Building Sustainability

ENERGY AND SUSTAINABILITY STATEMENT

PROPERTY ADDRESS

Blue Moon Paddock
Woodfield Lane
Essendon.

DATE

August 2016

PREPARED BY

EAL Consult

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EXECUTIVE SUMMARY

EAL Consult has prepared this Energy Strategy and Sustainability Statement in support of planning application for the development at Blue Moon Paddock, Woodfield Lane, Essendon. The proposal is for the construction of a four bedroom detached house on 1.33 hectares of derelict land within the Green Belt, as defined in the Welwyn Hatfield District Plan 2015. As a result, the building has been designed so that the proposed footprint of the development is contained within the outline established by the existing structures on the land in order to minimise the visual impact of the development.

Whilst it can be argued that the proposed residential development is, by definition, harmful to the Green Belt by reason of inappropriateness with reference to the National Planning Policy Framework 2012, it should be noted that the benefits from the development proposal far outweigh any harm from the proposal. The development has been planned to retain and enhance the landscape, visual amenity and biodiversity and also improve damaged and derelict land. For example, over 100 new trees are proposed to be planted at the site as part of the Woodland Trust's Centenary wood project in memory of the 100 year World War 1. The owner has also committed to on-going management of the project.

This statement covers all aspects of sustainable design and construction, including energy use by setting standards which the development will achieve to comply with local and national policies. There is therefore no separate energy statement as all relevant information is included herein. Discussions concerning relevant planning policy as well as a Code for Sustainable Homes Preliminary assessment also form part of the report.

The evidence contained within demonstrates that the development will meet and in certain areas exceed the minimum policy requirements of the National Planning Policy Framework and the Welwyn Hatfield Core Strategy. Overall the development design and construction proposal is of a very high standard of sustainability.

The Energy strategy proposed adheres to the principles of the energy hierarchy by proposing “Lean and Green” measures to reduce the overall energy consumption and carbon emissions from the development.

The methodology and measures used is outlined below:

Be “Lean” - Use less energy: This first step deals with the reduction in energy use, through the adoption of sustainable design and construction measures. The development has been designed to **achieve 17% carbon emissions reduction through energy efficiency measures alone**, by adopting high levels of insulation, which exceed current Building Regulations (2013) requirements such as good airtightness levels. Energy demand reduction measures include:

- High levels of insulation, which exceed current Building Regulations (2013) requirements.
- High performance glazing
- Low Air Permeability 3.5 /h.m3 at 50
- 100% Low energy lighting
- Limited flow rates to water fittings to reduce hot water demand.

Be “Clean” – supply energy efficiently; There are no installed district heating schemes in the immediate vicinity of the site and the proposed development is considered to be too small too successfully incorporate a community heating system.

Combined heat and power (CHP) has been assessed in terms of feasibility. The smallest commercially available CHP unit is too large for the scheme due to the number of dwellings and therefore, not considered to be viable for the proposed development.

Be "Green" – use renewable energy: A feasibility study was carried out to determine the most suitable and cost effective renewable technology for this development. The analysis included a biomass heating system, ground and air source heat pumps, photovoltaics, solar thermal and wind turbines.

The analysis demonstrated that a combination of photovoltaics system and Air Source Heat Pump would be most suited to this development. Several factors had to be considered to determine the amount of PV that could be sited on the roof and the capacity of the air source heat pump.

It was concluded that a combination of Mitsubishi ECODAN 14 PUHZ-HW140-VHA(2)-BS Electric Air Source Heat Pump and 9kWp photovoltaics system would be the most feasible option for the development to reduce carbon emissions to zero.

Table 1 – Carbon Emissions Reduction

Energy Efficiency Measures			Renewable Technology – Heat Pump and PV		
TER	**DER**	**% CO_2 Reduction**	**TER**	**DER**	**% CO_2 Reduction**
17.12	**14.08**	**17%**	**25.18**	**-1.37**	**100%**

Table 1 shows the result from applying the SAP methodology and Building regulations Part L 2013. The Dwelling Emission Rate (DER) for the development is compared to Target Emission Rate (TER) for each stage of the energy hierarchy.

Table 2 Code for Sustainable Homes Level 6

Credit Allocation	Available	Awarded	% Achieved	Score
Energy	31	29	93.54	34.05
Water	6	6	100	9
Materials	24	22	91.66	6.60
Surface Water Runoff	4	2	50.00	1.10
Waste	8	8	100.00	6.40
Pollution	4	3	100.00	2.80
Health and Wellbeing	12	12	100.00	14.00
Management	9	9	100.00	10
Ecology	9	6	66.00	8
			Total	91.95

Sustainable Design and Construction

Proposed development has been designed to Lifetime Homes Standard. Furthermore, a range of measures will be incorporated to maximise opportunities for a sustainable development:

- **Energy Use:** Energy efficiency measures such as High Efficacy Lighting and good building fabric have been incorporated.
- **Pollution: Air, Noise and Light:** Measures to reduce pollution during construction will be included in the project management brief. The development could be registered under Considerate Constructors Scheme. It has been designed to be naturally ventilated with good internal air quality. Good indoor air quality will be achieved through sustainable building techniques and the use of products with low Volatile Organic Compounds (VOCs).
- **Transport:** external storage for four bicycles has been incorporated in the design and an external electric vehicle charging point will be included.
- **Flooding and Drainage:** development is in a low flood risk area according to the Environment Agency's Flood Zone 1. Sustainable urban drainage systems (Suds), will be incorporated wherever practical. Sustainable urban drainage systems (Suds), will be incorporated wherever practical.
- **Improving Resource Efficiency:** the development has been designed to meet a target of 105 litres of water per person per day. A Site Waste Management Plan will be in place which will include targets for recycling and diversion of waste from landfill.
- **Design Standards and Accessibility:** The building has been designed to make the house more easily adaptable for lifetime use at minimal cost. Design measures capable of mitigating and adapting to climate change have also been incorporated.

INTRODUCTION & METHODOLOGY

Welwyn Hatfield Core Strategy Policy CS 9 and CS 10 Sustainable Design and Construction state that "sustainable design and construction will be integral to new development in Welwyn Hatfield". This statement supports and forms part of the planning application documentation submitted for the proposed development and as such describes the approach to sustainable design and construction for the site. It comprises an energy strategy, sustainable design assessment and Code for Sustainable Homes preliminary assessment.

Site Description

The development is located within Green Belt on site area 1.33 hectares, which consists of a disused barn and stables in poor physical condition.

Proposed Development

The proposal is for demolition of existing redundant structures and erection of a single family house, together with associated tree planting scheme (part of Centenary Woods Project sponsored by Woodland Trust); landscaping (including poppy field supported by British Legion) and car parking. Local schools will also be granted access for educational and recreational purposes.

Energy Assessment

The development is required to make carbon emission reduction in accordance with Welwyn Hatfield District Plan Supplementary Design Guidance 2005. The expected energy performance as well as the energy efficient measures that will be employed to reduce CO2 emissions is outlined below.

This energy statement outlines energy demand from the development together with the associated CO_2 emissions, using the present Building Regulations Part L as a baseline. It demonstrates how the emissions from energy use in the development will be reduced through a combination of energy efficiency measures and renewable energy technology.

Methodology:

The methodology employed to determine the potential CO_2 savings is in accordance with the three steps of the Energy Hierarchy.

- **Be Lean -** Improve energy efficiency of the scheme.
- **Be Clean -** Supply as much of the remaining energy requirement with low carbon technologies such as combined heat and power (CHP).
- **Be Green -** Offset a proportion of the remaining carbon dioxide emissions by using renewable technologies.

The government approved Standard Assessment Procedure (SAP) methodology software (2013) has been used to determine the CO_2 emissions and energy requirements. It compares CO_2 emissions from regulated energy use (DER) with those of an equivalent dwelling built to Part L1A 2013 (TER), a notional dwelling of the same size and shape. These calculations do not include emissions from cooking or appliances

PLANNING POLICY CONTEXT

National Planning Policy Framework 2012 – emphasise the concept of sustainable development by encouraging local authorities to adopt proactive strategies to mitigate and adapt to climate change. It recommends the move to a low carbon future by:

- Planning new development in locations and ways, which reduce greenhouse gas emissions.
- Actively supporting energy efficiency improvements to existing buildings; and
- When setting any local requirement for a building's sustainability do so in a way consistent with the Government's zero carbon buildings policy and adopts nationally described standards.

The government's Energy Policy, including its policy on renewable energy, is set out in the Energy White Paper. This aims to put the UK on a path to cut its carbon dioxide emissions by 60% by 2050. As part of the strategy for achieving these reductions the White Paper sets out, the Government's target to generate 20% of UK Electricity from renewables by 2020.

Local Plan

Core Strategy Policy CS 9

Design out crime

- Ensure new development is accessible to all and designed to minimise crime and anti-social behaviour, without diminishing the high quality of the overall appearance.

- Incorporate active frontages to ensure spaces and buildings are overlooked to maximise natural surveillance, create defensible space and provide appropriate lighting.

Prudent use of resources

- The design and construction of new development should enhance the overall environmental sustainability of the scheme, minimising the use of resources in accordance with Policy CS10 Sustainable Design and Construction.

- Provide an appropriate density of development (mostly between 30 and 50 dph) that balances the efficient use of land with delivering high quality, functional design that respects distinctive local character. Higher density development will be encouraged in accessible locations, such as town and neighbourhood centres

Biodiversity and landscaping

- Incorporate soft and hard landscaping, using high quality local materials, which reflects local character and increases or enhances biodiversity.

Parking

The provision of sufficient well designed space for servicing and parking should reflect the goal to shift away from car travel, taking account of local circumstances. Detailed parking requirements will be set out in a Supplementary Planning Document.

Building function and form

- Individual buildings must be well designed to ensure they are neighboring buildings in terms of height, mass and scale.
- Ensure buildings and spaces are accessible and have adequate internal amenity and functionality.

Core Strategy Policy CS10 Sustainable Design and Construction

Sustainable design and construction will be integral to new development in Welwyn Hatfield. In delivering sustainable design and construction, development should address the following key issues:

- Re-use of land and buildings;
- Conservation of water and provision for water recycling;
- Use of sustainable drainage systems to reduce flood risk;
- Maximizing energy efficiency and incorporating renewable and/or low carbon technologies, in accordance with the energy hierarchy;
- Waste and recycling during construction and operation;
- Use of sustainable building materials and techniques;
- Opportunities to incorporate measures which enhance the biodiversity value of development, such as green roofs;
- Minimize pollution during construction and operation;
- Flexibility and adaptability of the building, allowing for future modification and retrofitting to meet higher standards of energy efficiency and connection to decentralized heating systems.

National Policy on Green Belt

The site is located within the Green Belt and the West End to Brickendon Wooded Slopes Landscape Character Area, as defined in the Welwyn Hatfield District Plan adopted in 2005. As advised by the Local Planning Authority, the site also lies within the Chestnut Farm Meadows Local Wildlife Site (Ref: 70/080), which at the time of selection was identified on the basis of its grassland interest. (This issue is addressed by Arbtech Consulting Ltd, expert ecologists, in their accompanying supporting documentation).

The National Planning Policy Framework (NPPF) (adopted March 2012) sets out the Government's policy position on Green Belts at Chapter 9. It stresses that the essential characteristics of Green Belt are their openness and permanence. They serve five main purposes, as follows:-

- to check the unrestricted sprawl of large built-up areas;
- to prevent neighbouring towns merging into one another;
- to assist in safeguarding the countryside from encroachment;
- to preserve the setting and special character of historic towns; and

- to assist in urban regeneration, by encouraging the recycling of derelict and other urban land.

Paragraph 81 states that;- *'Once Green Belts have been defined, local planning authorities should plan positively to enhance the beneficial use of the Green Belt, such as looking for opportunities to provide access; to provide opportunities for outdoor sport and recreation;* ***to retain and enhance landscapes, visual amenity and biodiversity; or to improve damaged and derelict land'.*** (Our emphasis in bold)

Paragraphs 87 and 88 set out that inappropriate development, is by definition, harmful to the Green Belt and should not be approved except in very special circumstances. Furthermore, such 'very special circumstances' will not exist unless the potential harm to the Green Belt by reason of inappropriateness, and any other harm, is clearly outweighed by other considerations. Paragraph 89 however provides for various exceptions, including;-

'the limited infilling or the partial or complete redevelopment of previously developed sites (brownfield land) whether in redundant or continuing use (excluding temporary buildings), which would not have a greater impact on the openness of the Green Belt and the purposes of including land within it than the existing development'.

Paragraph 92 in respect of 'Community Forests' is also of some relevance to this particular proposal in that it establishes that such projects may be a material consideration in deciding planning applications. It acknowledges the value of such projects for upgrading the landscape and providing for recreation and wildlife.

Chapter 10 (Meeting the challenge of climate change, flooding and coastal change) of the NPPF is particularly relevant in respect of the environmental credentials of the application proposals. In addition, Chapter 11 (Conserving and enhancing the natural environment) is relevant with its focus on protecting and enhancing valued landscapes. In particular, it stresses that opportunities to incorporate bio-diversity in and around developments should be encouraged. Paragraph 55 of the Framework should also be highlighted. This provides the various exceptions criteria for locating single new homes within countryside locations, including that of '*exceptional quality or innovative nature of the design'*

ENERGY STRATEGY

Energy strategy for the development is based on Energy Hierarchy; it adopts a set of principles to guide design and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. It seeks to incorporate energy efficiency through the approach detailed in Figure

Figure 1 the Energy Hierarchy

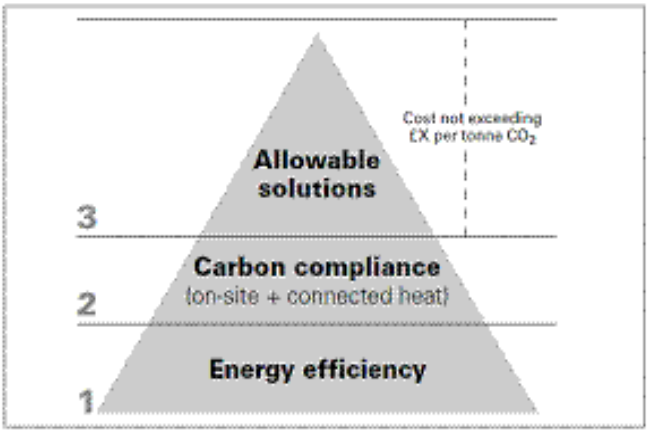

Figure 1 – Energy Hierarchy

Be 'Lean' - Demand Reduction

Lean Measures reduce the demand for energy by designing efficiency into the very fabric of the building through the specification and construction of an efficient thermal cover. The focus should be on air tightness, Accredited Construction Details (ACD's), thermal bridges and solar control, as well as taking into account the thermal mass of the areas being considered. Table 4 below shows a summary of target u values for each thermal element.

Table 3 – Fabric Energy Efficiency Standard

Thermal Element	Part L1A 2013 Minimum Standard
Wall	0.30 W/m²k
Roof	0.20 W/m²k
Floor	0.25 W/m²k
Glazing & Doors	2.00 W/m²k

The heat loss of different building elements is dependent upon their U –value. A building with low U values provides better levels of insulation and reduced heating demand.

The development will incorporate high levels of insulation and efficient glazing; thereby reduce demand for space heating. Table 5 below shows the U values for the development and the associated improvements over Building Regulations.

Table 4 - Energy Efficient Design Specification

Element	Standard	Blue Moon
Wall	0.30 W/m²k	0.18 W/m²k
Floor	0.20 W/m²k	0.10 W/m²k
Roof	0.25 W/m²k	0.12 W/m²k
Glazing	2.00 W/m²k	1.2 W/m²k
Air permeability	10 m³/hr/m² at 50Pa	3.5m³/hr/m² at 50Pa

Air-tightness and Thermal Bridging

Air tightness of a building is important in reducing heat loss, but also in the prevention of drafts that can ultimately mean warm temperatures feels uncomfortably cold. Current Part L Building Regulations (2013) sets a maximum air permeability rate of 10h/m² at 50Pa. The units within the development will improve upon this at 3.5m³/hr/m² at 50Pa.

Fabric Energy Efficiency

The Zero Carbon Hub developed the Fabric Energy Efficiency (FEE) standard as part of their deliberations in determining the definition of "Zero Carbon". The FEE of a building measures the amount of energy required to heat and cool its internal space. Issues such as fabric u values, solar gain, and thermal mass, thermal bridging and air permeability are assessed in the calculation.

In Approved Document L 2013 there is now a second standard called the fabric energy efficiency standard (FEES), for which a Target Energy Efficiency (TFEE) is set. This focus on energy demand of the building, and will therefore drive efficiency through measures that reduce energy use- such as "fabric first "approach, rather than mitigating C02 through building systems and renewable technologies.

The Target Fabric Energy Efficiency (TFEEs) of the development has been calculated and table 5 summarises the results following SAP calculations as designed and the target set by Approved Document L1A, 2013

Table 5 – Fabric Energy Efficiency

1B Hawthorn Avenue	Target FEE kWh/m²/yr	DFEE kWh/m²/yr	% improvement
	65.3	47.9	**26.6%**

High Efficacy Lighting

The development will incorporate low energy light fittings throughout. 100% of all light fittings will be specified as low energy lighting and will accommodate compact fluorescent (CFLs) or fluorescent luminaries only.

External lighting will be less than 60 luminaire per circuit watts and be automatically controlled to prevent operation during daylight hours and presence detection in areas of intermittent pedestrian traffic.

Ventilation

The layout of a house can provide good internal air quality for all areas but not too much so as to waste heat. The use of openable windows will create horizontal airflow. By achieving a good naturally ventilated building the energy demand for air conditioning and mechanical ventilation will thereby be reduced or eliminated.

Be 'Clean' – Supply Energy Efficiently

Community heating and Combined Heat and Power (CHP system)

CHP systems are usually needed where there is a large heat demand (schemes with more than 100-150 dwellings), usually resulting from the building(s) being in continuous use, or through specific heating requirements such as a swimming pool.

Community (or district) heating involves using a central boiler plant (or other heat sources) to heat a number of buildings through a network of well-insulated underground pipes

Be 'Green' - Renewable Energy

Once energy demand reduction measures have been applied, methods for generating low and -zero carbon energy can be assessed. The renewable technologies considered for the development are:

- Biomass
- Ground/water source heat pump
- Air source heat pump
- Wind energy
- Solar thermal panels
- Photovoltaic panels

Potential renewable technologies were assessed in conjunction with the Energy Efficiency and Carbon Compliance measures discussed in previous sections of the report. To determine the appropriate renewable technology for the site, the following factors were considered.

- CO_2 savings
- Their compatibility with the site and site constraints
- Installation and maintenance costs
- Any potential impacts

Biomass Heating

A biomass system designed for wood pellets, which have a high-energy content, would fuel this development. Wood pellets require less volume of storage than other biomass fuels. Pellet boilers also require less maintenance and produce considerably less ash residue. A biomass boiler could supply some of the space heating.

DEFRA approved double sided stove has been selected for secondary heating system. The Ekol Clarity double sided multi fuel wood burning stove gives a heat output of up to 14kWand a high efficiency rating of 73.3%.

Figure 2 – Ekol Clarity double sided stove

Ground Source Heat Pump

Ground source heat pumps use pipes, which are buried, in the garden to extract heat from the ground. This heat can then be used to heat radiators; underfloor or warm air heating systems and hot water in the development.
A ground source heat pump circulates a mixture of water and antifreeze around a loop of pipe, called a ground loop, which is buried in the garden. Heat from the ground is absorbed into the fluid and then passes through a heat exchanger into the heat pump. The ground stays at a fairly constant temperature under the surface, so the heat pump can be used throughout the year.

The use of Ground Source heat pumps for the scheme have been considered as not cost effective technology as it is more expensive to install than an air source heat pump, because of the need to install a ground heat exchanger. Problems can arise if the installation is poorly designed or not matched to the heating needs of the building. To get the full potential benefit of a well-designed system, it is necessary to be in touch with an expert installer, which will increase the cost of installation.

Air Source Heat Pump

Air source heat pumps are an efficient and environmentally-friendly way of heating using air drawn freely from the atmosphere. They operate rather like a refrigerator in reverse, absorbing heat from the air into a working fluid which is passed into a compressor where its temperature is increased before it is transferred into the heating and hot water circuits of the building. An air source heat pump can get heat from the air even when the temperature is as low as -15°C. One of the benefits of ASHP is that the system

Figure 3 - External unit

produces space heating and hot water through electricity, thereby negating the need for a gas connection. However, the efficiency of heat pump is very much dependent on the temperature difference between the heat source and the space required to be heated. The lower the difference between internal and external air temperature, the more efficient the system.

The use of this system has been considered appropriate and suitable for the development.

Wind turbines:

Building-integrated turbines would be most suited to this site due to the amount of roof space, as opposed to stand alone turbines. CO_2 savings from wind turbine technologies take into account their mounting height, the turbine wind curve and wind data.

To reduce the need for a high tower, vertical axis wind turbines (VAWTs) have become increasingly popular for integrated building applications. Micro VAWTs are often installed at locations with frequent windy conditions. Prior to installation of a wind turbine, it is important to collect wind data in the immediate vicinity of a building or installation site. Based on the wind data, a suitable type of wind turbine and suitable location can be determined to maximise the electricity generation.

Figure 5 - Micro turbines

Prior to installation of wind turbine(s) on building rooftop, it is important to ensure the roof structure is strong enough to hold the additional loads. These include the weight of wind turbine(s) and vibration from wind turbine operation. Vibration absorbent technology should be applied in order to prevent damage to building structure and to reduce interior noise in the building. As wind turbines are usually installed on the high point of the building, prevention measure from lighting damage should be in place. Accessibility for maintenance should also be planned for. Therefore, it is not the most cost effective system for this development

Solar thermal

Solar hot water systems (also known as Solar Thermal) harness heat from sunlight by capturing energy which is radiated by the sun within solar panels or collectors.

This heat energy is then moved down pipes to the hot water cylinder within the home, reducing the need to use Gas, Oil or Electricity to heat the hot water you require;


Figure 6 – Solar Thermal Panels

For this development solar thermal panels could be used for domestic hot water during summer periods. The system has been considered not suitable for the scheme as it will not contribute sufficiently towards the sustainability performance of the dwelling.

The installation and use of a Photovoltaic system would be easier to install in the development compared to solar thermal, which requires additional plumbing.

Photovoltaic Panel

Photovoltaic panels extract the energy of the sun to generate electricity. They operate most

efficiently when oriented to the south and are inclined to about 35 degrees. Several factors had to be considered to determine the amount of photovoltaic arrays that could be sited on the roof of the proposed development. This included:

- Any overshadowing from the neighboring buildings, which is not an issue because of the location.
- The extent of available roof space.

Based on these factors, it was concluded **that 9kW photovoltaic Panels** could be located on the roof. In general, photovoltaics would be most suited to this development because installation is much simpler when compared to other renewable technologies. Through SAP calculations it has been determined that solar PV system mounted at a 30°- 40° angle, will provide electricity for the development.

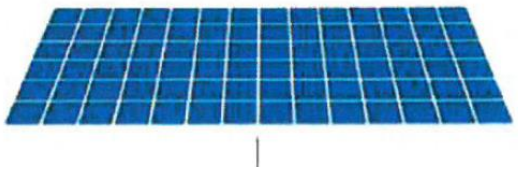

Figure 7 – Solar Panels

Tesla powerwall home battery will be installed to maximize the usefulness of solar panels. It will store excess energy and make it available for use at night. Tesla powerwall unit has a 7kWh energy storage capacity. The unit is a wall mounted, rechargeable lithium ion battery with liquid thermal control.

Figure 8 – Tesla Powerwall Home Battery

SUSTAINABLE DESIGN AND CONSTRUCTION

Welwyn Hatfield District Council Plan; Supplementary Design Guidance specifies minimum standards and recommendations on the sustainability issues identified below. Furthermore, all new dwellings must also be built to Code level 4 or above. However, the proposed development exceeds the council's requirement by achieving Code level 6 and nets zero carbon emissions.

Climate Change Adaptation

In accordance with the council's policy the development will address the causes of climate change by reducing predicted CO2 emissions through a combination of energy efficiency measures and renewable energy sources generated on site.

Conservation of Water and Provision for Water Recycling

Water efficiency becomes increasingly important in a changing climate with diminishing water resources. We consume a vast amount of potable water in non- potable situations including flushing the toilet, washing the car and irrigating our gardens. Only a small proportion of our mains water is used for drinking, cooking and personal washing.

This and the fact that we have diminishing water resources are reflected in the increasingly stringent requirements for water usage, hence the Code for Sustainable Homes set a target of 105litres per person per day (for Code Level 3 and 4). This is against a national average of approximately 155l/p/d. It is proposed that the development will reduce water consumption further to 80/l/p/d by installing sanitary appliances with lower flow rates and rain water harvesting.

Table 6– Water Fittings Standards 80 l/pd

Appliance	Flow rate or Capacity
WC	Dual flush WC 4/2.6 litre
Basin	1.6 litres/min
Shower	6 litres/minute flow
Bath	155 litres
Sink	3 litres/min
W/machine	6.14
Dish Washer	0.67

Use of Sustainable Drainage Systems to reduce Flood Risk

Surface water runoff will be managed through selection of Sustainable Urban Drainage System (SUDs). A suitably qualified Hydrologist or Water Engineer will be appointed to design the system to ensure that all the mandatory elements of Code Sur 1 will be met and 2 credits for no discharge to watercourse for rainfall of up to 5mm. The overall design will also take into consideration all the requirements and recommendations relevant to the project. The development site is in a low Flood Risk Area.

Waste Management

The development will comply with the standards set out in the council's guidance – provision of household recycling and refuse waste collection services. A minimum internal storage capacity of 30 litres per dwelling will be provided which can accommodate containers for the temporary storage of materials to be recycled. Materials will then be transferred to external containers for collection.

Adequate external storage for bins with applicable disabled access will be on site; level threshold, gentle approach, a hard surface with adequate turning circle has incorporated into the design

Waste and Recycling during Construction and Operation

There will be measures in place that will facilitate high levels of reuse and recycling throughout the construction stage. The development Site Waste Management Plan (SWMP) will aim to divert at least 80 % by weight or by volume of non-hazardous construction waste from landfill, to score 3 Credits under the Code for Sustainable Homes.

Use of Sustainable Building Materials and Techniques

Materials can have a significant impact on environmental performance, both in construction but also ongoing use. Materials used in the development will have lower environmental impacts over their lifecycle. This applies to the materials used in the external walls, roof, ground floor and upper floors and windows and extends to elements of the materials category such as the basic building materials (staircases, internal walls, upper floors) and the finishing elements (fascias, skirting, furniture).

Opportunities to incorporate measures which Enhance Biodiversity Value of Development

All existing features of ecological value on the site will be maintained and adequately protected during site clearance, preparation and construction works. The development will include ecological features that contribute towards protecting, managing and enhancing biodiversity, and compensate for any unavoidable loss in biodiversity.

Over 100 new trees are proposed to be planted at the site as part of the Woodland Trust's Centenary wood project in memory of the 100 year World War 1 anniversary, with on-going management to be provided by the applicant. The package of tree planting that is proposed will include hawthorn; hazel; birch; rowan; oak and blackthorn. In addition to the woodland proposals, thousands of wild poppies are to be planted, as a complementary project supported by British Legion. As part of the wider amenity and landscaping scheme, the applicant is also proposing a chicken coop; vegetable garden; an apple and pear orchard; and a bee hive.

Air Quality

An appropriate Construction Management Plan will be prepared to address issues such as water, waste, noise and vibration, dust, emissions and odours, ground contamination etc. The project will commit to the Considerate Constructors Scheme. The Considerate Constructors Scheme is a national initiative to improve the management of construction sites and minimize nuisance caused to neighbours and the general public.

Noise and Vibration Pollution

During construction noise and disruption will be minimized through good site management, operation and the specification of techniques, such as the use of framed construction and pre-fabricated components. Construction activities will be planned to limit both the level and duration of noise, to minimize disturbance to premises and amenities in the area. An Environmental Health Officer (EHO) will be consulted at an early stage.

Minimise Pollution during Construction and Operation

The development will implement measures to minimise light pollution. Guidance notes for the reduction of Obstructive Light (GN01) 2005 prepared by the institution of Lighting Engineers (ILE) or equivalent will be followed.

Proposal for CODE Level 6 Policy

Welwyn Hatfield Borough Council Sustainable Design and Construction Local Plan April 2013 stipulate that all major developments within the borough must be built to Code for Sustainable Homes Level 4.

The Code for Sustainable Homes (The Code) is the national standard for assessing the sustainability of new homes. It is used in the design and construction of new homes with a view to encouraging continuous improvement in sustainable home building.

It was devised by the Building Research Establishment (BRE) under contract to the Department for Communities and

Scoring System

The Code utilizes a rating system of between one and six stars. A star is awarded for each level achieved and is governed by a series of thresholds both within the mandatory issues (Energy and Water) and as an overall score:

Table 7 Scoring System

Code Level	Energy Threshold	Water Threshold	Total
Level 1 ★	0% (Compliant with Part L 2010)	≤ 120 l/p/day	36 points
Level 2 ★★	0% (Compliant with Part L 2010)	≤ 120 l/p/day	48 points
Level 3 ★★★	0% (Compliant with Part L 2010)	≤ 105 l/p/day	57 points
Level 4 ★★★★	19%	≤ 105 l/p/day	68 Points
Level 5 ★★★★★	100%	≤ 80 l/p/day	84 Points
Level 6 ★★★★★★	Net Zero CO2 Emissions	≤ 80 l/p/day	90 points

Preliminary Assessment

A Code for Sustainable Homes pre-assessment has been undertaken to identify the credits that could reasonably be expected to be claimed and demonstrate that Code level 6 can be achieved.

A selection of the targeted credits within each of the nine Code sections is outlined under the following headings. Full details of the targets can be found in the Pre-assessment estimator (Appendix C).

1. **Energy and Carbon Dioxide Emissions**

- **Ene 1 – Dwelling Emission Rate:** There is a mandatory requirement for a Code Level 6 rating to achieve net carbon emissions. Design stage SAP Assessment show 100% improvement in DER/TER for the development. This improvement will be achieved by means of high-performance building envelope and energy efficient building services and systems.

- **Ene 2 – Fabric Energy Efficiency: Low U values.**

- **Ene 3 – Energy Display Devices:** Energy display Device that show real time energy consumption in kW and kWh will be provided in a prominent location.

- **Ene 4- Drying Space:** The development will have secured outside space to accommodate 6m of drying line.

- **Ene 5 – Energy labelled Goods:** To obtain all available credits the white goods provided will be A+ rated. For example, the fridges and freezers will be A+rated and washing machine and dishwasher will be A rated under EU Energy Efficiency Labelling Scheme.

- **Ene 6 – External Lighting:** All space lighting within the external areas will be dedicated energy efficient. Lighting will be controlled either through a time switch and/or movement detectors.

- **Ene 7 – Low or Zero Carbon Technology:** Photovoltaic panels will be installed to generate energy from a renewable source leading to over 50% reduction in carbon emissions.

- **Ene 8 – Cycle Storage:** Adequately sized, covered and secure cycle storage will be provided within the development.

- **Ene 9-Home Office:** Home office facilities will be provided in a non-master bedroom to allow residents to work from home. This will include two double power sockets and two telephone points along a wall of at least 1.8m in length in a room with adequate ventilation and daylight.

2. **Water**

- **Wat 1- Internal Water Use:** Indoor water use will be reduced to 80 litres per person per day. This will be achieved by specifying water efficient appliances such as WCs, taps, power shower and white goods.

Wat 2 – External Water Use: outdoor mains water consumption will be reduced by use of a rainwater harvesting system.

3. Materials

Environmental Impact of Materials: It is a mandatory requirement for any Code rating that at least three of the five key building elements achieve a D rating or better in the Green Guide Specification. This mandatory requirement will be exceeded by sourcing locally for high grade materials.

Main elements relating to this credit are

- Roof
- External walls
- Internal walls (including separating walls)
- Upper and ground floors
- Windows

Mat 2 Responsible Sourcing; Basic Element: responsibly sourced materials will be used for basic building elements and finishing elements, such as FSC timber and other materials covered by the BES 6001 sourcing standard or a certified Environmental Management System (EMS).

Mat 3 Responsible Sourcing of Materials –Finishing Elements: Materials used in finishing elements will be responsibly sourced.

4. Surface Water run-off

- **Sur 1- Reduction =**Rainwater harvesting systems and appropriately sized soak a ways as well as the use of permeable paving would ensure that the peak rate of run -off over the development lifetime (allowing for climate change), will be no greater for the development site than the pre-development site.

  Volume of run- off will comply with the predicted 100 year 6 hour event. An appropriately qualified professional will confirm this. A hydrologist report will confirm run- off to watercourses and the client will comply with 5mm rainfall scenario.

- **Sur 2-** A flood risk assessment will also confirm that the development is in a low flood risk area and that it is not at risk of flooding from other sources.

5. Waste

- **Was 1 Storage of non-recyclable waste and recyclable waste** -It is a mandatory requirement for any Code rating that external space allocated for waste storage is at least 100 litres for a single bedroom dwelling, with a further 70 litres for each additional bedroom in accordance with BS5906.
  The space provided for waste storage will be sized to hold all the external containers provided. It will be enclosed and accessible to wheelchair users in accordance with Checklist Inclusive Design Principles (IDP).
  The client has committed to installing a single bin of at least 30 litres for storage of recyclable waste within the kitchen area. It will be permanent and fixed to the kitchen unit. Recycling storage will comply with Welwyn Hatfield Borough Council requirements for recycling both internally and externally.

- **Was 2 Construction Site Waste Management**-The development seeks to set targets or

procedures to minimize waste as well as divert at least 85% of non- hazardous waste (by weight or volume) from landfill paying due regard to the waste hierarchy. The principal contractor will have relevant mechanisms and experience to satisfy this issue.

- **Was 3- Composting:** The development will include composting facility.

6. Pollution

- **Pol 1 – Insulant Global Warming Potential**: The proposed specification used in the SAP calculations has allowed for materials used having low global warming potential (GWP) less than 5 (in manufacturing installations.

- **Pol 2** – Air Source Heat Pump.

7. Health and Wellbeing

- **Hea 1-** There are no mandatory requirements in this section. Credits are targeted for achieving the relevant minimum average daylight factors in living, dinning and study areas, and average daylight factor of 2% for the kitchen.

- **Hea 2-Sound Insulation**: The house is detached, therefore will receive full credit by default under Sound Insulation.

- **Hea 3- Private Space:** The dwelling benefits from private outdoor space.

- **Hea 4- Lifetime Homes:** The development has been designed to meet Lifetime Homes thereby ensuring that the development can meet the reasonable needs of residents over their lifetime.

8. Management

- **Man1- Home User Guide;** A home user guide for the dwelling will be provided to the residents with information on how to operate their home efficiently and how to make the best use of local facilities. The guide will be available in alternative format.

- **Man 2- Considerate Constructors Scheme:** The contractor will be required to register the site under the Considerate Constructors Scheme and achieve a score of at least 32, with a score of at least 3 in every section.

- **Man 3- Construction Site Impacts:** The Construction site will be managed in a manner that mitigates environmental impacts by adopting best practices with regard to air (dust) pollution from site activities and water (ground and surface pollution).

- **Man 4- Security:** An Architectural Liaison Officer or Crime Prevention Design Advisor will be consulted and the requirements of Section 2 - Physical Security from "Secure by Design - New Homes" met.

9. Ecology

- **Eco 1 –Ecological value of Site:** The site has ecological value.

- **Eco 2- Ecological Enhancements:** The developer is working with Woodland Trust to plant 105 trees on the land as well as other major ecological enhancement already mentioned in the previous section.

- **Eco 3-Protection of Ecological Features:** An ecologist will be employed to assess the site and make recommendations.

CONCLUSION

The design and sustainability measures incorporated in the proposed strategy are of an award winning standard. Welwyn and Hatfield Borough Council Energy and Sustainability Policies and appropriate measures have been incorporated at design level. After incorporating efficiency measures, air source heat pump system and photovoltaic system the development will achieve net zero carbon emission.

- Code for Sustainable Homes pre-assessment shows that the dwelling can meet Code level 6
- A truly unique design of a high standard of architecture.
- The proposed fabric specification exceeds the requirements of Part L1A 2013 and is in line with the principles of the Energy Hierarchy.

Project Information

Building type Detached house

Reference
Date 16 March 2016
Project Blue Moon Paddock
Woodfield Lane
ESSEDON
AL9 6JJ

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

	Area (m^2)	Av. Storey height (m)	Volume (m^3)	
Ground floor (1)	215.13	2.10	451.77	(3a)
Total floor area	215.13			(4)
Dwelling volume (m^3)			451.77	(5)

2. Ventilation rate

	main + seondary + other heating		m^3 per hour	
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)
Number of intermittent fans	4	x 10	40.00	(7a)
Number of passive vents	0	x 10	0.00	(7b)
Number of flueless gas fires	0	x 40	0.00	(7c)

		Air changes per hour	
Infiltration due to chimneys, fans and flues		0.09	(8)
Pressure test, result q50	3.50		(17)
Air permeability		0.26	(18)
Number of sides on which sheltered		2.00	(19)
Shelter factor		0.85	(20)
Infiltration rate incorporating shelter factor		0.22	(21)

Infiltration rate modified for monthly wind speed

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70	
												52.50 (22)

Wind Factor

1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18	
												13.13 (22a)

Adjusted infiltration rate (allowing for shelter and wind speed)

0.29	0.28	0.27	0.25	0.24	0.21	0.21	0.21	0.22	0.24	0.25	0.26	
												2.94 (22b)

Ventilation : natural ventilation, intermittent extract fans

Effective air change rate

0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.53	(25)

3. Heat losses and heat loss parameter

Element	Gross area, m²	Openings m²	Net area A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest)			**5.610**	**1.15 (1.20)**	6.42			(27)
N/W SIDE X								
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest)			**3.810**	**1.15 (1.20)**	4.36			(27)
FRONT X								
Solid door			**1.970**	**1.20**	2.36			(26)
FRONT X								
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest)			**12.280**	**1.20**	14.74			(26)
N/W SIDE X								
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast)			**11.010**	**1.20**	13.21			(26)
S/E SIDE X								
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast)			**3.600**	**1.20**	4.32			(26)
N/E REAR								
Walls			102.71	0.18	18.49	190.00	19515.66	(29)
EXTERNAL								
Ground floors			215.13	0.10	21.51	20.00	4302.60	(28)
Pitched roofs with integrated insulation			331.68	0.12 (Ru=0.50)	40.49	9.00	2985.12	(30)

Total area of external elements Sigma A, m²	687.80	(31)
Fabric heat loss, W/K	125.91	(33)
Heat capacity	26803.38	(34)
Thermal mass parameter, kJ/m²K	124.59	(35)
Effect of thermal bridges	27.50	(36)
Total fabric heat loss	153.41	(37)

Ventilation heat loss calculated monthly

80.62	80.39	80.16	79.07	78.87	77.92	77.92	77.74	78.28	78.87	79.28	79.71

(38)

Heat transfer coefficient, W/K

234.03	233.79	233.56	232.48	232.27	231.32	231.32	231.15	231.69	232.27	232.68	233.11

232.47 (39)

Heat loss parameter (HLP), W/m²K

1.09	1.09	1.09	1.08	1.08	1.08	1.08	1.07	1.08	1.08	1.08	1.08

HLP (average) 1.08 (40)

Number of days in month (Table 1a)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements **kWh/year**

Assumed occupancy, N	3.02	(42)
Annual average hot water usage in litres per day Vd,average	111.54	(43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage in litres per day for each month												
122.69	118.23	113.77	109.31	104.85	100.39	100.39	104.85	109.31	113.77	118.23	122.69	(44)
Energy content of hot water used												
181.95	159.14	164.21	143.17	137.37	118.54	109.85	126.05	127.55	148.65	162.27	176.21	

Energy content (annual)	1754.96	(45)
Distribution loss		

27.29	23.87	24.63	21.47	20.61	17.78	16.48	18.91	19.13	22.30	24.34	26.43	(46)

Cylinder volume, l	300.00	(47)
Manufacturer's declared cylinder loss factor (kWh/day)	1.90	(48)
Temperature Factor	0.5400	(49)
Energy lost from hot water cylinder (kWh/day)	1.03	(55)

Total storage loss												
31.81	28.73	31.81	30.78	31.81	30.78	31.81	31.81	30.78	31.81	30.78	31.81	(56)
Net storage loss												
31.81	28.73	31.81	30.78	31.81	30.78	31.81	31.81	30.78	31.81	30.78	31.81	(57)
Primary loss												
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Total heat required for water heating calculated for each month												
237.02	208.88	219.28	196.46	192.44	171.83	164.91	181.12	180.85	203.72	215.56	231.28	(62)
Output from water heater for each month, kWh/month												
237.02	208.88	219.28	196.46	192.44	171.83	164.91	181.12	180.85	203.72	215.56	231.28	(64)

	2403.34	(64)
Heat gains from water heating, kWh/month		

104.55	92.70	98.66	90.24	89.73	82.05	80.58	85.97	85.05	93.48	96.59	102.64	(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
151.08	151.08	151.08	151.08	151.08	151.08	151.08	151.08	151.08	151.08	151.08	151.08	(66)
Lighting gains												
45.38	40.30	32.78	24.81	18.55	15.66	16.92	21.99	29.52	37.48	43.75	46.64	(67)
Appliances gains												
385.21	389.20	379.13	357.69	330.62	305.18	288.18	284.18	294.26	315.70	342.77	368.21	(68)
Cooking gains												
38.11	38.11	38.11	38.11	38.11	38.11	38.11	38.11	38.11	38.11	38.11	38.11	(69)
Pumps and fans gains												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)												
-120.86	-120.86	-120.86	-120.86	-120.86	-120.86	-120.86	-120.86	-120.86	-120.86	-120.86	-120.86	(71)
Water heating gains												
140.53	137.95	132.60	125.33	120.61	113.96	108.30	115.55	118.12	125.65	134.15	137.96	(72)
Total internal gains												
639.44	635.78	612.83	576.15	538.10	503.12	481.73	490.05	510.22	547.15	588.99	621.13	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) N/W SIDE X	0.9 x 5.610	11.28	0.63 x 0.70	0.77	19.3445	
Window - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthWest) FRONT X	0.9 x 3.810	36.79	0.63 x 0.70	0.77	42.8422	
Solid door FRONT X	0.9 x 1.970	0.00	0.00 x 0.70	0.77	0.0000	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthWest) N/W SIDE X	0.9 x 12.280	11.28	0.63 x 0.70	0.77	42.3441	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (SouthEast) S/E SIDE X	0.9 x 11.010	36.79	0.63 x 0.70	0.77	123.8039	
Full glazed door - Double-glazed, argon filled, low-E, En=0.1, soft coat (NorthEast) N/E REAR	0.9 x 3.600	11.28	0.63 x 0.70	0.77	12.4136	
Total solar gains, January				240.75	(83-1)	

Solar gains

240.75	434.70	660.15	927.54	1138.95	1174.71	1114.23	949.79	751.69	498.06	292.84	203.13	(83)
Total gains												
880.18	1070.48	1272.98	1503.69	1677.04	1677.82	1595.96	1439.84	1261.91	1045.21	881.83	824.26	(84)

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)

Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau												
31.81	31.85	31.88	32.03	32.05	32.19	32.19	32.21	32.14	32.05	32.00	31.94	
alpha												
3.12	3.12	3.13	3.14	3.14	3.15	3.15	3.15	3.14	3.14	3.13	3.13	
Utilisation factor for gains for living area												
0.99	0.99	0.97	0.93	0.84	0.71	0.57	0.63	0.84	0.96	0.99	0.99	(86)
Mean internal temperature in living area T1												
18.76	19.00	19.41	19.95	20.45	20.79	20.92	20.89	20.60	19.95	19.25	18.71	(87)
Temperature during heating periods in rest of dwelling Th2												
20.01	20.01	20.01	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.02	20.01	(88)
Utilisation factor for gains for rest of dwelling												
0.99	0.98	0.96	0.91	0.81	0.64	0.47	0.53	0.79	0.95	0.98	0.99	(89)
Mean internal temperature in the rest of dwelling T2												
16.98	17.33	17.93	18.71	19.39	19.83	19.97	19.94	19.61	18.72	17.70	16.91	(90)

Living area fraction (98.87 / 215.13) 0.46 (91)

Mean internal temperature (for the whole dwelling)

17.80	18.10	18.61	19.28	19.88	20.27	20.41	20.38	20.07	19.29	18.42	17.74	(92)
Apply adjustment to the mean internal temperature, where appropriate												
17.80	18.10	18.61	19.28	19.88	20.27	20.41	20.38	20.07	19.29	18.42	17.74	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains												
0.99	0.98	0.95	0.90	0.80	0.66	0.51	0.57	0.79	0.93	0.98	0.99	(94)
Useful gains												
868.36	1044.53	1213.01	1353.89	1347.18	1104.89	814.31	823.68	999.44	976.72	862.58	815.11	(95)
Monthly average external temperature												
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20	(96)
Heat loss rate for mean internal temperature												
3159.5	3086.0	2828.6	2413.2	1899.90	1310.76	880.82	919.69	1382.49	2017.8	2633.1	3156.5	(97)
Fraction of month for heating												
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
Space heating requirement for each month, kWh/month												
1704.64	1371.86	1201.98	762.71	411.23	-	-	-	-	774.56	1274.79	1741.98	

Total space heating requirement per year (kWh/year) (October to May) 9243.77 (98)

Space heating requirement per m² (kWh/m²/year) 42.97 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

												kWh/year	
Fraction of heat from secondary system									0.1000				(201)
Fraction of space heat from main system(s)									0.9000				(202)
Efficiency of main heating system									249.90%				(206)
Efficiency of secondary heating system									65.00%				(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
1704.64	1371.86	1201.98	762.71	411.23	-	-	-	-	774.56	1274.79	1741.98		(98)
Appendix Q - monthly energy saved (main heating system 1)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(210)
Space heating fuel (main heating system 1)													
613.92	494.07	432.89	274.69	148.10	-	-	-	-	278.95	459.11	627.36		(211)
Appendix Q - monthly energy saved (main heating system 2)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(212)
Space heating fuel (main heating system 2)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(213)
Appendix Q - monthly energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00		(214)
Space heating fuel (secondary)													
262.25	211.06	184.92	117.34	63.27	-	-	-	-	119.16	196.12	268.00		(215)
Water heating													
Water heating requirement													
237.02	208.88	219.28	196.46	192.44	171.83	164.91	181.12	180.85	203.72	215.56	231.28		(64)
Efficiency of water heater												175.10	(216)
175.10	175.10	175.10	175.10	175.10	175.10	175.10	175.10	175.10	175.10	175.10	175.10		(217)
Water heating fuel													
135.36	119.29	125.23	112.20	109.90	98.13	94.18	103.44	103.28	116.35	123.11	132.08		(219)

Annual totals	kWh/year	
Space heating fuel used, main system 1	3329.09	(211)
Space heating fuel (secondary)	1422.12	(215)
Water heating fuel	1372.55	(219)
Electricity for pumps, fans and electric keep-hot central heating pump	30.00	(230c)
Total electricity for the above, kWh/year	30.00	(231)
Electricity for lighting (100.00% fixed LEL)	801.34	(232)
Energy saving/generation technologies		
PVs 0.80 x 9.000 x 1068.070 x 0.800	6152.086	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
PVs 0.80 x 0.000 x 0.000 x 0.500	0.000	
	6152.086	(233)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	803.01	(238)

10a. Does not apply

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	3329.09	0.519	1727.80	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	1422.12	0.019	27.02	(263)
Water heating	1372.55	0.519	712.36	(264)
Space and water heating			2467.17	(265)
Electricity for pumps and fans	30.00	0.519	15.57	(267)
Electricity for lighting	801.34	0.519	415.90	(268)
Electricity generated - PVs	-6152.09	0.519	-3192.93	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			-294.29	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			**-1.37**	(273)

Project Information

Building type Detached house

Reference
Date 16 March 2016
Project Blue Moon Paddock
Woodfield Lane
ESSEDON
AL9 6JJ

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England
assessed by program JPA Designer version 6.03a1, printed on 16/3/2016 at 15:59:07

New dwelling as designed

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1 TER and DER

Fuel for main heating system: Standard tariff (fuel factor = 1.55)

Target Carbon Dioxide Emission Rate	TER = 25.18	
Dwelling Carbon Dioxide Emission Rate	DER = -1.37	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 65.3	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 47.9	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

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2b Fabric U-values

Element	Average	Highest	
Wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	0.10 (max. 0.25)	0.10 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

---

3 Air permeability

Air permeability at 50 pascals:	3.50	OK
Maximum :	10.00	

4 Heating efficiency

Main heating system:

Air source heat pump, underfloor, electric

Source of efficiency: default from Table 4 of SAP document

Secondary heating system:

Room heater systems - Solid fuel

Stove (pellet fired)

Efficiency: 65.00%

Minimum: 65.00% OK

5 Cylinder insulation

Hot water storage

Manufacturer's declared cylinder loss factor (kWh/day)		1.90	
Permitted by DBSCG		2.86	OK
Primary pipework insulated	Yes		OK

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	2207 Time and temperature zone control	OK
	Cylinderstat - Yes	OK
	Independent timer for DHW - Yes	OK
Boiler Interlock	No	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100.0%

Minimum: 75.0% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Thames Valley): OK

Slight OK

Based on:

Thermal mass parameter : 124.59

Overshading : Average or unknown (20-60 % sky blocked)

Orientation : SouthWest

Ventilation rate : 6.00

Blinds/curtains :

None with blinds/shutters closed 0.00% of daylight hours

10 Key features

Ground floors U-value 0.10 W/m²K

Pitched roofs with integrated insulation U-value 0.12 W/m²K

Design air permeability 3.5 m³/h.m²

Low-carbon or renewable for secondary heating fuel.

Wood logs

Photovoltaic array

breglobal

Results

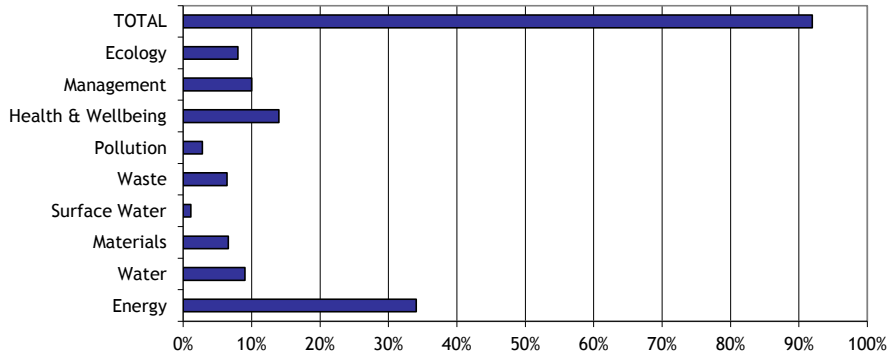
Development Name:	Blue Moon Paddock
Dwelling Description:	Detached House
Name of Company:	EAL Consult
Code Assessor's Name:	Ann Aina
Company Address:	17 DOBREE AVENUE
Notes/Comments:	

PREDICTED RATING - CODE LEVEL: 6

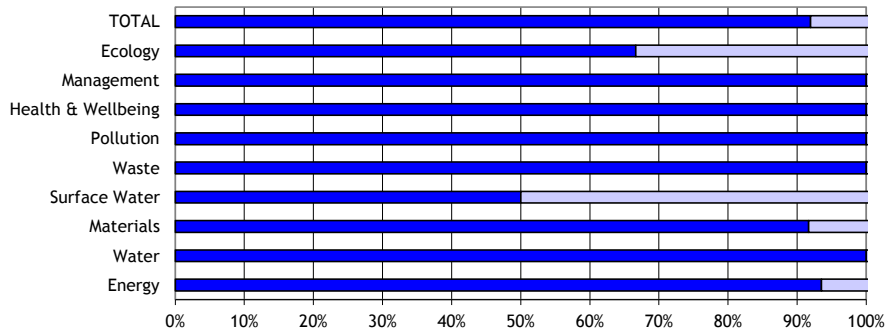
Mandatory Requirements: **All Levels**

% Points:	**91.95%**	**- Code Level: 6**
Breakdown:	**Energy**	**- Code Level: 6**
	Water	**- Code Level: 6**

Graph 1: Predicted contribution of individual sections to the total score and percentage of total achievable score



Graph 2: Predicted percentage of credits achievable: Total and by Category



NOTE: The rating obtained by using this Pre Assessment Estimator is for guidance only. Predicted ratings may differ from those obtained through a formal assessment, which must be carried out by a licensed Code assessor.

CATEGORY 1 ENERGY	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 93.54		Credits	Level		
Contribution to Overall % Score: 34.05 points		29.0 of 31 Credits	Level 6		
Ene 1 Dwelling Emission Rate	Credits are awarded based on the percentage improvement of the Dwelling Emission Rate (DER) over the Target Emission Rate (TER) as calculated using SAP 2009. Minimum standards for each Code level apply. The Code energy calculator can be used to calculate a predicted score. Enter the predicted score What is the predicted number of credits? 10.0 OR Are zero net CO_2 emissions achieved? ☑	10.0 of 10 Credits	Level 6		
Ene 2 Fabric Energy Efficiency	Credits are awarded based on the Fabric Energy Efficiency (kWh/m^2/yr) of the dwelling. Minimum standards apply at Code levels 5 and 6. The Code energy calculator can be used to calculate a predicted score. Enter the predicted score Apartments, Mid-terrace ◉ OR End terrace, Semi and Detached ○ OR Staggered Mid terrace ○ What is the predicted number of credits? 7.0	7.0 of 9 Credits	Level 6		
Ene 3 Energy Display Devices	Credits are awarded where a correctly specified Energy Display Device is installed monitoring electricity and/or primary heating fuel consumption. Select whether the EDD monitors electricity and/or fuel None Specified ○ Primary Heating only ○ OR Electricity only ○ OR Electricity and primary heating fuel ◉	2 of 2 Credits	-		

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 4 Drying Space	One credit is awarded for the provision of either internal or external secure drying space with posts and footings or fixings capable of holding 4m+ of drying line for 1-2 bed dwellings and 6m+ for dwellings with 3 bedrooms or greater. Will drying space meeting the criteria be provided? Yes ◉ OR No ○	**1 of 1 Credits**	-		
Ene 5 Energy Labelled White Goods	Credits are awarded where each dwelling is provided with either information about the EU Energy Labelling Scheme, White Goods with ratings ranging from A+ to B or a combination of the previous according to the technical guide. Select the appropriate option below EU Energy labelling information only ☐ A+ rated appliances ☑ A+, A and B rated appliances ☐ Combination of compliant rated white goods with EU Energy Labelling Scheme ☑	**2 of 2 Credits**	-		
Ene 6 External Lighting	Credits are awarded based on the provision of space lighting* with dedicated energy efficient fittings and security lighting fittings with appropriate control gear.. Space Lighting None provided ○ OR Non Code compliant lighting ○ OR Code compliant lighting ◉ Security Lighting None provided ◉ OR Non Code compliant lighting ○ OR Code compliant lighting and controls ○ Dual lamp luminaires Compliant with both above criteria ☑ * Statutory safety lighting is not covered by this requirement	**2 of 2 Credits**	-		9

Issue		Credits	Level	Assumptions Made	Evidence Required
Ene 7 Low or Zero Carbon Technologies	Credits are awarded where there is a 10% or 15% reduction in CO_2 emissions resulting from the use of low or zero carbon technologies. Select % contribution made by low or zero carbon technologies Less than 10% of demand ○ OR 10% of demand or greater ○ OR 15% of demand or greater ◉	**2 of 2 Credits**	-		
Ene 8 Cycle Storage	Credits are awarded where adequate, safe, secure and weather proof cycle storage is provided according to the Code requirements. Fill in the development details below Number of bedrooms: 5 Number of cycles stored per dwelling* 4.0 * if you have storage for 1 cycle per two dwellings insert 0.5 in number of cycles stored per dwelling	**2 of 2 Credits**	-		
Ene 9 Home Office	A credit is awarded for the provision of a home office. The location, space and services provided must meet the Code requirements. Will there be provision for a Home Office? Yes ◉ OR No ○	**1 of 1 Credits**	-		

CATEGORY 2 WATER	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 100.00		Credits	Level		
Contribution to Overall Score: 9.00 points		6 of 6 Credits	Level 6		
Wat 1 Indoor Water Use	Credits are awarded based on the predicted average household water consumption, calculated using the Code Water Calculator Tool. Minimum standards for each code level apply. Select the predicted water use / Mandatory Requirement greater than 120 litres/ person/ day ○ OR ≤ less than 120 litres/ person/ day ○ OR ≤ less than 110 litres/ person/ day ○ OR ≤ less than 105 litres/ person/ day ○ OR ≤ less than 90 litres/ person/ day ○ OR ≤ less than 80 litres/ person/ day ◉	5 of 5 Credits	Level 5 AND Level 6		
Wat 2 External Water Use	A credit is awarded where a compliant system is specified for collecting rainwater for external irrigation purposes. Where no outdoor space is provided the credit can be achieved by default. Select the scenario that applies No internal or communal outdoor space ○ OR Outdoor space with collection system ◉ OR Outdoor space without collection system ○	1 of 1 Credits	-		

CATEGORY 3 MATERIALS	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 91.66		Credits	Level		
Contribution to Overall Score: 6.60 points		22 of 24 Credits	All Levels		
Mat 1 Environm-ental Impact of Materials	Mandatory Requirement: At least three of the five key building elements must achieve a Green Guide 2008 Rating of A+ to D. Tradable Credits: Points are awarded on a scale based on the Green Guide Rating of the specifications. The Code Materials Calculator can be used to predict a potential score. Mandatory Requirement Will the mandatory requirement be met? ☑ Enter the predicted score What is the predicted number of credits? 13	13 of 15 Credits	All Levels		
Mat 2 Responsible Sourcing of Materials - Basic Building Elements	Credits are awarded where materials used in the basic building elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. Enter the predicted Score What is the predicted number of credits? 6	6 of 6 Credits	-		
Mat 3 Responsible Sourcing of Materials - Finishing Elements	Credits are awarded where materials used in the finishing elements are responsibly sourced. The Code Materials Calculator can be used to predict a potential score. Enter the predicted Score What is the predicted number of credits? 3	3 of 3 Credits	-		

CATEGORY 4 SURFACE WATER RUN-OFF	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted:	50.00%	Credits	Level		
Contribution to Overall Score:	1.10 points	2 of 4 Credits	All Levels		
Sur 1 Management of Surface Water Run-off from developments	Mandatory Requirement: Peak rate of run-off into watercourses is no greater for the developed site than it was for the pre-development site and that the additional predicted volume of rainwater discharge caused by the new development is entirely reduced as far as possible in accordance with the assessment criteria. Desiging the drainage system to be able to cope with local drainage system failure. Tradable Credits: Where SUDS are used to improve water quality of the rainwater discharged or for protecting the quality of the receiving waters. Mandatory Requirement Will the mandatory requirement be met? ☑ Select the appropriate option No SUDS ☐ No runoff into watercourses for the first 5 mm of rainfall ☐ Runoff from hard surfaces will receive an appropriate level of treatment ☐	0 of 2 Credits	All Levels		
Sur 2 Flood Risk	Credits are awarded where developments are located in areas of low flood risk or where in areas of medium or high flood risk appropriate measures are taken to prevent damage to the property and its contents in accordance with the Code criteria in the technical guide. Select the annual probability of flooding (from PPS25*) Zone 1 - Low ◉ OR Zone 2 - Medium ○ OR Zone 3 - High ○ Select the apropriate option(s) Low risk of flooding from FRA** ☑ All measures of protection are demonstrated in FRA ☐ Ground floor level and access routes are 600 mm above design flood level ☐ * Planning Policy Statement 25 - Planning and Flood Risk ** FRA - Flood Risk Assessment	2 of 2 Credits	-		

CATEGORY 5 WASTE	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted:	100.00%	Credits	Level		
Contribution to Overall Score:	6.40 points	8 of 8 Credits	All Levels		
Was 1 Storage of non-recyclable waste and recyclable household waste	Mandatory Requirement: The space provided for waste storage should be sized to hold the larger of either all external containers provided by the Local Authority or the min capacity calculated from BS 5906. Tradable Credits are awarded for adequate internal and/ or external recycling facilities. Mandatory Requirement Will the minimum space be provided and be accessible to disabled people? ☑ Internal Recyclable household waste storage Where there is no external recyclable waste storage and no Local Authority collection scheme Internal storage (capacity 60 litres) ☐	0 of 2 Credits			
	Local Authority collection Scheme Post Collection sorting Internal storage (capacity 30 litres) ☑ Pre-collection sorting Internal storage (3 separate bins, capacity 30 litres) ☐	4 of 4 Credits	All Levels		
	External Storage, no Local Authority collection scheme 3 separate internal storage bins (capacity 30 litres) ☐ **AND** Houses External Storage(capacity 180 litres) ☐ Flats Private recycling operator ☐ 3 or greater types of waste collected ☐	0 of 4 Credits			

Issue		Credits	Level	Assumptions Made	Evidence Required
Was 2 Construction Site Waste Management	A credit is awarded where a compliant SWMP is provided with targets and procedures to minimise construction waste. Credits are available where the SWMP include procedures and commitments for diverting either 50% or 85% of waste generated from landfill. SWMP details Does the SWMP include: + No SWMP ○ + SWMP with targets and procedures to minimise waste? ○ + SWMP with procedures to divert 50% of waste ○ + SWMP with procedures to divert 85% of waste ◉	**3 of 3 Credits**			
Was 3 Composting	A credit is awarded where individual home composting facilities are provided, or where a community/ communal composting service, either run by the Local Authority or overseen by a management plan is in operation. Select the facilities available No composting facilities ○ Individual composting facilities ◉ OR Communal/ community composting*? ○ Local Authority ☐ OR Private with management plan ☐ * including if an automated waste collection system is in place	**1 of 1 Credit**	-		

CATEGORY 6 POLLUTION	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 100.00%		Credits	Level		
Contribution to Overall Score: 2.80 points		4 of 4 Credits	All Levels		
Pol 1 Global Warming Potential (GWP) of Insulants	A credit is awarded where <u>all</u> insulating materials only use substances (in manufacture AND installation) that have a GWP of less than 5. Select the most appropriate option All insulants have a GWP less than 5 ◉ OR Some insulants have a GWP of less than 5 ○ OR No insulants have a GWP of less than 5 ○	1 of 1 Credits	-		
Pol 2 NOx Emissions	Credits are awarded on the basis of NOx emissions arising from the operation of the space and water heating system within the dwelling. Select the most appropriate option Greater than 100 mg/kWh ○ OR Less than 100 mg/kWh ○ OR Less than 70 mg/kWh ○ OR Less than 40 mg/kWh ◉ OR Class 4 boiler ○ OR Class 5 boiler ○ OR All space and hot water energy requirements are met by systems who do not produce NOx emissions ○	3 of 3 Credits	-		

CATEGORY 7 HEALTH & WELLBEING	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 100.00%		Credits	Level		
Contribution to Overall Score: 14.00 points		12 of 12 Credits	Level 6		
Hea 1 Daylighting	Credits are awarded for ensuring key rooms in the dwelling have high daylight factors (DF) and a view of the sky. Select the compliant areas Room Kitchen: Avg DF of at least 2% ☑ Living Room*: Avg DF of at least 1.5% ☑ Dining Room*: Avg DF of at least 1.5% ☑ Study*: Avg DF of at least 1.5% ☑ 80% of working plane in all above rooms receive direct light from the sky? ☑ Any room used for Ene 9 Home Office must also achieve a min DF of 1.5%.	3 of 3 Credits	-		
Hea 2 Sound Insulation	Credits are awarded where performance standards exceed those required in Building Regulations Part E. This can be demonstrated by carrying out pre-completion testing or through the use of Robust Details Limited. Select a type of property Detached Property ◉ Attached Properties: - Separating walls and floors only exist between non habitable spaces ○ - Separating walls and floors exist between habitable spaces ○ Select a performance standard Performance standard not sought ◉ Airborne: 3db higher; Impact: 3dB lower ○ OR Airborne: 5db higher; Impact: 5dB lower ○ OR Airborne: 8db higher; Impact: 8dB lower ○	4 of 4 Credits	-		

Issue		Credits	Level	Assumptions Made	Evidence Required
Hea 3 Private Space	A credit is awarded for the provision of an outdoor space that is at least partially private. The space must allow easy access to all occupants. Will a private/ semi-private space be provided? Yes, private/semi-private space will be provided ◉ OR No private/semi-private space ○	1 of 1 Credits	-		
Hea 4 Lifetime Homes	Mandatory Requirement: Lifetime Homes is mandatory when a dwelling is to achieve Code Level 6. Tradable credits: Credits are awarded where the developer has implemented all of the principles of the Lifetime Homes scheme. Mandatory Requirement Dwelling to achieve Code Level 6? ☑ Lifetime Homes Compliance All Lifetime Homes criteria will be met ◉ OR Exemption from LTH criteria 2/3 applied ○ Credit not sought ○	4 of 4 Credits	Level 6		

CATEGORY 8 MANAGEMENT	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 100.00%		Credits	Level		
Contribution to Overall Score: 10.00 points		9 of 9 Credits	All Levels		
Man 1 Home User Guide	Credits are awarded where a simple guide is provided to each dwelling covering information relevant to the 'non-technical' home occupier, in accordance with the Code requirements. Tick the topics covered by the Home User Guide Operational Issues? ☑ Site and Surroundings? ☑ Is available in alternative formats? ☑	3 of 3 Credits	-		
Man 2 Considerate Constructors Scheme	Credits are awarded where there is a commitment to comply with best practice site management principles using either the Considerate Constructors Scheme or an alternative locally/ nationally recognised scheme. Select the appropriate scheme and score No scheme used ○ Considerate Constructors OR Best Practice: Score between 24 and 31.5 ○ OR Best Practice+: Score between 32 and 40 ◉ Alternative Scheme* OR Mandatory + 50% optional requirements ○ OR Mandatory + 80% optional requirements ○ * In the first instance, contact a Code Service Provider if you are considering to use an alternative scheme.	2 of 2 Credits	-		
Man 3 Construction Site Impacts	Credits are awarded where there is a commitment and strategy to operate site management procedures on site as following: Tick the impacts that will be addressed Monitor, report and set targets, where applicable, for: - CO_2/ energy use from site activities ☑ - CO_2/ energy use from site related transport ☐ - water consumption from site activities ☐ Adopt best practice policies in respect of: - air (dust) pollution from site activities ☑ - water (ground and surface) pollution on site ☑ 80% of site timber is reclaimed, re-used or responsibly sourced ☑	2 of 2 Credits	-		

Issue		Credits	Level	Assumptions Made	Evidence Required
Man 4 Security	Credits are awarded for complying with Section 2 - Physical Security from Secured by Design - New Homes. An Architectural Liaison Officer (ALO), or alternative, needs to be appointed early in the design process and their recommendations incorporated. Secured by Design Compliance Credit not sought ○ OR Secured by Design Section 2 Compliance ◉	**2 of 2 Credits**	-		

CATEGORY 9 ECOLOGY	Overall Level: 6	Overall Score	91.95	Assumptions Made	Evidence Required (The below cells can be formatted by assessors if required.)
% of Section Credits Predicted: 66.00%		Credits	Level		
Contribution to Overall Score: 8.00 points		6 of 9 Credits	All Levels		
Eco 1 Ecological Value of Site	One credit is awarded for developing land of inherently low value. Select the appropriate option Credit not sought ○ OR Land has ecological value ◉ OR Land has low/ insignificant ecological value* ○ * Low ecological value is determined either a) by using Checklist Eco 1 across the whole development site; or b) where an suitably qualified ecologist is appointed and can confirm or c) produces an independent ecological report of the site, that the construction zone is of low/ insignificant value; AND the rest of the development site will remain undisturbed by the works.	0 of 1 Credits	-		
Eco 2 Ecological Enhancement	A credit is awarded where there is a commitment to enhance the ecological value of the development site. Tick the appropriate boxes Will a *Suitably Qualified Ecologist* be appointed to recommend appropriate ecological features? ☑ AND Will all key recommendations be adopted? ☑ AND 30% of other recommendations be adopted? ☑	1 of 1 Credits	-		
Eco 3 Protection of Ecological Features	A credit is awarded where there is a commitment to maintain and adequately protect features of ecological value. Type and protection of existing features Site with features of ecological value? ◉ OR Site of low ecological value (as Eco 1)? ○ AND All* existing features potentially affected by site works are maintained and adequately protected? ☑ *If a suitably qualified ecologist has confirmed that a feature can be removed due to insignificant ecological value or poor health conditions, as long all the rest have been protected, then this box can be ticked.	1 of 1 Credits	-		

Issue		Credits	Level	Assumptions Made	Evidence Required
Eco 4 Change of Ecological Value of Site	Credits are awarded where the change in ecological value has been calculated in accordance with the Code requirements and is calculated to be: Change in Ecological Value Major negative change: fewer than -9 ○ Minor negative change: between -9 and -3 ○ OR Neutral: between -3 and +3 ○ Minor enhancement: between +3 and +9 ○ Major enhancement: greater than 9 ◉	**4 of 4 Credits**	-		
Eco 5 Building Footprint	Credits are awarded where the ratio of combined floor area of all dwellings on the site to their footprint is: Ratio of Net Internal Floor Area: Net Internal Ground Floor Area Credit Not Sought ◉ OR Houses: 2.5:1 OR Flats: 3:1 ○ OR Houses: 3:1 OR Flats: 4:1 ○ OR Houses & Flats Weighted (2.5:1 & 3:1) ○ OR Houses & Flats Weighted (3:1 & 4:1) ○	**0 of 2 Credits**			