

Gladman Developments Ltd

Land at Henthorn Road

Clitheroe

Renewable Energy & Sustainable Resources Strategy

&

Building for Life Evaluation



July 2010

1 SUMMARY

1.1 Renewable Energy

1.1.1 Chapters 2-4 review the various levels of policy relating to renewable energy and sustainable resources. It considers the technological options available and assesses their suitability given the characteristics of the application site.

1.1.2 Chapter 5 concludes that:

- It is evident that the vast bulk of the requirements of National policy and Local aspirations can be met through an assessment under the Code for Sustainable Homes to meet the Level 3 standard.
- Through the application of solar thermal systems, to provide the maximum feasible solar contribution to domestic hot water needs (plus some PV to certain properties if necessary) the RBVC requirement to meet 10% of predicted energy requirements through on-site renewable energy supply can be feasibly achieved.

1.1.3 It will lie within the ambit of subsequent Reserved Matters Applications to meet these policy requirements in full.

1.2 Building for Life Evaluation

1.2.1 Chapter 6 assesses the application proposals against the 20 criteria set out in RVBC's Building for Life Evaluation Table (which is included at Appendix A).

2 POLICY FRAMEWORK

2.1 National Policy

2.1.1 PPS1 (Climate Change Supplement) and PPS22 (Renewable Energy) set out the national policy framework relating to renewable energy and sustainability. This national policy is being reflected in emerging LDF documents.

2.1.2 In parallel with this, and entirely separately, CLG has also set out an ambitious programmed uplift in national building regulations, complied with through Building Control, and backed by statutory instruments, in the form of the Building Regulations Approved Documents. This trajectory, set out in December 2006 in Building a Greener Future and formally reiterated in the 2007 Housing Green Paper.

2.2 Local Policy

2.2.1 The preparation of the 1998 adopted Ribble Valley Districtwide Local Plan (RVDLP) was well in advance of more recent developments in energy policy. Policies ENV24, ENV25 and ENV26 set out the policy framework for larger renewable energy proposals; there are no specific Local Plan policies relating to on-site renewable generation.

2.2.2 During pre-application discussions with RVBC, the applicant was informed the Council was seeking to ensure future housing development can meet 10% of predicted energy requirements through on-site renewable energy supply.

3 CODE FOR SUSTAINABLE HOMES STANDARDS

3.1 Introduction

3.1.1 Given the development of National Policy in advance of local policy on this matter, it is proposed to assess the scheme under The Code for Sustainable Homes. This section discusses the approach to compliance with the Code.

3.2 Minimum Mandatory Standards within the Code

3.2.1 The Code for Sustainable Homes has been expressly formulated to promote best practice, encourage innovation, and signal future direction of travel for future reform of technical standards through the Building Regulations.

3.2.2 The Table below shows the mandatory minimum standards within the Code for Sustainable Homes:

	Code Level 3	Code Level 4
Energy	25% reduction in emissions	44% reduction in emissions
Water	105 litres/person/day	105 litres/person/day (same)
Waste	Site Waste Management Plan in place Adequate external bin store	Site Waste Management Plan in place Adequate external bin store
Runoff	Ensure that peak run-off does not exceed previous condition	Ensure that peak run-off does not exceed previous condition
Materials	Ensure 3 of 5 key elements meet Green Guide Rating of D or more	Ensure 3 of 5 key elements meet Green Guide Rating of D or more

3.2.3 Since these standards were set in December 2006, both national policy, and broader regulations have indeed developed, in part as anticipated at the time by CLG. As a result, rising national minimum standards will increasingly "catch up" with Code, as all development is required to meet them. To that extent, the Code has a built-in obsolescence as a tool to promote best practice. The Code is also regularly reviewed 6-monthly to maintain its consistency with emerging regulatory change, and the state of available technical knowledge.

3.2.4 While the energy credit minimum threshold at CSH3 of a 25% reduction of regulated emissions is enshrined in national Building Regulations from 2010, the credits required will demand standards significantly higher than regulatory minima across the wide range of other areas covered by the Code.

3.2.5 The application of any on-site renewable/LZC requirement in parallel, is likely in practice to work with the new National Minimum Standards to cause individual dwellings to overshoot the 25% threshold to some degree once detailed designs are assessed using the Revised National Compliance Methodology tool, also known as SAP2009. This is in essence because new energy efficiency standards are likely to be applied, across a number of areas, including lighting where there is no trade-off against key renewable technologies, such as solar thermal in particular.

3.3 Achieving Code Level 3

3.3.1 As an Outline Application, much of the detail which is required to complete a Code assessment is yet to be determined. This section demonstrates the issues surrounding how compliance at Code Level 3 would be achieved.

Energy Requirements

3.3.2 The detailed upgrade path is dependent on individual dwellings, their size, planform and orientation, as well as significant detailed design variations, such as size and positioning of fenestration. The NCM is also undergoing substantial modification at this time, in order to make it better capable of accurately assessing the performance of much lower energy buildings in the immediate future. Model specification and parameters are therefore subject to change, and at the point when Reserved Matters and Building Regulations approvals are sought, the new Approved Documents will be in force.

3.3.3 However it is submitted to offer transparency and some certainty that the application of the CSH Level 3 standard does indeed demand significant improvements over national minimum current standards in order to achieve the threshold, and indeed, when taken together with the separate LZC threshold of 10%, is likely to exceed 2010 standards by some margin.

3.3.4 The biggest changes in SAP2009 are likely to be the deletion of the need for secondary heating, the potential to assign emissions reductions from 100% Compact Fluorescent Luminaries (CFLs; "low-energy bulbs" to the layman) compared to 30% today; and the imposition of a significantly higher minimum thermal performance standard, the definition and compliance route are still matters of ongoing debate. Therefore, application of the standards set out below may be more likely to achieve a higher nominal emissions reduction than the current NCM (SAP2005) would produce.

3.3.5 The table below sets out the potential generic upgrade path for energy standards of Code for Sustainable Homes Level 3/4:

Housing/FOGs: 40dpHa +		
Part L 2006 Compliant	Code Level 3	Code Level 4: As CSH3 plus:
<ul style="list-style-type: none"> • Air permeability 8.0 • Wall U=max 0.35 • Roof U=0.15 • Heating load compensation • Argon-filled sealed units centre pane U=1.5 • Front Door U=1.4 • Thermal Bridging Y=0.08 or more 	<ul style="list-style-type: none"> • Air permeability 5.0 or better • Wall U=max 0.27 • Roof U=0.11 • Zoned Heating and load compensation • Solar thermal at maximum coverage • Argon-filled sealed units centre pane U=1.4 • Front Door U=1.0 • Thermal Bridging Y=0.05 	<ul style="list-style-type: none"> • Air permeability 1.5 • Wall U=max 0.21 • Roof U=0.11 • Floor U=0.11 • Closed panel timber frame, Airguard APM and 2.5mm service void • Whole house MVHR • Krypton-filled sealed units centre pane U=1.1 • May need modest PV installation • Thermal Bridging Y=0.03 may be rational
Housing: 30-40 DpHa		
<ul style="list-style-type: none"> • Air permeability 8.0 • Heating load compensation • Argon-filled sealed units centre pane U=1.5 • Front Door U=1.5 • Thermal Bridging Y=0.08 	<ul style="list-style-type: none"> • Air permeability 5.0 • Zoned Heating and load compensation • Solar thermal at maximum coverage • Argon-filled sealed units 	<ul style="list-style-type: none"> • Air permeability 1.5 • Wall U=max 0.21 • Closed panel timber frame, Airguard APM and 2.5mm service void • Whole house MVHR

	centre pane U=1.4 • Condensing Gas secondary heating • Thermal Bridging Y=0.05	• Krypton-filled sealed units centre pane U=1.1 • May need modest PV installation • Thermal Bridging Y=0.03 will be needed
--	--	--

3.3.6 The mandatory 25% emissions reduction required at Code Level 3 can in theory be achieved on houses without the need for renewables. It would demand that the space heating load be reduced radically however; by about half, from about 70kWh/sqm/annum to a target of between 30-40 kWh/sqm/annum. This needs balanced whole-house controlled ventilation with heat recovery. As a minimum, improved wall U-values to less than 0.21W/m²/K and improved air-tightness to less than 2ACH/@50Pa. (5m³/hr/m²), and mechanical ventilation with heat recovery is required, with minimum 75% CFL and zoned heating controls. For mid terraces it would probably involve high performance triple glazing (U=1.0) and wall constructions approaching Passivhaus standards (Walls U<0.15).

Meeting Water Use requirements

3.3.7 Managing internal water efficiency; and the mitigation of Surface Runoff are two aspects of water use which will be addressed:

Potable Water Use: WAT1 Credits

3.3.8 Reducing potable water use is assessed through a water use calculation model within the Code, to meet criteria WAT 1. It is proposed that a modified version be used to assess compliance against proposed Revisions to AD Part G of the Building Regulations, from 2009. The 105litres/person/day benchmark is a near 30% reduction over notional average use in the North West Water Region, and as such is quite challenging.

3.3.9 The BRE water calculator model is as specified below, and is not based on the number of installations fitted, but on the use of a given type of installation. Obviously occupants do not use the toilets more if they have more en-suites, for example. However some estimate parameters are open to question; it is assumed all baths are filled to 40% full for example, and estimates per person on household appliance use seem very crude (assume all dwellings have a three-person occupancy before multiple daily cycles are needed).

3.3.10 A row needs to be created for each extra fitting and the proportion figure adjusted accordingly, though if all toilets are the same model, for example, this should not be necessary. The table below sets out the BRE Potable Water Use Calculator for Code for Sustainable Homes:

A	B	C	D	E	F	G
Installation Type	Unit of measure	Capax./ Flow rate (Default)	Use factor	Proportion in dwelling (one/nil installed)	Uses/ person/ day	Litres/ person/ day
WC fixed flush	Flush	<i>6</i>	1		4.8	
WC dual flush	Full flush Part Flush	<i>6</i> <i>4</i>	0.33 0.67		4.8 4.8	
Bidet	Per use	2.64	1		2	
Wash hand basin	l/min		0.67		7.9	
Shower	l/min		5.0		0.6	
Bath	capax to overflow		0.4		0.4	
Kitchen sink	l/min		0.67		7.9	
Washing Machine	Per cycle	<i>49</i>	1		0.34	
Dishwasher	Per cycle	<i>13</i>	1		0.3	
Water softener	Per use	12.5	1		1	

Bold values are fixed within the model

Italic default values can be reset with reference to the specification as designed/built

3.3.11 Empirical use of the calculator and experience suggests that use of flow restriction and low-capacity baths, along with reductions in the flush capacity of WCs, can achieve the Level 3 benchmark.

3.3.12 However, parallel changes to the Water Supply (Water Fittings) Regulations 1999 with a view to setting new performance standards for key fittings that can be installed, as part of changes to Part G of Building Regulations that are imminent, is likely to lead to some adjustment. It is possible, though unclear how likely, than the specification of non-potable supply (rainwater or grey-water harvesting, for example) may be required. This would radically affect a number of technical and design areas as well as consumer acceptance.

External Potable Water Use: WAT2

3.3.13 The average rainfall in the north west, and Ribble Valley Borough specifically, is above the national average, benefiting in parts from localised orographic enhancement. More generally, the site will benefit from the fact the region is directly exposed to prevailing moisture-laden Atlantic Maritime airflows for much of the year.

3.3.14 Under the Code, reduction in external potable water use is addressed by the Credits under WAT2, related to the provision of external water butts. These must be of 200l minimum capacity, covered to prevent children falling in, and on a paved base, with a plumbed overflow into a compliant gully.

3.3.15 The provision of such water butts makes no contribution to the reduction of surface water runoff, audited under Code SUR1 Credits, as the Code Technical Guidance assumes that the Butt will be full, especially in extreme rainfall events.

- 3.3.16 It is extremely likely that these Credits will be sought by the developer, to meet the requirements of Code itself.

Addressing Surface Water Runoff, and the potential for Sustainable Urban Drainage Systems

- 3.3.17 Credit Area SUR1 deals with measures to reduce and delay surface runoff, in effect incentivising Sustainable Urban Drainage Systems (SUDS), among a number of possible measures. More detail on the approach to be taken with this regard is contained within the FRA submitted with this application.

- 3.3.18 The overarching philosophy is to ensure measures are taken to ensure nil detriment to undeveloped runoff rates are achieved.

- 3.3.19 Credit Area SUR2 incentives developers selecting sites outside areas of identified flood risk. The proposed housing will be constructed outside EA Flood Risk Zones. Accordingly both Credits under this area would be achievable.

Meeting other Credit Categories within Code

- 3.3.20 Once floor benchmarks for energy and water use are set, and other now-statutory requirements are met, extra points are required which can be met from enhancing performance further against either these or other categories.

- 3.3.21 Level 3 Requires a minimum of 57 Points. In practice developers would be well-advised seek to ensure post-compliance audit by aiming a little higher than this.

- 3.3.22 Minima for Emissions and Internal Water generate a total of just 9.5 points after the weightings are applied. At least 48 other points must be awarded out of 100.

3.3.23 The table below sets out a summary of Code for Sustainable Homes scoring system at Level 3:

Category	Credits	Weighting Factor	Points Generated	HCA Required	Likely Targeted Credits
Energy	29	1.255	36.4		
a) emissions reduction	15				○
Level 3 minimum	4				
b) Heat loss parameter	2				(○)
c) Internal Lighting	2				
d) External Lighting	1				
e) Renewables/LC	2				○
f) cycle storage	2				○
g)home office	1				○
Water	6	1.5	9		
Level 3 minimum	3				
Internal	5				○
External	1				○
Materials	24	0.3	7.2		
Environmental Impact	15				○
(Green Guide Rating)					
FSC etc structural	6				
FSC etc finishing	3				
Surface Water Runoff	4	0.55	2.2		○
Waste	7	0.915	6.4	●	○
a) construction	2				○
b) household	4				○
c) composting	1				○
Pollution	4	0.7	2.8		
global warming potential	1				
NOx emissions	3				○
Health and Wellbeing	12	1.16	14		
a) daylighting	3				
b) sound transmission	4				
c) Amenity Space	1			●	
d) Lifetime Homes	4			●	
Management	9	1.111	10		
home user guide	3				○
Considerate Contractor	2			●	○
Construction site impacts	2				○*
Security	2			●	○
Ecology	9	1.333	12		
value	1				
enhancement	1				
protection	1				○
increase in biodiversity	4				○
footprint (site coverage)	2				○
TOTAL	104		100		57 or more

3.3.24 The final column shows the areas where later detailed design work would seek to demonstrate that all reasonable attempts have been made to secure at least some if not all the Credits available under the category. It can readily be seen that a very wide range of other categories will need to be addressed, and that any shortfall still gives plenty of scope to achieve or exceed the threshold through application of further consideration to other Credit Categories.

4 ON-SITE LOW-CARBON ENERGY REQUIREMENT

4.1 Introduction

4.1.1 It is conceivable that the 25% regulated emissions reduction required by Code Level 3 and future changes to Building Regulation planned in 2010 could be achieved without the need for on-site renewable (or low-carbon) energy production.

4.1.2 RVBC's desire that a proportion of energy requirements be met from on-site renewable installations, in effect overlapping with the Code, under Credit Area ENE7.

4.2 Defining Predicted Energy Requirements

4.2.1 The carbon intensity of different fuel/power sources varies very greatly, and within SAP is reflected by the application of "fuel factors", that when applied to energy from specific sources, generate the predicted emissions. Today, SAP places the carbon intensity of displaced mains electricity at 0.568kg CO₂/kWh, nearly three times that of natural gas at 0.19 kg CO₂/kWh. These factors may well be adjusted within SAP2009.

4.2.2 The table below shows BRE Benchmark estimates of the sources of Domestic Carbon Emissions at current Building Regulations Part L1A 2006:

Units	Space Heating	Domestic Hot Water	Lighting and appliances	TOTAL
kWh	38.25%	33.35%	28.4%	100%
Carbon Intensity Fuel Factor	Gas 0.19 kgCO ₂ /kWh	Gas 0.19 kgCO ₂ /kWh	Grid Electricity 0.568 kgCO ₂ /kWh	
Proportion of emissions kgCO ₂	28.2%	24.5%	47.3%	100%

4.2.3 These figures vary across dwelling typologies, in particular where compact multi-storey typologies and formats such as single aspect apartments within a block significantly further reduce heat loss due to the very limited amount of external wall area relative to enclosed volume. In such cases, the proportion attributable to DHW rises significantly to become the largest contributor to emissions.

4.2.4 SAP2005, and its successor SAP2009, represent the National Compliance Methodology for emissions mitigation in domestic buildings. The table at 4.2.8 calculates likely emissions scenarios that would represent likely regulatory minima for energy efficiency and the current likely changes to SAP.

4.2.5 The assumptions used involve a significant upgrade in thermal performance of individual building elements over those parameters generally needed for compliance with 2006 Part L1A. They also involve a significant improvement in air permeability, to the minimum needed before whole-house balanced mechanical ventilation is required, and marked reduction in thermal transmittance through repeated thermal bridging. Finally, rather than SAP2005 factors for displaced grid electricity, a lower factor of 0.502 has been used, which reflect the likelihood the fuel factors in SAP2009 will be changed, downwards, from that in SAP2005.

4.2.6 The table below shows the generic specification for empirical SAP assessment of generic standard dwellings:

Housing: 30-40 DpHa		
Typical Part L 2006 Compliant	Typical Code Level 3 Compliant	AS MODELLED: Notional Part L 2010 Compliant plus enhancements
<ul style="list-style-type: none"> • Air permeability 8.0 • Heating load compensation • Secondary heating Gas • 30% CFL • Wall U=0.35 • Roof U=0.15 • Argon-filled sealed units centre pane U=1.5 • Front Door U=1.5 • Thermal Bridging Y=0.08 • SEDBUK=0.88 	<ul style="list-style-type: none"> • Air permeability 5.0 • Zoned Heating and load compensation • Secondary heating gas • 30% CFL • Solar thermal at maximum coverage • Argon-filled sealed units centre pane U=1.4 • Condensing Gas secondary heating • Thermal Bridging Y=0.05 • SEDBUK 0.9 	<ul style="list-style-type: none"> • Air permeability 5.0 • Zoned Heating/ load compensation • No secondary heating • 100% CFL • Wall U=0.21 • Roof U=0.11 • Argon-filled sealed units centre pane U=1.4 • Front Door U=1.1 • Thermal Bridging Y=0.05 • SEDBUK=0.913

4.2.7 The table below shows the Gladman empirically-derived benchmarks for predicted energy demand by dwelling typology (results from likely 2010 ADL1A methodology):

		(2-bed) Top-floor flat/FOG	(2-bed) Mid terrace	(3-bed) End terrace	(3+-bed) MT 3- storey	(4-bed) Detached
House type		2F663	2H713	3H918	4T1350	4H1256
Total floor area (m ²)		61.6	66.2	85.3	125.4	116.7
Energy Requirements (kWh/annum)	Space Heat	3,132	1,891	2,596	3,155	4,241
	DHW	2,356	2,433	2,742	3,346	3,219
	Fans and Ancillaries	250	250	250	250	250
	Lighting	298	302	385	591	521
	Cooking	1,167	1,270	1,278	1,472	1,417
	Non-reg Appliances	727	928	925	1,062	1,046
	Total					
Carbon Dioxide Emissions (kgCO ₂ /annu m)	Space Heat	595	359	493	599	806
	DHW	448	462	521	635	612
	Fans and Ancillaries	126	126	126	126	126
	Lighting	150	152	193	297	262
	Cooking	222	241	243	280	269
	Non-reg Appliances	365	466	464	533	525
	Total	1,906	1,806	2,040	2,470	2,600
Total Emissions/m ² (kgCO ₂ /m ²)		30.9	27.3	23.9	19.7	22.3
<p><i>Notes</i></p> <ul style="list-style-type: none"> • Standard total floor areas (TFA) have been assumed per dwelling type. • The figures provided are calculated under SAP2005 for dwellings build to the Approved Document L1A 2006 regulatory standards. Cooking from NHER algorithm. Appliance loads from Code Level 6 with cooking loads from BREDEM12/NHER algorithm subtracted. Aspect E-W (worst case) • Lighting at 100% CFL as per SAP2005 Appendix L • Nil Secondary Heating: Primary heating as per SAP2005 calculation • The carbon emissions assume that the heating, hot water and cooking fuel is mains gas for all dwelling types. • It is assumed that no secondary heating is provided and that the entire space heating and hot water requirement is met by the main heating system (91.3 per cent efficient). • The carbon emissions incorporate production, delivery and appliance conversion losses. • Carbon Intensity Factors Gas=0.1935kgCO₂/kWh, mains power=0.502kgCO₂/kWh. 						

4.2.8 It is immediately apparent that for detached houses in particular, improvements to building fabric reduce the notional predicted energy demand very substantially over the CBC/EST benchmarks based on 2006 minimum compliance. In fact, any SAP-generated analysis will be sensitive to a full range of parameters. As mandatory efficiency standards increase, this sensitivity increases, arguably making the use of rules of thumb less meaningful.

4.2.9 Given that the NCM will probably change in 2010 to mandate a range of higher energy efficiency standards, and that Code for Sustainable Homes Level 3 requires only the same 25% regulated

emissions reduction as the revised Building Regulations, there is scope to align compliance with Code and RVBC requirement, whilst still ensuring that the existing Policy intent to mandate a higher than minimum standard of emission reduction is achieved, within a unified compliance route.

- 4.2.10 This is because:
- the 10% LZC Policy benchmark includes all emissions, not just regulated ones, raising the benchmark for emissions reductions substantially, over those regulated emissions considered by national regulations. The 10% proportion of energy demand from renewable energy (although not from low-carbon sources) would thus mitigate regulated emissions by up to 23.25%, before mandated energy efficiency standards over the current national standard are considered
 - The new NCM, SAP2009, will allow for a wider range of energy efficiency measures than is allowed for by SAP2005, including a higher proportion of high-efficiency luminaries, and the dropping of assumptions that secondary heating will be incorporated. This will be accompanied by requirements for a higher standard of thermal performance, though the exact compliance route and benchmarks are as yet not set. These on their own are likely to see actual emissions reductions, before application of LZC technologies, approaching 15% of regulated emissions, for a fairly readily achievable efficiency upgrade.
 - SAP2009 should incorporate a nationally-accepted algorithm for residual non-regulated appliance loads, as discussed above.
- 4.2.11 It is therefore proposed that 10% of total emissions from predicted energy use, as defined by SAP (TER) plus the prevailing nationally-approved methodology or algorithm for calculating appliance loads (SAP2009 or Code for Sustainable Homes otherwise), and measured in kgCO₂/annum (not kgC/annum, in order to be aligned with SAP) shall be displaced by on-site low and/or zero carbon sources.
- 4.2.12 The benchmark shall be the SAP reference TER at 2010 levels (i.e. the 25% reduction from all measures), plus non-regulated emissions as calculated by the approved methodology for compliance with CSH Level 6. Therefore, the LZC solution shall also contribute, as necessary and/or appropriate, to meeting the 25% regulated emissions reduction required both by Code Level 3 and National Building Regulations ADL1A 2010.
- 4.2.13 This could be probably achieved for most dwelling houses (not flats) by ensuring the equivalent of a minimum of 24% of regulated emissions are displaced by LZC technologies. Given that this gives scope for typology-dependent variations to be accommodated, whilst clearly exceeding national regulations and the code Level 3 requirement for each dwelling, such an approach seems both practical and justifiable. It is also quite ambitious.
- 4.2.14 It is therefore proposed in the first instance, at Outline application stage, that the generic SAP assessment of generic types be the basis of calculating the predicted emissions benchmark, using the empirical data submitted above and incorporating the CSH algorithm for appliance loads. This will also include some other generic housetypes for representativeness.

4.2.15 Outline consent could deal with any residual uncertainty by condition, to be discharged by a Renewable Energy Statement accompanying any Reserved Matters Application, that complies with this same basic methodology, with SAP-derived data as the benchmark for the submitted planning layout, to derive the benchmark for the 10% of total predicted emissions defined as above.

4.3 Appropriate On-site Low-Carbon Energy Supply Technologies

4.3.1 A brief analytical synopsis of a range of admissible technologies is included here, reflecting the body of knowledge increasingly understood by stakeholders in the development sector, and following both academic research and monitoring of specific installations, including that at Buckshaw Village Site B, in South Ribble District. This is in line with typical Merton Rule requirements and is also set out within the compliance requirement of ENE7 within the Code for Sustainable Homes.

Wind Energy

4.3.2 The kinetic energy in any flow of fluid is directly proportional to its mass. It also increases by the square of the velocity: doubling the speed therefore increases the energy by four times:

m = mass of air going through a turbine

v = velocity of airflow

ρ = density of air (around 1.225 kg/m³ at sea level)

r = length of turbine blade

$$E = \frac{1}{2} mv^2$$

4.3.3 The mass of airflow is directly proportional to the swept area of the turbine: the larger the area the more air mass. As the area is proportional to the square of the radius, doubling the size of the rotor increases its area (and so the air mass) by four times.

$$m = \rho(\pi r^2)$$

4.3.4 This has two very major implications for wind turbine design:

- The higher the wind speed the better, but structures have to be robust enough to deal with the geometrical increase in dynamic loads as the wind speed increases
- The larger the diameter of the turbine the better, but the size of the structure and the loads on it increase with system size.

4.3.5 Unlike photovoltaics, or solar thermal systems, wind turbines are mechanical devices with moving parts. This reduces their viability due to mechanical failure and maintenance, as they need regular attention to keep them operating optimally. The other issue that turbines face is that while they work well in stable airflows, they are unable to generate in light or very strong winds (though some are capable of functioning at very high wind speeds), and they need to reorient themselves whenever the wind direction changes.

4.3.6 In the context of a lowland urbanised environment, the systems will operate in airflows that are inherently turbulent, substantially reducing their effectiveness.

4.3.7 Onshore micro-wind turbine systems are a far from proven renewable energy technology. In fact, it is becoming clear that the engineering difficulties associated with this technology in the urban context are so great as to be all but practically insurmountable.

4.3.8 A Report issued by the Carbon Trust in June 2008 summarises the difficulties assessing the potential contribution of urban small-scale domestic installations succinctly:

"While in general, the suitability of micro-generation technologies depends on building type and energy demand profile, few types of micro-generation are affected significantly by the built environment in which they are installed.

Small wind turbines, by virtue of needing to be exposed to high wind speeds, are affected in this way. While there is considerable experience of successfully installing turbines in open, exposed rural areas, understanding how they will perform in urban locations is technically challenging:

- *There has been limited research into urban small-scale wind energy, and both theoretical and empirical evidence of performance is limited; and*
- *While much can be drawn from existing theory, the best methods for assessing the performance of small turbines in urban areas are unclear."*

4.3.9 The largest single piece of empirical research into the performance of micro-wind generation in the UK, the so-called Warwick Trials, reported in 2008. In almost all circumstances, the actual power output in urban contexts was poor or very poor, in a large number of cases negligible to the point that the parasitic loads demanded from the mains to operate control systems were not repaid by generation over the year.

4.3.10 The BERR National Wind speed database is a very crude means of assessing the wind regime at a given locality. Data is offered as a notional average at a 1km grid square resolution. It is far from being a fully empirically derived model. It tends to underestimate the speeds near the coast, and over-estimate them inland, when compared with empirical data generated by long-term monitoring on site. Within a grid square there will be potentially great variation of average wind speeds, especially nearer ground level where surface roughness and the effects of topography, buildings and vegetation are exponentially greater in significance. On the site, the mean estimated wind speed at 10m AGL is 4.1 m/sec, which is typical for the locality and more broadly, the kind of local topography, which is open and rural, with relatively few buildings or trees.

4.3.11 It is recommended that micro-turbines are sited as far from obstacles as possible, and at least 9m above the nearest obstacle, to benefit from reasonably stable laminar airflow. In a developed context, this would be 9m above ridge height. It would be necessary to mount turbines on tall structures, on which the dynamic loads would be magnified by bending moments the longer they become. In fact, it is almost inconceivable that it would be practical to mount them on the built fabric, because of the loads on the structure.

- 4.3.12 It is especially notable, in the context of this site, that at Buckshaw Village, no fewer than three micro-turbines were fitted by Barratt Manchester in 2007, in a suburban context, to evaluate their performance. This was done by Manchester University. All performed extremely badly, mainly because they were mounted inappropriately, generally on gable ends and only 2-3m above roof ridges. One on a 2-storey property was down-wind of the gable end of a large footprint deep plan unit, and was almost never able to operate meaningfully. In February 2007 a winter storm event took place that led to the complete structural failure of two of the three, in one case bending the mounting pole about 30° out of vertical. One of the turbines was never able to develop a meaningful output because of the failure of the control systems.
- 4.3.13 The sensitivity of wind turbines to siting is acute, and all the more in urban contexts nearer ground level. When the effects of satisfactory urban design, not least to take due regard for the need to incorporate passive solar gain; and other aesthetic and amenity impacts, are placed in priority above the siting requirements of wind installations in this way, in practice an effective installation is quite impossible.
- 4.3.14 To achieve an engineering solution that would allow meaningful wind energy to be harnessed safely and consistently on this site is not a credible proposition. The best that could be envisaged might be one or two free-standing turbines, probably vertical axis, and would require siting on guyed masts in excess of 25m tall, probably within a large open space area. When amenity, noise, flicker, structural issues and risk of uncontrolled installation failure and destruction in high wind speeds are considered on top of this, the specification on the application site is considered inappropriate.

Hydro-power

- 4.3.15 Hydropower installations depend entirely on a consistent high-volume flow of water, and the availability of sufficient fall to create a meaningful hydrostatic head.
- 4.3.16 The site gently undulating and elevated above the main local watercourse, the River Ribble. Whilst the creation of attenuation ponds and the existing partially culverted existing water course to represent water resources on site, the discharge seems likely to be well below the volume required to represent a suitable environment for this method of generation.

Landfill Gas/Anaerobic Digestion

- 4.3.17 There are no onsite or near-site sources of landfill gas. In fact, harvesting and processing such gas, in order to both remove impurities (especially sulphur compounds) and increase its calorific value, tend to require considerable scale, as well as specialist plant, which is appropriately located at or near the source.
- 4.3.18 Anaerobic digestion of waste streams is generally only appropriate when large and consistent waste streams can be processed. This is only achievable commercially and practically at a substantial scale. It is not appropriate for on-site construction of a major waste-handling facility to be considered as an integral part of a residential development.

4.3.19 It is clear that landfill gas, AD Gas; and indeed other sources of bio-gas, could meet a very significant proportion of UK energy needs. However this will best be accomplished at scale, making best use of the grid as a distribution resource, either of the gas itself or accompanying power generation.

4.3.20 Neither will be appropriate on this site.

Biomass

4.3.21 Biomass refers to any fuel feedstock that can be grown and burnt, including animal and human (putrescent) wastes and carcasses. Typically it is used as a shorthand term for plant material that can be burnt. It is the earliest source of fuel known to humans.

4.3.22 The energy density of wood compared to other feedstocks means it is typically the most appropriate solution for applications within the built environment. Other feedstocks either need very large-scale processing and combustion plant, or give rise to serious amenity issues.

4.3.23 Wood-fuel boilers on a domestic scale fall into two main types: simple log-burners which must be manually loaded, and which sometimes double as ovens; and much more advanced wood-chip fired and pellet-fired units which seek to offer all the benefits of traditional fuel sources with carbon-neutrality. Unlike all the other renewables, biomass in itself represents the energy store, to be released when desired. This means that supplemental energy sources for heating and hot water are not needed. Along with solar power, this is practically the only way to achieve a carbon neutral autonomous dwelling as things stand.

4.3.24 Woodchips can today be competitively priced against mains gas per kWh heat generated, whereas higher density pellets made from sawdust are somewhat costlier. However, for domestic applications woodchips are not appropriate as their volume and water content is significantly higher, and the storage volume requirements are much greater. Further, the availability of woodchip is highly erratic in the UK and consequently prices tend to spike. While many wood-fired installations have been specified to leave open the possibility of woodchip feedstocks, in practice they tend to rely on pellets.

4.3.25 There are nevertheless significant obstacles to large-scale specification of biomass boilers in relatively high-density (above 30 dwg/Ha) urban environments.

4.3.26 Modern small-scale applications have tended to feature advanced pellet-fired boilers. Most advanced pellet-boilers have been developed in countries that have a significant demand from rural houses off the gas grid, or in wilderness areas: Canada, USA, Eire, Germany and Austria.

4.3.27 These boilers are microprocessor controlled and automatically load pellets and discharge ash from the grate. The operating efficiency of the boiler means that ash is all but eliminated, and the ash collector only needs to be emptied as little as twice a year. The very low moisture content and high combustion temperatures mean that the traditional problems with soot, creosote and smoke emissions are largely eliminated.

- 4.3.28 Rural properties in remote and wilderness locations tend to benefit much more from the advantages of biomass by the fact they:
- Have plenty of internal volume to be heated, and therefore high space heating demand
 - Often include panoramic windows to take advantage of views, adding to the night-time heating load
 - Have basements to accommodate the plant and pellet storage.
 - Are geographically close to major forestry zones
 - Are off-grid and do not benefit from cheap fossil fuel supply.
- 4.3.29 Indeed, most systems have been designed around a rating of 10kW or above; the smallest 15kW Viessman Vitolog 300 unit can be de-rated to 7.5 kW but is inefficient at less than that. Other options are as much as 26kW. Kunzel offer a 15kW and a 25kW. They are as much as 90% efficient using the same condenser technology as gas boilers.
- 4.3.30 Austrian and German products are also relatively very expensive: typically £6000-7000 for a 10kW boiler. This is exclusive of the costs of the storage hopper, which can easily add the same costs again if a separate building or new bunker is needed.
- 4.3.31 Smaller stoves with back boilers are available, but these deliver a large proportion of the heat in one room, which although visually attractive creates serious thermal comfort problems when the building envelope is specified to be very thermally efficient. Such boilers are also very expensive, between £2900 and £4000 for a 5-10kW model.
- 4.3.32 For most urban UK dwellings, and especially those that will be built at high levels of thermal performance, the output of even the smallest high performance boilers on the market is completely excessive, making both the capital costs and the ongoing running costs uneconomic. It is also inherently wasteful, especially since a residual carbon footprint is proportional to the mass of fuel transported and the distance. Moreover on a large scale the total amount of biofuel feedstock that would be demanded would be needlessly high. A highly specified envelope should aim at a heat demand of 20-25W/m², and therefore a large 3-bed at 100 m² could quite easily only need 2.5kW. Smaller dwellings would need less still.
- 4.3.33 The space needed for an external fuel storage bunker, which is necessary for safety and practical reasons, is also significant, relatively hard to integrate within modern urban housing layouts and adds significantly to cost.
- 4.3.34 Shared communal systems have all the practical, technical commercial and stewardship issues associated with larger scale community-level solutions, and more besides. They have been tried on a small scale, generally on innovative co-housing schemes, where ownership and operation of the system falls within the terms of a Commune model.
- 4.3.35 Accordingly biomass heat-only systems are not considered to be appropriate to development on this site.

Photo-voltaics

- 4.3.36 This is unquestionably the iconic renewable technology. The attractiveness of electrical energy from light in conceptual terms has driven an extraordinary amount of scientific research since World War 2, as the understanding of semiconductors and photo-catalysts has grown.
- 4.3.37 Mature PV technology generally is driven by silicon wafer cells. The efficiency of the conversion of solar irradiation to electrical current is proportional to the purity of the silicon and its degree of crystalline structure. The most efficient cells are monocrystalline, polycrystalline less so, and amorphous still less again. However, the embodied energy and environmental impact of producing hybrid monocrystalline cells, the most efficient of which are rated about 25%, is very high indeed. Arguably the entire sustainability of large scale PhotoVoltaics is highly suspect, at least in a UK context where the tradeoff against power output potential is compromised by latitude and cloudiness.
- 4.3.38 The cost of the most efficient systems per installed area is also higher for the same reasons. However, in effect the higher cost is traded off quite well against actual power output, such that the installed cost per installed kWp is about the same across all kinds of cells.
- 4.3.39 Despite continued reductions in the cost of production of photovoltaic-grade silicon, solar panels are extremely expensive. About 8-10m² of panels are required to deliver 1kWp rated installation, sufficient to deliver a significant amount (750-850kWh/annum) of electricity to a single family dwelling, usually approximating to about 40-50% of its regulated loads demand over the year. Currently the capital cost for a single installation is approximately £1000 per square metre, and an average home would need a £8-10,000 installation, plus the inverter and additional circuitry.
- 4.3.40 An indicative volume cost of about £5500-6000/kWp installed is now the best estimate and takes into full account the discounts accruing to volume.
- 4.3.41 The uptake of solar photovoltaics is very high only in Germany, largely as a result of an extremely generous subsidy and soft loans scheme, together with tax breaks.
- 4.3.42 Given the residential sales values that could be achieved at this location, the capital cost of solar panels even at 1kWp could not be recouped to any degree through higher sales prices, especially since the current RICS valuation model expressly prohibits micro-renewables being assigned any value at all. If this should change, nevertheless any attempt to recoup the installation price would tend to raise the total sale price to a level that would be uncompetitive with resale properties, and uneconomic if it had to be absorbed by the builder within a competitive overall selling price.
- 4.3.43 Owing to the very high cost per kWh output, photovoltaics are unlikely to be appropriate for economic reasons as the sole or initial renewables upgrade. However, given their reliability, simplicity and effectiveness, compared with the alternative means of meeting the on-site renewables requirement, they might in fact be an appropriate measure to supplement the maximum practical contribution of other lower-cost systems.

Solar Thermal

- 4.3.44 Solar Thermal has been available in the UK for as long as 30 years. Uniquely therefore there is a significant amount of long-term experience with the technology. Not only that, but of all the zero-carbon energy sources it has a penetration at least an order of magnitude greater than any other installation.
- 4.3.45 There are two main reasons for this:
- The technology is extremely simple (especially flat plates)
 - Linked to this it is relatively much cheaper per installed unit of capacity.
- 4.3.46 The systems work by direct solar radiation falling on a collector plate array which is attached with an efficient thermal conductor, usually copper, to a fluid medium which transfers the energy to the home.
- 4.3.47 The amount of solar heat available between summer and winter varies by about ten times. Therefore solar thermal can only generally work if supplemented by a conventional boiler; the specification of a sufficient solar collector aperture to meet January demand would be infeasible and uneconomic, given the surplus heat generated in summer. Solar Coverage is the proportion of total heat requirement sourced from the system. Optimum efficiency is gained when the summer peak output approximately matches demand, avoiding the production of surplus energy, and the system having to operate at higher temperatures, when efficiency declines. Most manufacturers and installers strongly recommend 100% summer coverage, and no more.
- 4.3.48 However maximum coverage, say above 55%, requires a certain thermal overshoot in Summer.
- 4.3.49 This is also the reason why coupling solar thermal to central heating is fundamentally unhelpful, since most of the heat would be generated when it is not needed. Solar thermal should be considered appropriate to supply Domestic Hot Water only.
- 4.3.50 It should also be pointed out that widespread application of solar thermal fundamentally undermines the case for development level heat-supply, whether from CHP or otherwise, as the baseload heat demand is covered for much of the year.
- 4.3.51 The efficiency of the collector clearly works at its optimum facing due south, with a roof pitch angle of 30-35°. Steeper pitches of 50° are preferable in winter with low angles of solar incidence, though in Summer the efficiency is somewhat less. At high latitudes arguably a steeper pitch is preferable, to tap proportionately more solar energy when it is most needed rather than maximising efficiency in summer when it will be wasted. However for solar thermal systems, especially evacuated tubes, a great proportion of diffused radiation is tapped, and therefore even facing due East or West, up to 79% of the maximum is achievable, and 95% facing directly SW or SE.
- 4.3.52 The system benefits in terms of both efficiency and robustness from continual demand for the heated water, such that water stagnates in the collector as little as possible. The stagnation temperature is the peak temperature at which thermal loss from the collector to ambient air is equal to the solar

input, and can easily for EVT's exceed 260°C. The lower the stagnation temperature the less chance of damage to the system and there being excessive water temperatures in the thermal store.

4.3.53 Various designs to transfer the collected heat from the array to the domestic hot water system exist. Pumped indirect circuits, incorporating a heat-transfer fluid including anti-freeze and corrosion inhibitor (usually a glycol-water antifreeze mixture), are the most popular type of system in the UK. Double-walled heat exchangers or twin coil solar tanks prevent contamination of household water. Some standards require double walls when the heat-transfer fluid is anything other than household water. The pump, controlled by a differential temperature controller, circulates the heat-transfer fluid from the collector panels through the heat exchanger in the hot water cylinder and back to the solar collectors for re-heating. The temperature sensors of the differential temperature controller are situated at the solar collector and on the hot water cylinder. They ensure that fluid is only circulated when the fluid in the collectors is hotter than in the cylinder.

4.3.54 The technical appropriateness and cost-effectiveness of solar thermal installations has already led to its rapid uptake by developers in order to meet on-site renewables requirements. As a result supply-chain and installer knowledge and capacity continues to develop. Over the last 18 months, many volume developers have concluded supply chain and standard specifications to optimise the technical and commercial issues. Accordingly, it is most likely that solar thermal technology will be that used to meet the much if not all the requirements RVBC.

Other LZC technologies

4.3.55 A range of other technologies are often cited to support attempts to reduce non-renewable energy use. However they are generally either strictly speaking inadmissible as renewables, in the strictest sense, and/or cannot be considered sufficiently mature as technologies to be applicable in this context. These include:

- **Heat Pumps** - These extract heat from the environment that ultimately derives from the sun. They are electrically driven from grid supply, which means that they could be considered relatively low-carbon technologies, but not renewables in the strict sense. Coupling the heat pump to a ground source is extremely costly involving as it does an extensive length of ground loop, and also suffers from technical and cost issues related to its low output temperatures. Air-source heat pumps are cheaper and rather simpler in many respects, but the physics involved means their seasonally adjusted efficiency is much lower and when the grid electricity intensity is included, there is virtually no saving against conventional high efficiency gas-fired sources of heat. Given the availability of gas supply on the site, emissions savings would be illusory.
- **Combined Heat and Power** - Simply put, these systems seek to use the heat that is usually wasted when electricity is generated. To that extent they are a low-Carbon rather than renewable energy technology unless they are fired by biomass or renewably-produced hydrogen (see Fuel Cells). Most applications require a large and constant heat load to allow the efficient and effective operation of the CHP engine. Residential applications do not offer either the size of constancy of heat demands to allow the specification of CHP, in any form. Systems benefit

strongly from operational and other economies of scale, also tending to imply the coupling of a large communal generation set to a communal/District Heating system. The fixed costs of providing this relative to the revenues accruing make the delivery of such networks entirely uneconomic. These costs rise at a rapid rate as development density decreases, so in a low-rise development such as on the application/appeal site, these cost rise disproportionately. Furthermore, it is clear that the procurement and operation of such systems is uneconomic at small scale, with what few industry players examining this market largely withdrawing. Dwelling-integrated gas-fired Micro-CHP has been trialled at some scale, and several serious operational deficiencies were encountered. No system is yet available commercially. However the need for higher base heat loads than are likely to be found in most new dwellings from 2010, means that this technology is anticipated to be applicable mainly to the retrofit market. In any case, the combined efficiency is negligibly or no higher than the current high-performance heat only gas boilers. Biomass combined heat and power is not available anywhere in a operationally and technically robust form, despite the assertions of certain interested parties.

- **Fuel Cells** - These generate electricity and accompanying heat from a electro-chemical process, rather than mechanically. They are an immature technology, and also extremely expensive. They are actually not energy sources at all, but energy stores, and are best compared with batteries, since the feedstock generally either has to be stripped natural gas, or hydrogen from electrolysis. Handling and storing hydrogen has its own very substantial and fundamental difficulties. Micro-cells are under development that would avoid the need for expensive community heat distribution networks, but are not currently approaching commercial availability. There is certainly strong potential for them to be employed at scale in future, but they would not be applicable to a development on this scale, delivered within the planned timeframe.

4.4 Compliance with the on-site Renewable Requirement

- 4.4.1 From broad figures it can be concluded that it should be both achievable and viable to install solar thermal systems to maximise solar coverage for hot water to meet the 10% requirement as defined by RVBC.
- 4.4.2 Should a shortfall remain, it is likely that a supplemental application of photovoltaics would be the most rational upgrade path. Since the target is defined in terms of the development as a whole, this may well be concentrated on the most appropriate dwellings, given certain economies attached to minimising the number of inverters, which are a relatively high and fixed cost of an installation. While PV is absolutely and relatively expensive, it is reliable and easy to install. It also mitigates much more carbon emissions per kWh than addressing either space heating or DHW loads, which displace mains gas, which starts to reduce the relative cost per unit emissions mitigated substantially. It is likely a 1-1.2kWp installation would be focused on social units (which in any case may need to be upgraded to meet Code for Sustainable Homes Level 4 under HaCA grant-funding rules, if applicable); and/or larger 2-storey homes, where the added cost might be to a degree offset by higher sales values, should RICS valuation rules change in the near future.

- 4.4.3 Micro-CHP is not available in volume, and properties will have insufficient heat loads to derive any benefit.
- 4.4.4 Micro-wind will not be able to provably generate much if any net contribution to displacement of mains power and might even prove to be a small net burden. This is before structural, CDM and amenity issues are even considered.
- 4.4.5 The fact that the likely scheme is almost certainly to be accounted for entirely by houses makes it entirely plausible that all dwellings could benefit from solar thermal installation. Given that the solar thermal contribution would also be applicable towards the national 25% regulated emissions reduction target, and Code compliance, and this is assessed per dwelling, it is even more likely that specification will seek to apply a solar thermal system to as many plots as is feasible.

5 RENEWABLE ENERGY CONCLUSION

- 5.1.1 It is evident that the vast bulk of the requirements of National policy and RVBC aspirations can be met on the development site through the assessment of the development under the Code for Sustainable Homes to meet the Level 3 standard.
- 5.1.2 In parallel, it has been demonstrated that through the application of solar thermal systems, to provide the maximum feasible solar contribution to domestic hot water needs (with additional PV to certain properties if required) RVBC's requirement to meet 10% of predicted energy requirements through on-site renewable energy supply can also in all likelihood be feasibly achieved.
- 5.1.3 Developers will also be able to take advantage of, and have due regard for the advice set out in a number of guidance documents.
- 5.1.4 It is very difficult to demonstrate definitive compliance against such policy objectives at outline application stage, as meeting the standards concerned is inherently bound up with detailed design and specification issues. In addition, the National Compliance Methodology for energy standards to support the changes to Building Regulations Part L in 2010 is currently at an advanced stage of review, but the outcomes are far from firmly established. Nevertheless, evidence has been presented within this document to demonstrate that Conditioning an approval on meeting the standards required, through the Code at Level 3, and the SAP-derived methodology fully discussed and outlined, gives ample scope for the Authority to assess compliance with the full intent of Policy.
- 5.1.5 It should be recalled in closing, that the UK's national trajectory sets minima that are themselves evolving on an ambitious trajectory, unmatched anywhere in the developed world, and quite probably beyond.
- 5.1.6 It will lie within the ambit of subsequent Reserved Matters Applications to meet these policy requirements in full.

6 BUILDING FOR LIFE EVALUATION

6.1.1 As part of pre-application discussions, RVBC asked Gladman to assess application proposals against the 20 criteria set out in RVBC's Building for Life Evaluation Table (which is included at Appendix A).

6.1.2 It is essential to note prior to considering compliance that this is an outline application; with the exception of access, all other matters are reserved matters for consideration as part of a subsequent application.

6.1.3 Whilst extensive master planning and design detail has been included to assist RVBC in their consideration of the proposals, all such material is illustrative.

6.1.4 The table below lists each criteria, together with a comment on the proposals compliance:

Criteria		Compliance Comment
Environment and Community		
1	Does the development provide or is it close to community facilities, such as a school, parks, play areas, shops, pubs?	Extensive recreational facilities abut the northern edge of the site, with a number of sports pitches and the Roefield Leisure Centre just beyond and adjacent school on Edisford Road. Adjacent to the river and the Clitheroe Camping and Caravanning Club site there are play facilities, model railway, miniature golf, parking and toilets. Clitheroe is the largest town in the Borough and has a good sized local centre offering a range of facilities. A full facilities audit is provided within the TA, see Figure 13.
2	Is there an accommodation mix that reflects the needs and aspirations of the local community?	As detailed in the D&A, a key design principle is the delivery of a mix of housing, offering 2-5 bedroom properties, comprising a range of house types, with predominantly semi-detached and detached properties and also some terrace/linked mews cottages. This approach, together with the provision of 30% affordable housing will ensure the housing appeals to a wide cross section of the existing community, resulting in a balanced and mixed occupier profile.
3	Is there a tenure mix that reflects the needs of the local community?	30% affordable housing will be provided, recognising the identified need for increased provision within Ribble Valley and will include an appropriate mix of dwelling types and tenures.
4	Does the development have easy access to public transport?	There are typically about 8-9 buses per hour calling at bus stops near to the Site during the day on Monday-Saturday. It is proposed that a new bus stop is introduced within the Site. Negotiations have taken place with the C1 service provider (Travel for All Ltd), which have concluded that the existing C1 service can easily be re-routed to include a 'loop' within the Site without any problems. The Travel Plan assesses this and other modes of public transport in detail.

5	Does the development have any features that reduce its environmental impact?	<p>Alongside the provision of a mix of housing types to meet the needs and aspirations of the local community, the design will establish a landscape and public open space resource which will provide amenity, recreational, biodiversity and sustainability benefits.</p> <p>It is expected that the scheme will achieve Level 3 of Code for Sustainable Homes. As discussed above, measures will also be put in place to meet RVBC's target that 10% of predicted energy requirements will be provided through on-site renewable energy supply.</p>
Character		
6	Is the design specific to the scheme?	<p>Whilst the development does not advocate pastiche or historic solutions, it is important that the new development has some connection with local character and placemaking. This is achieved through an analysis of street character, built form and materials set out in detail in the D&A.</p> <p>One of the most obvious ways of achieving a response will be by using a commonality of building materials, the use of colour and boundary details. This will be a guiding principle for the development.</p>
7	Does the scheme exploit existing buildings, landscape or typography?	<p>There are no buildings presently on the site.</p> <p>Development at this location avoids the use of sensitive landscape such as areas of outstanding natural beauty or Green Belt.</p> <p>The development proposals have evolved as a result of analysis of the site and its setting, and by responding to the best practice design guidance.</p> <p>There are relatively few landscape features of merit within the site itself, these are limited to trees within existing hedgerows, the internal and boundary hedgerows and the small watercourse, all of which can be retained and enhanced within the development.</p>
8	Does the scheme feel like a place with a distinctive character?	<p>To maintain good legibility of the site, appropriate to the scale of the proposed development, a simple street hierarchy is to be used.</p> <p>The central loop road provides a strong sense of place and orientation passing through and alongside the retained central valley landscape feature drawing the countryside into the heart of the development, landmark buildings will be located at key junctions and arrival points.</p>
9	Do the buildings and layout make it easy to find your way around?	<p>A lower density arrangement of Lanes will extend outwards from the loop to the green development edge, they will include a more intimate arrangement of focal spaces and arrival points to provide areas for landmark buildings and green spaces.</p>
10	Are the streets defined by well structured building layout?	<p>Inside the Loop, the secondary roads (courts) will include a more intimate arrangement of buildings.</p>

Streets, Parking and Pedestrianisation		
11	Does the building layout take priority over the roads and car-parking, so that the highways do not dominate?	As discussed in criteria 8-10 above and in greater detail in the D&A, great care has been taken to create a high quality design which is not dominated by highways restraints.
12	Is the car parking well integrated and situated so as to support the street scene?	<p>Car parking design is a matter for consideration at the reserved matters stage. However, the same careful approach would be adopted to ensure between balance the design ethos and local authority parking standards.</p> <p>Detail design of road and parking areas would adopt the approach recommended in Manual for Streets.</p>
13	Are the streets pedestrian, cycle and vehicle friendly?	These streets will be designed to slow vehicular traffic and provide a safer environment for pedestrians and cyclists.
14	Does the scheme integrate with existing roads, paths and surrounding development?	<p>The master plan seeks to maximise connectivity to the existing settlement and wider area. This includes linkages to the football pitches and existing riverside recreation area as well as a new linkage to the Ribble Way.</p> <p>In addition, path and roads through the connected green spaces of the scheme will open up new routes in an area which currently has no public access.</p>
15	Are public spaces and pedestrian routes overlooked and do they feel safe?	The layout of streets would provide a safe and well overlooked network of public spaces as set out by Best Practice.
Design and Construction		
16	Is public space well designed and does it have suitable management arrangements in place?	<p>Integral to the scheme is a strong green framework of structural landscape and habitat areas. These areas combine to create a robust Green Infrastructure which builds upon the site's existing natural assets and offers substantially enhanced biodiversity, public amenity and flood surface water storage features.</p> <p>Given the informal settlement edge character and the existing extensive playing field provision adjacent to the site, no formal sports facilities are proposed for the site. Instead a new informal rural edge Community Park is proposed, this will connect into the development via green fingers that extend and reinforce the existing landscape framework. New footpath and cycleway connections between the settlement edge and the riverside recreation areas are proposed within this framework.</p> <p>Two local equipped areas of play are proposed within the Green Infrastructure, offering toddler, child and teenage play provision. These are indicated on the Development Framework Plan and are located within the development to ensure that all parts of the site are within easy walking distance of them.</p> <p>The future maintenance and management of the development's formal public landscape areas would be offered for adoption by Ribble Valley Borough Council, via a commuted sum payment or similar. Alternatively it may be maintained and managed by a Private Management Company.</p>

17	Do buildings exhibit architectural quality?	Whilst a matter for consideration at reserved matters stage, the D&A sets out the framework and design ethos to meet this criteria.
18	Do internal spaces and layout lend themselves for adaption, conversion or extension?	This is a matter which can only be considered when the detailed design of individual homes is undertaken. Nothing in the design principles prevent the attainment of this criteria at a later stage.
19	Has the scheme made use of advances in construction or technology that enhances its performance, quality or attractiveness?	It is expected that the scheme will achieve Level 3 of Code for Sustainable Homes.
20	Do buildings or spaces outperform statutory minima, such as building regulations?	It is expected that the scheme will achieve Level 3 of Code for Sustainable Homes. As discussed above, measures will also be put in place to meet RVBC's target that 10% of predicted energy requirements will be provided through on-site renewable energy supply.



Appendix A

Building for Life Evaluation + Planning Policy

Name:

Criteria	National Policy	Local Policy
Environment and community		
1 Does the development provide (or is it close to) community facilities, such as a school, parks, play areas, shops, pubs ?	PPS3 (16), PPS1(16,36)	Policy G1 of the RVBC Local Plan. Policies DP1, DP2, and L1 of the RSS.
2 Is there an accommodation mix that reflects the needs and aspirations of the local community?	PPS3 (20-22), PPS1(16,36)	Policies G1, G2, G3, G4, H19, H20 and H21 of the RVBC Local Plan. Policies L2, L4 and L5 of the RSS. Affordable Housing Memorandum of Understanding.
3 Is there a tenure mix that reflects the needs of the local community?	PPS3 (12), PPS1(4,16,36)	Policies G1, G2, G3, G4, H19, H20 and H21 of the RVBC Local Plan. Policies L2 and L5 of the RSS. Affordable Housing Memorandum of Understanding.
4 Does the development have easy access to public transport?	PPS3 (16), PPS1(36,4), PPS7	Policies G1 and T1 of the RVBC Local Plan. Policies DP5, RT1 and RT3 of the RSS.
5 Does the development have any features that reduce its environmental impact?	PPS3 (15,16), PPS1(16), Code for Sustainable Homes, BRE Green Code.	Policy G1 of the RVBC Local Plan. Policies EM16 and EM18 of the RSS.
Character		
6 Is the design specific to the scheme?	PPS3 (16)	Policies G1, G2, G3, G4, G5, ENV1, ENV3 and ENV16 of the RVBC Local Plan.
7 Does the scheme exploit existing buildings, landscape or topography?	PPS3 (13)	Policies G1, G2, G3, G4, G5, ENV1, ENV3, ENV16 and ENV19 of the RVBC Local Plan.
8 Does the scheme feel like a place with a distinctive character?	PPS3 (13,16), PPS1(38)	Policies G1, G2, G3, G4, G5, ENV1, ENV3 and ENV16 of the RVBC Local Plan.
9 Do the buildings and layout make it easy to find your way around?	PPS3 (14)	Policy G1 of the RVBC Local Plan.
10 Are streets defined by well structured building layout?	PPS3 (16), PPS1(35)	Policy G1 of the RVBC Local Plan.
Streets, parking and pedestrianisation		
11 Does the building layout take priority over the roads and car-parking, so that the highways do not dominate?	PPS3 (16), Manual for Streets	Policy G1 of the RVBC Local Plan.
12 Is the car parking well integrated and situated so as to support the street scene?	PPS3 (16), Manual for Streets	Policies G1 and T7 of the RVBC Local Plan. Policy RT2 of the RSS.
13 Are the streets pedestrian, cycle and vehicle friendly?	PPS3 (16), Institute of Highways & Transportation Guidelines for Cycle Audit and Review, Manual for Streets.	Policies G1, T1 and T7 of the RVBC Local Plan. Policies RT4 and RT9 of the RSS.
14 Does the scheme integrate with existing roads, paths and surrounding development?	PPS3 (14), Manual for Streets.	Policies G1, RT18, RT19, T1 and T7 of the RVBC Local Plan. Policies RT1, RT2, RT3 and RT4 of the RSS.
15 Are public spaces and pedestrian routes overlooked and do they feel safe?	PPS3 (14), PPS1(35,37), Secure by Design, Safer Homes Guide, Manual for Streets.	Policy G11 of the RVBC Local Plan.
Design and Construction		
16 Is public space well designed and does it have suitable management arrangements in place?	PPS3 (16), PPS1(36)	Policy RT8 of the RVBC Local Plan.
17 Do buildings exhibit architectural quality?	PPS3 (14)	Policies G1, ENV1, ENV3, ENV16 and ENV19 of the RVBC Local Plan.
18 Do internal spaces and layout allow for adaptation, conversion or extension?	PPS3 (14), Lifetime Homes	None relevant.
19 Has the scheme made use of advances in construction or technology that enhance its performance, quality, and attractiveness?	PPS3 (14), Code for Sustainable Homes, Lifetime Homes	Policies DP9, EM16 and EM18 of the RSS.
20 Do buildings or spaces outperform statutory minima, such as Building Regulations?	PPS3 (15), PPS1(36), Code for Sustainable Home, Lifetime Homes	Policy DP9 of the RSS.