

PROPOSED RESIDENTIAL DEVELOPMENT
LAND SOUTH OF HANLYE LANE
CUCKFIELD
WEST SUSSEX
RH17 5HN

ENERGY STATEMENT

FOR

SIGMA HOMES

September 2023

Project no. 16871

PROPOSED RESEDENTIAL DEVELOPMENT
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CUCKFIELD
WEST SUSSEX
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ENERGY STATEMENT

SIGMA HOMES

REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
0	14/09/2023	Joe Mountain	Harry Hinchliffe	For Comment

The current report provides a brief overview of the wide range of opportunities for renewable energy and is not intended as detailed design advice. As such data and information should only be treated as INDICATIVE at this stage of the process. Further investigation can be undertaken when more accurate and detailed information is required on specific measures.

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C80 Solutions Ltd
2nd Floor Suite
Sanderson House
22 Station Road
Horsforth
LS18 5NT
www.c80solutions.co.uk

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1.0 Introduction

1.1 About C80 Solutions Ltd

C80 Solutions are independent Sustainability and Energy Consultants providing carbon reduction solutions to help the UK achieve its carbon emission reduction target of 80% by 2050 - as set out in the Government's Climate Change Act 2008.

Our range of affordable but comprehensive solutions for the construction industry are broken down into two sectors; i) Building Compliance and ii) Consultancy.

Building Compliance:

Our Building Compliance services include; Code for Sustainable Homes Assessments, SAP Calculations, On Construction Energy Performance Certificates, Water Efficiency Calculations, SBEM Calculations, Commercial EPCs, BREEAM assessments and Air Tightness Testing.

Consultancy:

Our experience and exposure to building compliance combined with previous experience and IEMA accredited training means we have built up a vast amount of knowledge which enables us to provide our clients with invaluable advice. Our Consultancy services include; Renewable Energy Feasibility Reports, Energy Statements for planning, Sustainability Statements and Building Compliance Advisory Reports.

1.2 Introduction to Developments

C80 Solutions have been instructed to prepare an Energy Statement by Sigma Homes for the proposed new build residential development at Hanlye Lane, Cuckfield

The project anticipates the provision of 55 new residential dwellings, with associated roads, landscaping and public areas.

The site is located in a predominantly suburban area, in the borough of Cuckfield, West Sussex

All plots will be provided with an Electric Vehicle charging point.

The plan of the proposed development can be seen in Figures 1 below.

Figure 1; Proposed Site Plan



This statement will demonstrate how the proposed development is being designed in line with the requirements of planning policy DP39: Sustainable Design and Construction

1.3 Planning Policy

The following Energy/CO2 related planning requirements are applicable to this development:

DP39: Sustainable Design and Construction

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change.

Evidence Base: Gatwick Sub Region Water Cycle Study; West Sussex Sustainable Energy Study, Mid Sussex Sustainable Energy Study.

All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures:

- **Minimise energy use through the design and layout of the scheme including through the use of natural lighting and ventilation;**
- **Explore opportunities for efficient energy supply through the use of communal heating networks where viable and feasible;**
- **Use renewable sources of energy;**
- **Maximise efficient use of resources, including minimising waste and maximising recycling/re-use of materials through both construction and occupation;**
- **Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment;**
- **Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer term resilience**

1.4 Methodology

The methodology that has been applied in this report is as follows:

1. Prepare baseline energy calculations for the site based on a Part L 2021 compliant construction specification designed for the development.
2. From the baseline energy calculations, the predicted energy demand for the development in kWh/year and the predicted CO₂ emissions in kgCO₂/year for the site can be established.
3. Multiplying the site wide predicted CO₂ emissions figure by 100% will provide the CO₂ reduction target required.
4. Apply energy efficient design principles (improved fabric spec) in order to reduce the energy demand and CO₂ emissions of the site. Prepare energy calculations using the improved fabric specification.
5. From these improved calculations, the reduced energy demand for the development in kWh/year and the predicted CO₂ emissions in kgCO₂/year for the site can be established.
6. Carry out a renewable energy feasibility study to ascertain which LZC technologies would be suitable for the development.

Establish the sizing of suitable renewable technologies to ensure the CO₂ emission reduction target is met.

2.0 Predicted Annual Carbon Emissions

Baseline SAP 10 calculations were prepared based on the construction specification shown in table 1 below.

Aspect		L1A
	External Walls	0.26
	Communal Walls	0
	Insulated Roofs	0.16
	Ground floors	0.18
	Windows (All)	1.6
	Communal Doors	N/A
	Thermal Bridging	N/A
Ventilation	Airtightness m ³ /(hr.m ²)	5
Heating	Heating	Gas Boiler
	Hot Water	As Per Heating
	Controls	TTZC
Low energy lighting		100%
Ventilation		Natural ventilation with extracts
Renewables / LZC	None	NA

Table 1: Part L compliant construction specifications

The conducted SAP and SBEM calculations have shown the proposed development will generate **63449.87 kgCO₂/year**. In order to satisfy the planning requirements on sustainable design, the developer is committed to reduce predicted site wide CO₂ emissions.

Therefore, since the development's predicted CO₂ emissions is **63449.87 kgCO₂/yr**, this would equate to a reduction target of **37896.3 kgCO₂/yr**. In other words, providing the total site emissions of **25553.57 kgCO₂/yr** is achieved once improvements have been made to the calculations.

3.0 Predicted Annual Energy Demand

Based on using the specification outlined in table 1 above, this would create a total predicted energy demand for the development of **250,955.38 kWh/year**. The breakdown of this predicted energy demand can be seen in table 2 below. The figures quoted have been derived from the Design Stage SAP 10 Calculations for the development.

			Total Predicted Energy Requirement (kWh/yr)			Total Predicted Energy Requirement (kWh/yr)
			Space Heating	Water Heating	Lighting, Pumps, Fans	
Plot	No.	Units	Electric	Electric	Electric	
Plot 1	1	kWh/yr	377.5	518.53	20.05	808.44
Plot 2	1	kWh/yr	335.61	502.62	18.29	759.54
Plot 3	1	kWh/yr	237.54	526.40	20.18	674.35
Plot 4	1	kWh/yr	217.65	527.01	20.57	655.46
Plot 5	1	kWh/yr	541.72	616.86	38.44	993.43
Plot 6	1	kWh/yr	450.87	533.84	21.42	822.94
Plot 7	1	kWh/yr	366.01	535.62	21.42	739.85
Plot 8	1	kWh/yr	466.14	585.99	27.26	835.49
Plot 10	1	kWh/yr	509.51	584.90	27.26	877.77
Plot 9	1	kWh/yr	416.20	577.56	27.19	789.81
Plot 11	1	kWh/yr	606.56	617.08	31.88	941.33
Plot 12	1	kWh/yr	416.20	577.56	27.19	789.81
Plot 13	1	kWh/yr	606.56	617.08	31.88	941.33
Plot 14	1	kWh/yr	552.77	615.91	35.69	896.56
Plot 15	1	kWh/yr	552.77	615.91	35.69	896.56
Plot 16	1	kWh/yr	561.54	615.73	35.69	905.16
Plot 17	1	kWh/yr	620.78	614.42	35.69	963.09
Plot 18	1	kWh/yr	557.34	547.44	22.92	717.96

Plot 19	1	kWh/yr	557.34	547.44	22.92	717.96
Plot 20	1	kWh/yr	557.34	547.44	22.92	717.96
Plot 21	1	kWh/yr	610.14	613.97	31.09	941.02
Plot 22	1	kWh/yr	1,753.11	670.5	91.73	2,264.35
Plot 23	1	kWh/yr	610.14	613.97	31.09	941.02
Plot 24	1	kWh/yr	1,753.11	670.5	91.73	2,264.35
Plot 25	1	kWh/yr	627.69	614.91	31.52	966.32
Plot 26	1	kWh/yr	585.78	615.79	31.52	925.3
Plot 27	1	kWh/yr	792.92	630.23	36.34	1,151.59
Plot 28	1	kWh/yr	756.13	630.82	36.34	1,115.39
Plot 29	1	kWh/yr	792.92	630.23	36.34	1,151.59
Plot 30	1	kWh/yr	756.13	630.82	36.34	1,115.39
Plot 31	1	kWh/yr	954.95	627.57	35.75	1,182.78
Plot 32	1	kWh/yr	954.95	627.57	35.75	1,182.78
Plot 33	1	kWh/yr	954.95	627.57	35.75	1,182.78
Plot 34	1	kWh/yr	954.95	627.57	35.75	1,182.78
Plot 35	1	kWh/yr	1,104.21	636.61	43.17	1,380.26
Plot 36	1	kWh/yr	1,104.21	636.61	43.17	1,380.26
Plot 37	1	kWh/yr	1,163.82	630.41	38.46	1,333.36
Plot 38	1	kWh/yr	1,163.82	630.41	38.46	1,333.36
Plot 39	1	kWh/yr	1,061.59	629.86	37.35	1,280.54
Plot 40	1	kWh/yr	1,061.59	629.86	37.35	1,280.54
Plot 41	1	kWh/yr	1,101.56	629.39	37.35	1,320.03
Plot 42	1	kWh/yr	1,473.94	634.79	43.41	1,652.71
Plot 43	1	kWh/yr	1,473.94	634.79	43.41	1,652.71

Plot 44	1	kWh/yr	1,594.17	633.83	43.41	1,771.99
Plot 45	1	kWh/yr	1,414.63	634.02	42.44	1,642.72
Plot 46	1	kWh/yr	1,488.39	640.35	48.46	1,652.16
Plot 47	1	kWh/yr	1,488.39	640.35	48.46	1,652.16
Plot 48	1	kWh/yr	1,488.39	640.35	48.46	1,652.16
Plot 49	1	kWh/yr	1,488.39	640.35	48.46	1,652.16
Plot 50	1	kWh/yr	1,315.92	637.44	45.06	1,524.49
Plot 51	1	kWh/yr	646.89	613.38	31.09	977.19
Plot 52	1	kWh/yr	428.10	496.60	17.97	794.64
Plot 53	1	kWh/yr	423.59	499.65	18.29	790.3
Plot 54	1	kWh/yr	1,070.89	627.53	36.34	1,452.39
Plot 55	1	kWh/yr	861.91	612.30	31.29	1,261.50
Total	1	kWh/yr	46784.16	33266.24	1963.45	63449.87

Table 2: Baseline Predicated Annual Energy Demand

4.0 Reducing Carbon Emissions through Energy Reduction

The Energy Hierarchy sets out the most effective way to reduce a dwelling's CO₂ emissions. Firstly by reducing energy demand, then by using energy efficiently and lastly by incorporating LZC/Renewable technologies.

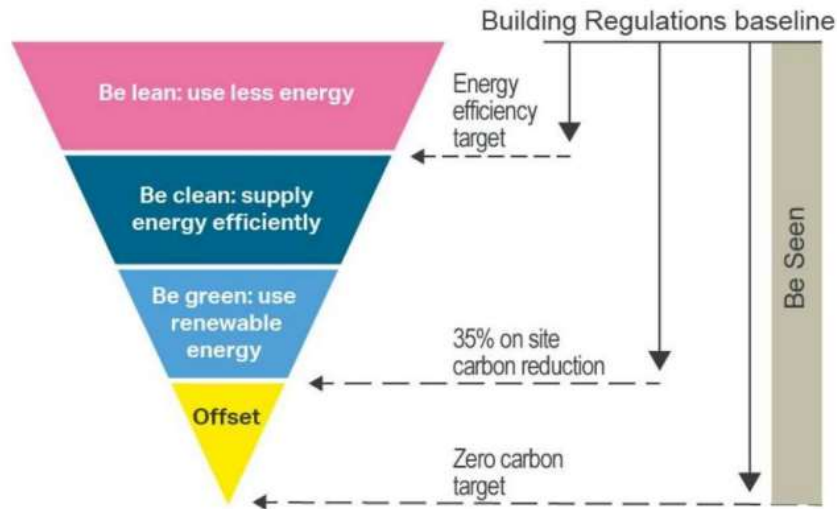


Figure 3: The Energy Hierarchy

Reducing the need for energy usage in the dwelling's design:

The first and most cost beneficial action is to reduce the amount of energy needed by the occupants of the dwelling whilst still maintaining or even improving the comfort conditions. A lot can be achieved through passive design, improving the dwelling's external fabric and following principles to reduce air infiltration.

The developer will reduce the energy demand and CO₂ emissions of the development by making the following fabric and energy efficiency improvements to the current Part L Building Regulations 2021:

Energy reduction strategies include:

- Adopting enhanced fabric specifications
- Installing high efficiency heating systems
- Incorporating energy-efficient lighting: 100% of all new lighting to be energy efficient
- Adopting principles of airtight construction
- All new windows will be double -glazed
- Passive Solar Design – Solar gain, solar shading, thermal mass
- Natural / Passive Ventilation strategy

5.0 Feasibility Study of Renewable Technologies

This section will assess the technical viability of the following renewable energy technologies for the site in order to rule out unfeasible options:

- Mast mounted wind turbines
- Roof mounted wind turbines
- Solar PV (Photovoltaic) Panels
- Solar Thermal Panels
- ASHP (Air Source Heat Pump)
- GSHP (Ground Source Heat Pump)
- Biomass
- CHP

The following observations have been made with regard to the technical feasibility of integrating renewable energy technologies into this development.

Renewable Technology	Feasible	Reasons
Mast Mounted Wind Turbine	No	There is no sufficient open land for a mast mounted wind turbine to be installed on site.
		The site is situated in a densely populated area. Surrounding properties aren't far enough away to be unaffected by turbine noise, reflected light and shadow flicker.
		The site area is surrounded by buildings and other obstructions that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 5 m/s at 10m, 5.7 m/s at 25m and 6.2 m/s at 45m height for the property postcode. Therefore, the wind speeds are not sufficient for a mast mounted wind turbine to be viable.
Roof Mounted Wind Turbine	No	The site area is surrounded by buildings and other structures that could cause uneven and turbulent wind patterns. Turbulent air conditions may reduce lifespan of components.
		Roof mounted wind turbines are not yet a proven technology and a number of technical problems have been identified by manufacturers which are being investigated to rectify these issues. Vibration that can be transmitted to the building structure. Noise from a turbine may cause irritation

		to occupants of the dwelling and adjacent buildings. Noise may also adversely affect ventilation strategy.
		Currently the BWEA suggests a large wind turbine to be viable where wind speed is 7m/s or above. According to the NOABL database the average wind speeds for the site is: 5 m/s at 10m, 5.7 m/s at 25m and 6.2 m/s at 45m height for the property postcode. Therefore, the wind speeds are not sufficient for a roof mounted wind turbine to be viable
Solar PV (Photovoltaic) Panels/Tiles	Yes	The proposed development has sufficient roof area for solar panels accommodation.
		Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
Solar Thermal Collectors	No	The proposed development has sufficient flat roof area that can accommodate solar thermal panels.
		Most of the roofs should be free from overshadowing for most of the day from other buildings, structures or trees.
		The site is located in the region with high level of global horizontal irradiation (1,000-1050 kWh/m2/year)
		Solar thermal collectors would be compatible with the planned heating system.
		There will be a year round hot water demand.
		In practical domestic solar hot water systems, the solar hot water system is usually run in conjunction with, rather than instead of, a backup conventional boiler and as a result the carbon intensity of the combined system is high relative to other renewables. Moreover the high efficiency of modern condensing boilers, which can convert over 90% of means that the carbon intensity of these heat sources is relatively low at 200-300 gCO ₂ /kWhth. As a result domestic solar water heating systems are a relatively expensive way of mitigating carbon emissions when they replace heat from efficient modern boilers. For this reason they are not recommended.
ASHP (Air Source Heat Pump)	Yes	The proposed development has been designed to accommodate the space for a hot water cylinder.

		The building is suitable for a low-grade heat distribution system (e.g. underfloor water system, oversized radiators). There is sufficient wall area to locate condenser units away from bedrooms and living rooms, which mitigates any potential noise issues. Domestic heat pumps have now been designed to be quiet enough that residents will not experience issues with noise. With an air source heat pump, you can save money on your energy bills and reduce your carbon footprint compared to a gas or electric heating system.
GSHP (Ground Source Heat Pump)	No	It may be possible to drill a limited number of vertical or horizontal boreholes for GSHP on the site. It is possible for developments to accommodate a low-grade heat distribution system (e.g. underfloor water system, oversized radiators). The site and neighbourhood may not have a suitable layout to accommodate the external plant equipment required for this kind of system. There is sufficient space inside all the proposed dwellings for the heat pump equipment.
Biomass Boiler	No	There is an established fuel supply chain for the area. There isn't sufficient space for a delivery vehicle (vehicular access to fuel storage, turning circle etc) There isn't sufficient space in the proposed buildings for a wood-fuel boiler and associated auxiliary equipment. There isn't sufficient space for fuel storage to allow a reasonable number of deliveries. Biomass systems are management intensive (fuel sourcing, transport, storage) and require adequate expertise from users.
CHP	No	There is a district heating system powering earlier phases of the development, however the network does not currently have the capacity to provide heating to this development, and there would be cost & feasibility issues to expand the network. A CHP unit only generates economic and environmental savings when it is running at least 4,500 hours per year. This equates to an average heat demand of about 17 hours a day for five days a week throughout the year. The proposed

		development energy and heat demand profile does not match this requirement.
		CHP is typically utilized on buildings with high electricity and heating demand for most of the year such as local authority buildings, leisure centres, universities, hotels, and district heating schemes where CHP is used to provide electricity, space and water heating.
		CHP should be considered wherever there is demand for electricity and an appropriate demand for heat in the near vicinity.

Table 4: Feasibility Study of Renewable Technologies

Based on the feasibility study in table 4 above, the following technologies have been identified as being feasible for the proposed development:

- ASHP
- PV

6.0 Improvements to Provide 28% CO₂ Reduction

The developer is proposing the following measures to improve the energy performance of the building:

Be Lean;

Improved Fabric U-values to-

- Walls: 0.19 W/m²K
- Floors: 0.12 W/m²K
- Roofs: 0.15 W/m²K
- High-Performance Double-Glazed Windows: 1.2 W/m²K

Be Clean;

Improved Space & DHW Heating System-

- Installation of a ASHP to provide space heating & DHW

Be Green

Renewable Energy Sources-

- High Efficiency ASHP with SCOP of min. 3.5 (Mitsubishi Ecodan or equiv.)

Table 5 below shows the percentage reduction in CO₂ emissions following the proposed heating and fabric improvements.

	Carbon Emissions (kgCO ₂ /yr)
Baseline	250,955.38
After Improvements	173,615.74
Total Reduction	77339.64
Percentage Reduction	30.8181%

Table 5: Percentage Reduction in Carbon Emissions following the above improvements

As can be seen from the above table, this development is achieving a 30.8181% reduction in predicted emissions. With its fabric first approach and use of LDC technologies, this proposed development promotes the goals of the Mid-Sussex development plan, in its ability to reduce heat demand, and then meet that demand by the most efficient means. The concentration on improving the fabric of the design to exceed best practice for the current times will not only help in the short term by reducing energy demands and CO₂ emissions now, but also allows the building to be future proofed and net-zero ready to meet further targets and needs that may be required in years to come.

Meanwhile, the use of an LDC technology to provide space heating & DHW also shows the developer's attitude to ensuring that the sustainable of the new homes provided is maximised, and the energy usage is minimised as much as possible.

Further Improvements

The Developer is proposing further improvements by including Solar PV on a small number of dwellings to increase the EPC rating to achieve a B rating.

The following Plots would require PV to achieve a B EPC rating

- Plot 1 – 0.3Kwp
- Plot 2 – 0.3Kwp
- Plot 3 – 0.3Kwp
- Plot 5 – 0.1Kwp
- Plot 6 – 0.2Kwp
- Plot 23 – 0.4Kwp

7.0 Water Efficiency

Policy DP39 also sets out a maximum water usage for all proposed residential developments of 110 litres/person/day. Below contains a water efficiency calculation that has been completed for this development;

Installation Type	Average Capacity/Flow Rate	Litres/Person/Day
Single Flush WC's	0	0
Dual Flush WC's	4.01	17.72
All WC's	4.01	17.72
Kitchen/Utility Room Taps	5	12.56
Other Taps	5	9.48
Baths	150	16.5
Showers	8.5	37.15
Dishwashers	1.25	4.5
Washing Machines	8.17	17.16
Water Softener		
Waste Disposal Unit	Not Present	0
Total Water Use	115.07 Litres/Person/Day	
Contribution from Rain Water	0 Litres/Person/Day	
Contribution from Grey Water	0 Litres/Person/Day	
Normalisation Factor	0.91 Litres/Person/Day	

Code for Sustainable Homes - Consumptions & Credits	
Water Consumption (Code for Sustainable Homes)	104.7 Litres/Person/Day
Credits Scored	3

Building Regulations 2000 AD Part G (2010 Ed) - Consumption	
External Water Use	5 Litres/Person/Day
Water Consumption (Building Regulation 17 K)	109.7 Litres/Person/Day

The proposed specification and capacities/flow rates shown which is to be used in all dwellings within this development allows for a total water consumption of 109.7 litres/person/day, within the limits set out by planning policy DP39.

8.0 Climate Change Adaptation

Planning policy DM39 requires that risks that future climate change associated with the development are identified, and remediation measures that are being considered to mitigate these risks are outlined. A risk assessment has been carried out for the development to evaluate the structural and fabric resilience to the effects of Climate Change, and the tables below evaluate the risks posed by a potential hazard, and outline how the design of the building minimises these risks, and mitigates against them as far as possible. Each risk has been rated based on the probability of it occurring, and the maximum potential damage it would cause. These ratings are as follows:

Likelihood	
1	Very Unlikely (within Lifetime)
2	Unlikely (within Decades)
3	
4	May Happen (within 10 Years)
5	
6	Likely (within a Year)
7	
8	Very Likely (within 6 Months)
9	Certain or Imminent
10	

Severity/ Consequence	
1	Delay Only
2	Minor Injury/Damage/Illness, (Not Lost Time)
3	
4	Significant Injury/Illness (Temporary Disablement), Damage, Difficult Working Conditions
5	
6	
7	Injury/Illness (Permanent Disablement), Pollution, Loss of Some Staff, Temporary Evacuation
8	
9	
10	Death, Significant Pollution, Unsafe Working Conditions, Permanent Evacuation

GREEN = No further measures required, **AMBER** = Tolerable, further measures required, **RED** = Immediate action required

The results of the climate change risk assessment can be seen below;

Solar radiation					
Area	Potential Damage	Likelihood	Severity	Risk	Risk Management Strategy
Structural Stability/Robustness	n/a	-	-	-	-
Weather Proofing and Detailing	Effect on colour coated render	4	1	4	
Material Durability	PVC breakdown over time	3	1	3	
Health and Safety to Building Occupants	Glare	4	1	4	
Impacts on building contents and continuity	Discolouration and fading of desks	3	1	3	

Temperature Variation					
Area	Potential Damage	Likelihood	Severity	Risk	Risk Management Strategy
Structural Stability/Robustness	Cracks/collapse from freeze-thaw weathering. Damage to rendered elevations	4	2	8	
Weather Proofing and Detailing	Potential for Blistering/Melting/Warping; Mildew/Mold from increased humidity	5	3	15	Specify building materials that are resistant to all relevant types of extreme or changeable weather. Utilise treated material to improve lifespans, and reduce the need for maintenance post construction
Material Durability	Bricks are susceptible to degradation from freeze-thaw weathering if not maintained	4	3	12	Specify freeze-thaw resistant bricks to remove the need for repairs or replacement in the future.
Health and Safety to Building Occupants	Potential for overheating	3	4	12	Completion of a TM59 Overheating analysis for a future climate situation at RIBA stage 4 to allow for consideration for the cooling & ventilation strategies to meet predicted climatic conditions for 30 year & 50 year scenarios.
Impacts on building contents and continuity	Mildew/Mold from increased humidity	3	2	6	

Water/Moisture					
Area	Potential Damage	Likelihood	Severity	Risk	Risk Management Strategy
Structural Stability/Robustness	Leaching, Warping/Swelling/Buckling, Rot	2	3	6	
Weather Proofing and Detailing	Rot, Leaching, Rust	4	2	8	
Material Durability	De-lamination, Rot, Leaching, Mildew/Fungi/Mold, Rust, Warping/Swelling/Buckling	6	2	12	Conduct Indoor Air Quality modelling to ensure ventilation systems specified are fit for purpose and provide the correct provision of fresh air, and dilution of pollutants and to remove moisture internally that could cause damage to relevant building materials.
Health and Safety to Building Occupants	Flooding, Leaks, Mildew/Fungi/Mold leading to health problems	3	8	24	Conduct a Flood Risk Analysis and SUDs feasibility study to identify and implement a bespoke drainage system that meets the needs of the site presently, and in a predicted future climate scenario.
Impacts on building contents and continuity	Flooding, Leaks, Mildew/Fungi/Mold, corrosion	3	8	24	Conduct a Flood Risk Analysis and SUDs feasibility study to identify and implement a bespoke drainage system that meets the needs of the site presently, and in a predicted future climate scenario.

Wind					
Area	Potential Damage	Likelihood	Severity	Risk	Risk Management Strategy
Structural Stability/Robustness	Collapse, Abrasion, Corrosion	2	9	18	Ensure structural designs for the home take into account potential increases in average wind speeds.
Weather Proofing and Detailing	Abrasion, Corrosion	3	2	6	
Material Durability	Abrasion	3	2	6	
Health and Safety to Building Occupants	Collapse of building would cause danger, entrapment, death	1	10	10	
Impacts on building contents and continuity	Collapse of building	1	10	10	

Precipitation (Rain/Snow)					
Area	Potential Damage	Likelihood	Severity	Risk	Risk Management Strategy
Structural Stability/Robustness	Corrosion, Collapse due to snow weight, Leaching	3	4	12	Snow load calculations will need to be produced for all roof areas, and these calculations will need to take into account and designs need to make allowances for future predicted snowfall levels.
Weather Proofing and Detailing	Corrosion, Rust	4	2	8	
Material Durability	Corrosion, Leaching, Discolouration, Rust	5	2	10	
Health and Safety to Building Occupants	Flooding due to rain/snow melt, Entrapment due to flash floods/roof collapsing from weight of snow.	2	8	16	Conduct a Flood Risk Analysis and SUDs feasibility study to identify and implement a bespoke drainage system that meets the needs of the site presently, and in a predicted future climate scenario.
Impacts on building contents and continuity	Flood damage, frozen pipes leading to lack of water/heating, Roof collapsing from weight of snow	3	7	21	Ensure building services are designed to operate during extreme weather conditions and have frost protection facilities to prevent failure at extreme temperatures. Snow load calculations also to be completed.

Extreme Events (e.g. Storms, Floods, Ground Movement, Fire etc)					
Area	Potential Damage	Likelihood	Severity	Risk	Risk Management Strategy
Structural Stability/Robustness	Collapse, fire/lightning damage, cracks, subsidence	3	3	9	
Weather Proofing and Detailing	Collapse, fire/lightning damage, cracks	5	1	5	
Material Durability	Fire/lightning damage, flood water damage (rot, mildew etc), cracks	5	2	10	
Health and Safety to Building Occupants	Electrocution, drowning, entrapment, injury from building collapse	1	10	10	Natural hazard risk assessment would provide a look into the potential extreme events that could be present in the area in a predicted climate scenario.
Impacts on building contents and business continuity	Fire/Flood damage, Building collapse, power surges, equipment destruction	2	10	20	

Appendix A:

BREs for all dwellings & SAP Summary Sheet