach.**
   The scheme will take a fabric first approach, following the *passive haus* methodology of high insulation, high airtightness and mechanical ventilation with heat recovery (MVHR).
2. **Heat Pumps.**
   The scheme will use renewable energy for heating and hot water in the form of an air source heat pumps.
3. **Onsite Renewable Energy Generation.**
   Buildings will generate their own renewable electricity from rooftop solar PV panels.

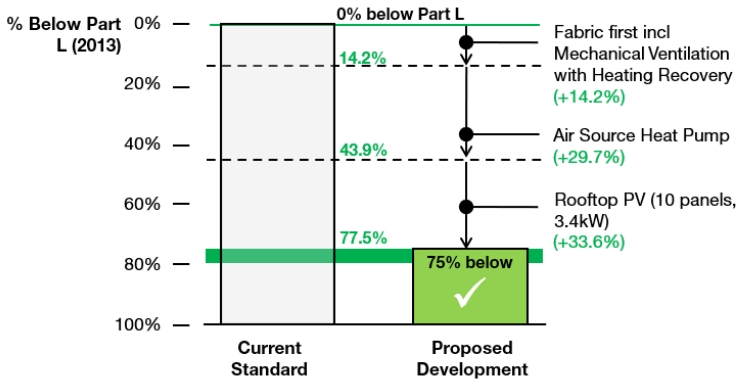


Figure 1: Carbon target of 75% below Part L (2013)

1 INTRODUCTION

1.1 OVERVIEW

This Renewable Energy Assessment has been prepared by Integration Consultancy Limited in support of the outline planning application for the proposed development of 99 new-build residential dwellings on the Land West of Station Road, Lingfield.

The scheme responds directly to the Climate Emergency as declared by the UK government who amended the Climate Change Act in June 2019 to set a legally-binding carbon emission target for the UK of "at least 100% of 1990 levels by 2050" i.e. net zero carbon emissions[1].

Around 20% of the UK's emissions come directly from residential energy use and government has set out a consultation process leading up to the Future Homes Standard which will define how the housing sector will respond to the emergency. This standard will replace Building Regulation in 2025.

In January 2021, the Future Homes Standard consultation showed that, in the interim, the 2021 Building Regulations would increase their performance by achieving 31% below the current Part L (2013) standard and, by 2025 the performance would be increased to 75-80% below the current Part L (2013). As a highly sustainable development, this scheme is aligned to the Future Homes Standard today and, as such, will be an important early precedent to show how very low-carbon developments can be realised.

Over a hundred and fifty thousand homes are built across England each year and are typically built to meet the Building Regulations standard. However, in terms of sustainability and environmental design, this approach of meeting the minimum required standards means that opportunities are missed. Besides significantly lower carbon emissions, these opportunities include aspects such as lower energy bills and lower water use. It also includes benefits to health and wellbeing that result from well-daylit, quiet, high air quality homes that are warm in winter and cool in summer as well as well-connected to the community and nature.

In an effort to improve residential design, the "Home of 2030" competition was held over the course of 2020. Speaking at the HOMES UK conference, Minister of State for Housing Christopher Pincher MP said "The Home of 2030 competition was born out of this Government's ambition to meet the grand challenges of our time: helping our country adapt to an ageing society, whilst fighting climate change and boldly pursuing our 2050 net zero commitments". This development aims to address these challenges and opportunities demonstrating how rural UK residential developments can be highly sustainable and offer an example for future schemes to follow.

This report summarises the energy and sustainability strategies incorporated within the development proposals and sets out an overview of the following aspects of sustainability:

- National and local policy
- Low carbon design – achieving the "Future Homes Standard" today.
- Promoting health & wellbeing
- Climate change resilience
- Local water use
- Biodiversity and green infrastructure
- Pollution minimisation
- Sustainable transport

[1] Climate Change Act 2008 (c. 27) as amended by The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [SI 2019 No. 1056]

The report highlights several key sustainability innovations that together make this a sustainable development. For example, its low carbon status brought about by a fabric first approach, low carbon systems and building integrated renewable energy. This will also help address the issue of rising energy prices and "fuel poverty", which affects one in ten households.

1.2 PROPOSED DEVELOPMENT

The application site is located in Lingfield Village, to the rear of Station Road within the Tandridge District Council. The scheme comprises the provision of 99 new-build residential dwellings, as summarised in the table below, with associated driveways and gardens as shown in the plan overleaf.

	Unit	Type	No. Beds	No. Storeys	Size	No. Units	Total Size
Private	3BH	House	3	2	1150	21	24150
	4BH1	House	4	2	1575	7	11025
	4BH2	House	4	2	1600	5	8000
	4BH3	House	4	2	1650	6	9900
	4BH4	House	4	2	1675	13	21775
	5BH1	House	5	2	2250	6	13500
	5BH2	House	5	2	3025	1	3025
Total Private						**59**	**91375**
Affordable	1BF	Flat	1	N/A	535	5	2675
	2BF	Flat	2	N/A	750	21	15750
	3BH	House	3	2	1050	14	14700
Total Affordable						**40**	**33125**
Total Site						**99**	**124500**

Table 1 - Schedule of Accommodation

Figure 2: Proposed development plan / layout

2 POLICY

2.1 OVERVIEW

This section provides an overview of national policy and local policy related to energy and sustainability.

2.2 NATIONAL PLANNING POLICY FRAMEWORK (NPPF – JULY 2021)

Sustainable Development

The NPPF is very clear on the importance of sustainable development with the first line of the first main chapter stating "*The purpose of the planning system is to contribute to the achievement of sustainable development*". Sustainable development meaning:

a) economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

b) a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

c) an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

At the heart of the Framework is a "*presumption in favour of sustainable development*".

Meeting the challenge of climate change

Section 14 of the NPPF relates to the challenge of climate change and flooding. Of particular relevance is paragraph 152 which states:

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

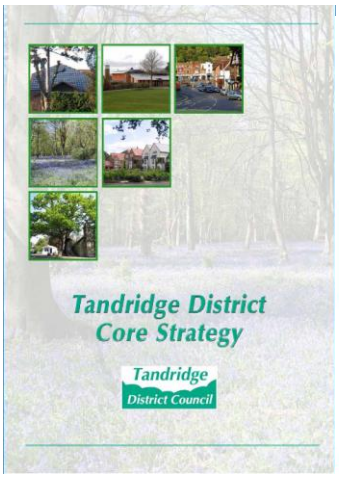
The importance of renewable energy is also highlighted by paragraph 155 and 156.

2.3 NATIONAL CARBON TARGETS

The UK government declared a Climate Emergency and amended the Climate Change Act in June 2019 to set a legally-binding carbon emission target for the UK of "at least 100% of 1990 levels by 2050" i.e. net zero carbon emissions[2].

[2] Climate Change Act 2008 (c. 27) as amended by The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [SI 2019 No. 1056]

2.4 LOCAL POLICY – TANDRIGE CORE STRATEGY AND LOCAL PLAN



The Tandridge District Core Strategy sets out Policy CSP14, which relates to sustainable construction:

Policy CSP14

Sustainable Construction

The Council will encourage all residential development (either new build or conversion) to meet Code level 3 as set out in the published Code for Sustainable Homes. Commercial* development with a floor area of 500m^2 or greater will be encouraged to meet the BREEAM "Very Good" standard.

All new residential development (either new build or conversion) and commercial* development with a floor area of 500m^2 or greater will be required to reach a minimum percentage saving in CO2 emissions through the incorporation of on-site renewable energy (as set out in the table below). The requirement varies according to the type of development and in the case of dwellings, the size of development.

Development Type	Percentage savings in Carbon Dioxide emissions through the provision of renewable energy technologies
Dwellings (1-9 units)	10%
Dwellings (10+ units)	20%**
Commercial* (500m^2+)	10%

Development over 5000m^2 will be expected to incorporate combined heat and power or similar technology. Small scale renewable energy projects will be permitted except where there are overriding environmental, heritage, landscape, amenity, or other constraints.

* Commercial includes all forms of non-residential development, for example social and leisure related development.

**Only where a developer can satisfy the Council why the higher target of 20% cannot be achieved will the lower target of 10% be applied

A new Local Plan is under development and incorporates Policy TLP45, which relates to low carbon development.

TLP45: Energy Efficient and Low Carbon Development

The Council will support new development of all types where, all reasonable steps have been taken to:

I. integrate low and zero carbon mechanisms in the design and layout of the proposed development, and
II. ensure the reduction of energy consumption by the end users; and
III. avoid or mitigate any adverse impacts including, but not limited to, landscape, noise, visual
IV. and cumulative impacts; and
V. accord with other policies of Our Local Plan, with specific regard to TLP18: Place-Making.

The impact of ancillary structures included as part of the proposed scheme will also be assessed.

Innovative design in all developments and community-led renewable energy schemes for low and zero carbon developments which can demonstrate direct community benefit will be encouraged.

The Council will prepare a Sustainable Design SPD to produce best practice guidance

3 CARBON TARGETS – 75% BELOW PART L (THE "FUTURE HOMES STANDARD")

The development will meet the proposed governments Future Home Standard, set for 2025, which is currently earmarked to be between 75% and 80% below the current Part L (2013) standard. This goes beyond the next Part L update, which comes into force in June 2022, which currently is set at 31% below Part L (2013).

This target relates to all building "regulated energy" which includes heating, hot water, lighting, fans and pumps.

This target will be achieved by:

1. **Fabric First Approach.**
   The scheme will take a fabric first approach, following the *passive haus* methodology of high insulation, high airtightness and mechanical ventilation with heat recovery (MVHR).

2. **Heat Pumps.**
   The scheme will use renewable energy for heating and hot water in the form of air source heat pumps.

3. **Onsite Renewable Electricity Generation.**
   Buildings will generate their own renewable electricity from rooftop solar photovoltaic (PV) panels.

The graph below illustrates the carbon target for the scheme: 75% below Part L.

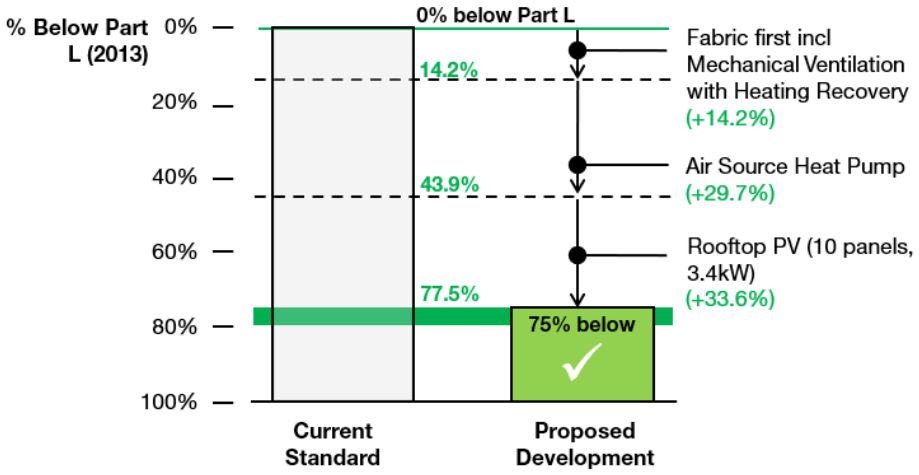


Figure 3: Overall carbon performance of the proposed development

Carbon (SAP) modelling has been carried out for an example 1600sqft 2-storey 4 bed dwelling to demonstrate how 75% below Part L (2013) may be achieved in practice using the strategy outlined above. This exercise is summarised in the appendix.

3.1 ZERO FOSSIL FUELS AND ZERO CARBON BY 2050

The scheme will not use any fossil fuels for heating and hot water, in line with the proposed Future Homes Standard.

Fossil fuels are currently used to heat most UK homes. However, the UK's electricity grid has decarbonised significantly in recent years and carbon intensities are expected to continue to fall each year as the grid continues to decarbonise. This is reflected by recent government projections which state that "*the low carbon share of UK electricity generation will rise from 51% in 2018 to 83% in 2040. This is the proportion of all generation from renewables, nuclear or Carbon Capture and Storage (CCS) power producers*"[3].

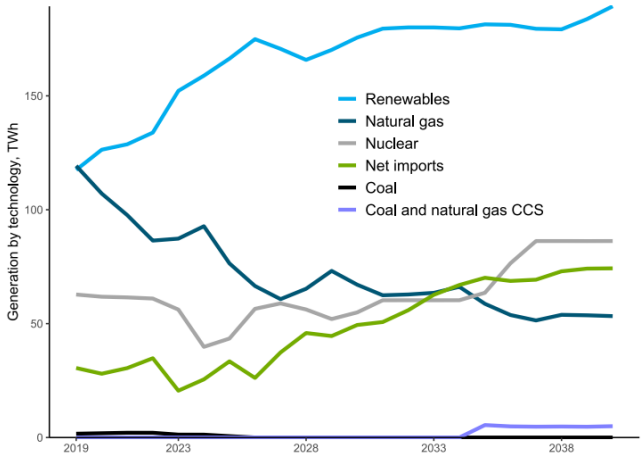


Figure 4: Electricity generation by fuel source (Source: UK governments Update Energy and Emissions Projections 2019)

The National Grid Future Energy Scenario (FES July 2021) show that the carbon emissions from electricity are steadily decreasing as shown in the image below. Therefore, one of the scheme's aspirations is zero fossil fuel use for buildings in order to decrease the development's carbon emissions continuously as the grid decarbonises.

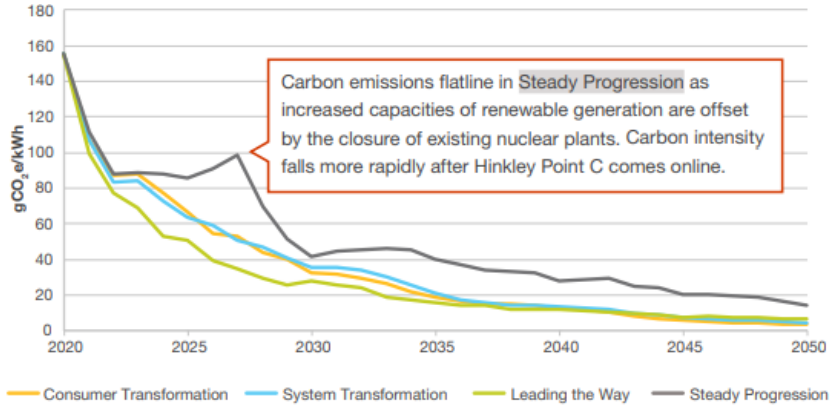


Figure 5: Long-term UK grid electricity carbon emission factors, excluding negative emissions from Biomass Energy with Carbon Capture (BECCS), from National Grid Future Energy Scenarios (FES July 2021)

[3] UK governments Update Energy and Emissions Projections 2019 (October 2020) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/931323/updated-energy-and-emissions-projections-2019.pdf

3.2 LOW EMBODIED ENERGY

The carbon emissions associated with construction, maintenance and future demolition are referred to as "embodied energy". This includes extraction, processing and manufacture, transportation and assembly.

Where possible, the scheme will incorporate low-embodied energy construction techniques e.g. timber frame construction which has a low embodied energy compared to traditional 'brick and block' building techniques.

There are many other materials that can be used with a lower embodied carbon for example glass mineral wool insulation made from recycled glass bottles or chipboard flooring from recycled wood. Material efficiency from off-site construction techniques can also improve performance as well as locally sourcing, the use of local demolition materials where possible and the use of the hierarchy within the BRE Green Guide to Specification, maximising the use of A & A+ materials wherever possible. https://www.bregroup.com/greenguide/podpage.jsp?id=2126

For timber used during the site preparation and construction the Forest Stewardship Council (FSC) certified or Programme for the Endorsement of Forestry Certification (PEFC) should be used. Nontimber materials can be sourced from organisations with an environmental management system such as ISO 14001 or BES 6001. This standard enables construction product manufacturers to ensure and then prove that their products have been made with constituent materials that have been responsibly sourced. The standard describes a framework for the organisational governance, supply chain management and environmental and social aspects that must be addressed in order to ensure the responsible sourcing of construction products.

Further details on the use of low embodied energy techniques will be provided where proposed at Reserved Matters stage.

3.3 RENEWABLE ENERGY

Solar PV

Rooftop solar PV panels are a proven low-carbon technology and will form an important part of the development. Further details on the use of rooftop solar PV panels will be provided where proposed at Reserved Matters stage.

Heat Pumps

Heat pumps can provide very low carbon space heating and domestic hot water. They can efficiently draw heat from the outside air (in the case of an air-source heat pump - ASHP) or from the ground (in the case of a ground source heat pump – GSHP). A heat pump can turn 1kWh of electricity into around 3kWh of heat i.e. a 300% efficiency. Heat pumps are now the lowest carbon way to practically produce reliable heat with carbon savings increasing each year as the grid continues to decarbonise.

Where ASHP are used, the external units will have their have noise and visual impacts mitigated through appropriate equipment specification and design e.g. positioning away from openable windows or amenity areas and by the use of screening.

Further details on the use of heat pumps will be provided at Reserved Matters stage.

4 PROMOTING HEALTH & WELLBEING

4.1 HIGH AIR QUALITY

The scheme as a whole allows for high air quality. This is achieved by the provision of open spaces, the departure from fossil fuel combustion for building related energy, the support for sustainable transport and migration to electric vehicle as well as suitable buffers from roads, which all serve to complement general high air quality found in the overall rural context.

Technologies such as Mechanical Ventilation with Heat Recovery (MVHR) will be incorporated with details to be confirmed at Reserved Matters stage. This comprises a ventilation unit with supply and extract fans, and a plate heat exchanger, which provides continuous background ventilation throughout a building. Besides significantly reducing energy requirements, providing continuous filtered ventilation throughout a building also allows for exceptional air quality.

The following Home Quality Mark standards will be adopted at detailed design stage. Minimum dwelling ventilation rate: 2 Bed 4P, 21l/s; 3 Bed 6P, 29l/s; and 4 Bed 8P, 37 l/s (plus 8l/s for reach additional bedroom). Boost Ventilation rate: Kitchen,15l/s; Bathroom/utility, 10l/s and WC, 8l/s.

Air quality in terms of pollutant minimisation is discussed further in section 8.2.

Figure 6: Mechanical ventilation with heat recovery in a dwelling

4.2 DAYLIGHT & NOISE

The orientated and fenestration will allow the scheme to benefit from high levels of daylight as well as passive heat gains from the low-angle sun during the heating season. The detail design of buildings will be confirmed as part of the detailed design at Reserved Matters stage.

In terms of noise, in line with the Home Quality Mark, a Suitably Qualified Acoustician (SQA) will be appointed. Homes will be built to meet the internal noise requirements outlined below and confirmed by a SQA as part of any Reserved Matters submission.

- Day (07:00-23:00) : Habitable rooms: 35dB kitchens: 35dB; open plan rooms that a kitchen is part of: lower target 35dB; upper target 45dB
- Night (23:00-07:00) : Habitable rooms: 30dB (bedrooms only); kitchens: 35dB; open plan rooms that a kitchen is part of: 35dB

The noise levels of external functional spaces will not exceed 50dB during the Day (07:00-23:00) as confirmed by a SQA. Ventilation systems should achieve an internal noise level of 35dB(A) or less in all non-bedroom spaces within the home and 30dB(A) or less in all bedrooms within the home in line with the methodology in ANC Guidelines Part 1 2011, operating at the minimum rate for continuous extract ventilation systems.

5 CLIMATE CHANGE RESILIENCE

5.1 MITIGATING OVERHEATING

Good building design is critical to ensure homes stay cool and healthy. The following aspects will be incorporated where possible.

- Dual aspect to promote crossflow ventilation and adequate openings.
- Secure ground-level openings to enable night cooling.
- Self-shading including use of planting, trees and trellis.
- Strategic use of exposed internal thermal mass.
- Local greenery for evapotranspiration.

Designs should allow for the ability to retrofit solutions e.g.: fans (e.g. ceiling or pedestal), evaporative cooling fans, reflective blinds and in more extreme future scenarios the use of active cooling via a reversable heat pump.

The use of via dynamic thermal modelling using the CIBSE **TM59 standard** will carried out for the main typologies to ensure buildings have a robust overheating design.

5.2 SUSTAINABLE URBAN DRAINAGE

A Flood Risk Assessment has been carried out by Lanmor Consulting which shows they site has a very low risk of surface water flooding. The main flood risk originates from the Eden Brook which approximately 46m to the east of the site. This was assessed to have a very low risk on the proposed homes.

In terms of sustainable drainage, discharge to a watercourse is considered to be the most appropriate option taking advantage of the ditch located along the south eastern boundary of the site as a point of discharge for surface water runoff generated from the proposed development.

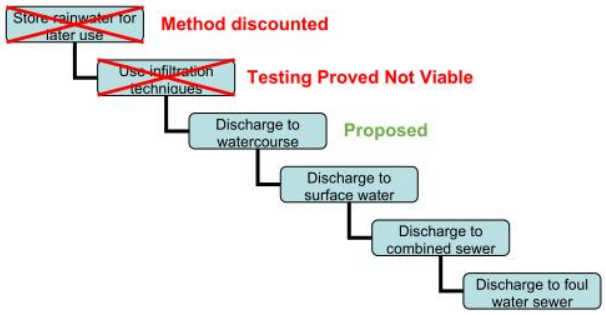


Figure 7: SUDS hierarchy applied to the scheme (Lanmor Consulting)

5.3 DAMP AND MOULD GROWTH

The proposed high-performance building envelopes will significantly mitigate the risk of condensation. Mechanical Ventilation with Heat Recovery (MVHR) systems in combination with high air tightness (~2 m^3/m^2.h @50Pa) will prevent cold damp air ingress and minimise the risk of mould.

6 LOCAL WATER USE

6.1 MINIMISING LOCAL WATER USE

To reduce potable water demand and use the resource efficiently the scheme adopts the higher water use target of 105 litres per person per day (110 l/p/d including external use) compared to the current Building Regulation requirement of 125 litres per person per day.

To achieve this a combination of the following strategies will be use dual and low flush toilets; reduced flow (low pressure) showers and aerated taps and flow restrictors on piped water supplies to sinks and basins. Water efficient appliances e.g. dishwashers and washing machines, will have maximum water efficiency ratings as set out in the table below.

Fitting	Water Consumption
WC	4 / 2.6 litres dual flush
Shower	8 litres / minute
Bath	170 litres
Washbasin taps	5 litres / minute
Kitchen Sink taps	6 litres / minute
Dishwasher	1.25 litres/place setting
Washing machine	8.17 litres/kg

Table 2: Minimum standards for residential water fittings to achieve the higher-use water target 105l/p/d

Rainwater harvesting will be adopted across the scheme to further improve the overall water performance of the scheme. This is likely to be in the form of simple rainwater collection for external use but could include rainwater collection for internal use such as WC flushing with details to be confirmed at Reserved Matters stage.

7 GREEN INFRASTRUCTURE AND BIODIVERSITY

As part of the development, there will be landscaping improvement, as described in the design and access statement, including the planting of around 70 new trees and wildflower planting. Parkland planting to the south will draw Lingfield park into the site and an increase in biodiversity will be achieved through marginal planting of swale and basin areas.

Figure 8: Landscape strategy

8 POLLUTIO

9 N MINIMISATION

9.1 EXTERNAL LIGHTING

Good lighting design is an important aspect to ensure that access roads and public areas within the development are lit adequately according to the purpose and intended usage. Good lighting design can also facilitate the sense of safety and minimise crime, create attractive external spaces for building occupants and reduce energy demand. At the same time, there is a strong need to reduce light pollution in the form of light intrusion, uncomfortable glare and increased sky glow, and minimise the effect on local biodiversity. The proposed scheme will follow lighting design in accordance to the latest British standards and recognise technical recommendations e.g.:

- BS 5489-1:2013 – Code of practice for the design of road lighting. Lighting of roads and public amenity areas.
- ILP Institution of Lighting professionals – Guidance notes for reduction of intrusive light.
- Lighting guide LG6: The Outdoor Environment.

9.2 AIR QUALITY

The proposals minimise air pollutants by:

- **Low carbon vehicles**

  The support for electric vehicle (EV) charging will aid the transition to electric vehicles. The use of EVs eliminates air pollutants associated with combustion in vehicles such as nitrous oxide and particulates.

- **Zero use of fossil fuel**

  The proposed zero-fossil fuel use for building energy will eliminate air pollutants associated with combustion in gas/oil-fired boilers.

- **Reduction in Volatile Organic Compounds (VOCs)**

  In line with the Home Quality Mark (HQM) standard, wood-based products used for residential internal fixtures and fittings will be tested and classified as formaldehyde E1 class as a minimum. The formaldehyde concentration in indoor air will measured post construction (but pre-occupancy) and to not exceed 0.1 mg/m^3 (100 µg/m^3), averaged over 30 minutes. The total VOC (TVOC) concentration in indoor air will be measured post construction (but pre-occupancy) and not exceed 0.5 mg/m3 (500 µg/m^3), averaged over 8 hours. Where levels are found to exceed these limits, measures will be undertaken to reduce levels to within the above limits e.g. increasing the ventilation rates for a defined period.

10 SUSTAINABLE TRANSPORT

10.1 SUSTAINABLE TRANSPORT HIERARCHY

To encourage walking, the scheme will have footways provided on either side of the access road that continue throughout the site. The footway along the northern edge of Town Hill provides a continuous route between the site and central Lingfield. A new pedestrian access is proposed to lead east out of the site onto Station Road (refer to the transport assessment for more details). Facilities such as a post office, supermarket, primary school, dental surgery, chemist, community centre, sports and social club are all within 10 minutes walk.

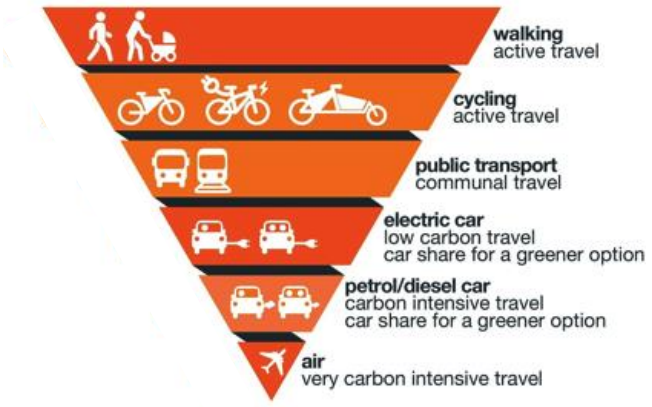


Figure 9: Sustainable transport hierarchy

The low speed limits on the majority of roads makes the environment suitable for cycling. Government guidance in respect of cycling indicates that people are prepared to cycle up to 5km in order to access local facilities or ravel to work. Within 5km of the site, cyclists can reach Lingfield, Dormansland, Felbridge and East Grinstead.

In terms of encouraging public transport there are a number of local accessible bus routes (e.g. the 231, 233, 409, 236, 281, 315 - refer to the transport assessment for more details).

Lingfield station is located within an 150m walking distance east of the site and the footway along the eastern edge of Station Road allows safe access to the station on foot.

The scheme will offer supports for ultra-low-emissions vehicles via the provision of home charging facilities via wall-box electrical charging point installed either inside of garages or on the outside of properties. Cycle storage will also be provided. Full details of the electric vehicle charging and cycle storage facilities will be confirmed at Reserved Matters stage.

11 SUMMARY

A summary of key sustainability aspects of the development is given below:

Carbon: The proposed UK government's **Future Homes Standard** will be met: **75%** below Part L1A, 2013 (compared to policy target of 20% below Part L from renewable energy)

Water: Water use target of **105 l/p/d** (excluding external water 5 l/p/d) and **rainwater harvesting**.

Overheating: **CIBSE TM59** overheating design standard will be exceeded for homes

Air quality: **100% fossil fuel free** combustion for heating / hot water.

Transport: **Electric car charging and cycle storage across the site**

The proposed carbon target is met by:

1. **Fabric First Approach.**
   The scheme will take a fabric first approach, following the *passive haus* methodology of high insulation, high airtightness and mechanical ventilation with heat recovery (MVHR).

2. **Heat Pumps.**
   The scheme will use renewable energy for heating and hot water in the form of heat pumps.

3. **Onsite Renewable Electricity Generation.**
   Buildings will generate their own renewable electricity from rooftop solar photovoltaic (PV) panels.

The graph below illustrates the carbon target for the scheme: 75% below Part L.

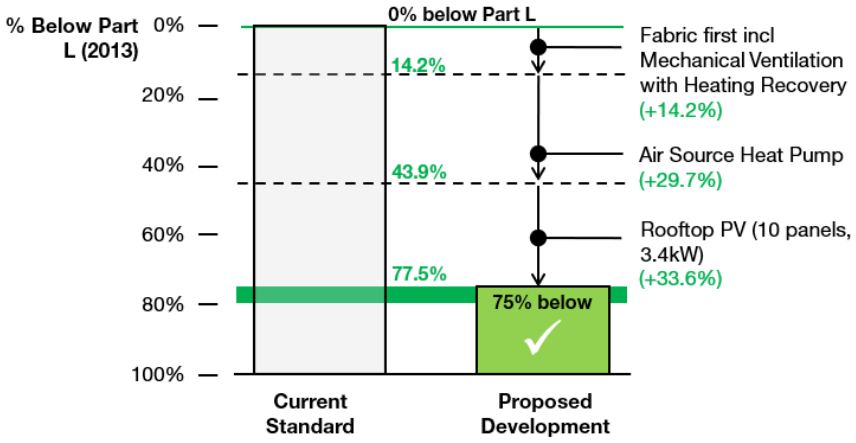


Figure 10: Carbon target of 75% below Part L (2013)

APPENDIX – EXAMPLE SAP ANALYSIS 75% BELOW PART L1A (2013)

The SAP carbon analysis summarised in this section has been carried out in order to illustrate the ability of an example 1600sqft 2-storey 4 bed dwelling to achieve 75% below Part L1 A of the Building Regulation (2013). This standard is in line with the preliminary announcements made on the government's proposed "Future Homes Standard" made in January 2021 and which is currently due to come into effect for 2025.

The building energy-related specifications used in the model are set out in the table below in relation to the Building Regulations "Notional Building" including the percentage improvement where relevant. The results are summarised in the graph below.

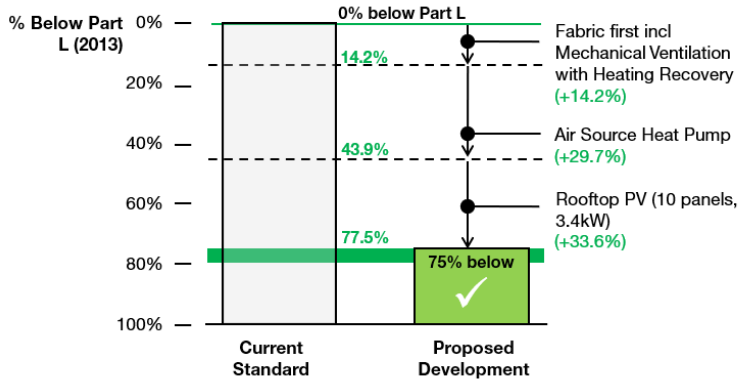
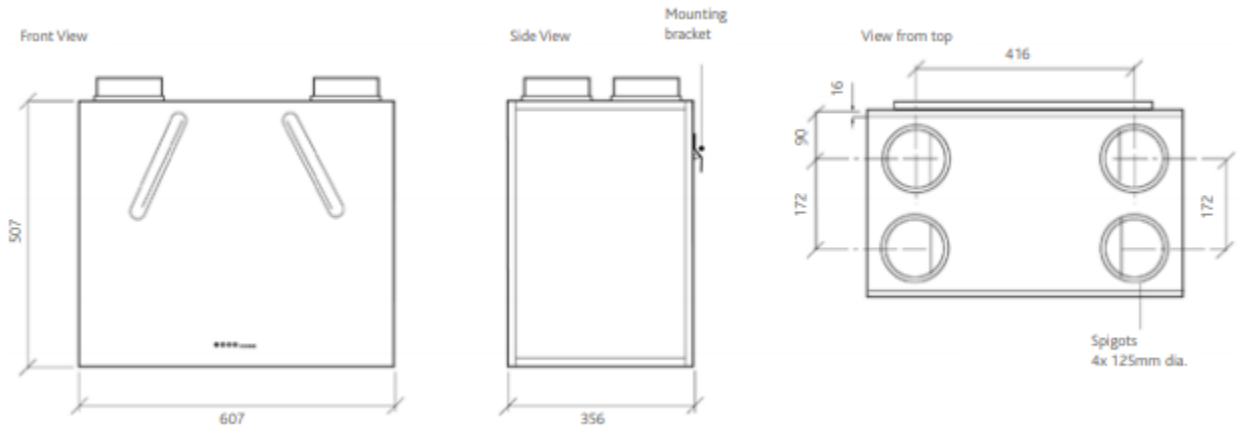


Figure A1: Route to the Future Homes Standard 75% below (Part L1A 2013)

Element	Building Regulations 2013 Notional Building	Example Building Properties for the proposed development	
	U Value (W/m²K)	U Value (W/m²K)	% decrease (improvement)
External Walls	0.18	0.15	16.6%
Ground Floor	0.13	0.13	-
Roof	0.13	0.12	8.7%
Windows	1.40	1.4 (g-value 0.55)	-
External Doors	1.0	1.0	-
Air Tightness	5.0 m³/m²/h@50 Pa	2 m³/m²/h	60%
Thermal Bridging	Accredited details	Accredited details or equivalent where feasible (e.g. sills, jambs lintels, corners)	
Ventilation	Extract fans	Mechanical Ventilation with heat recovery (MVHR) e.g. Nuaire MRXBOX-ECO2 or device with similar specific fan power and efficiency.	
Solar PV Panels	none	3.4kW (e.g. 10 x 340W panels). Assumed no shading, 15-30deg inclination and SW facing.	
Space Heating	Gas 89.9% efficient	Heat pump (A++ efficiency) e.g. Mitshubishi Ecodan 11.2kW PUHZ-W112VA Underfloor heating pipes in insulated timber Time temperature and zone controls	
Hot Water	Gas 89.9% efficient	As space heating	
Lights	100% low energy	100% low energy	

Table A1: Illustrative energy-related improvements for the Future Homes Standard target (compared to Part L1A 2013 notional residential building)



Product Code	MRXBOXAB-ECO2			MRXBOX-ECO2		
Application	Specific Fan Power (W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Compliant	Specific Fan Power (W/l/s)	Heat Exchange Efficiency	Energy Saving Trust Best Practice Compliant
Kitchen + 1 Wet Room	0.52	90%	Yes	0.47	89%	Yes
Kitchen + 2 Wet Room	0.59	89%	Yes	0.54	88%	Yes
Kitchen + 3 Wet Room	0.77	87%	Yes	0.66	87%	Yes
Kitchen + 4 Wet Room	1.00	86%	Yes	0.85	87%	Yes
Kitchen + 5 Wet Room	1.23	86%	Yes	1.05	86%	Yes

Figure A2: Example mechanical ventilation with heat recovery unit (MVHR) with performance summary

Figure A3: Example air source heat pump - Mitsubishi Ecodan 11.2kW PUHZ-W112VA
(A++ rating, quiet at 45dbA at 1m, SCOP 3.5 @55C, SCOP 4.35 at 35C)