

generator is used, the efficiency of the system is increased above that of a conventional power plant where the heat is not utilised. CHP is suitable for dense, mixed-use developments where there is a high, constant and varied heat demand. This is not the case for Phase 5 of the Littlehampton development, which is residential and only incorporates a total of forty-six dwellings. In addition, as there are no other CHP networks in the vicinity of the development with which to forge a connection, this is not a suitable technology for the development.

Biomass

- 2.11 Biomass community heating is an alternative to conventional fossil fuel heating but, as per the reasons used against the installation of gas-fuelled CHP, should be discounted as an option for the proposed dwellings. Biomass boilers within individual dwellings are usually installed with a standard gas boiler as back-up in case the occupier runs out of fuel. Although they are reducing in size, they are still large enough to require a dedicated room with additional space for the fuel – there is insufficient space available for such infrastructure in the majority of proposed dwelling types, especially the apartments. The management of fuel deliveries and ash dispersal is also complex, necessitating a dedicated operative as opposed to residents of the future dwellings. Furthermore, the emissions of Nitrous Oxide and particulate matter that are associated with biomass installations would have the capacity to worsen local air pollution.

Ground and Air Source Heat Pumps (GSHPs)

- 2.12 Neither of these technologies has been considered for implementation at Littlehampton due to their higher carbon dioxide emissions compared to the proposed gas boiler specification. Although both technologies are renowned for delivering reductions in carbon dioxide emissions, they do so from a much higher baseline than when gas is the specified fuel for space heating and hot water generation. Electricity consumption is also associated with much higher Nitrous Oxide emissions than Class 5 gas boilers.

Hydroelectric power

- 2.13 Hydroelectric power plants generate electricity using the gravitational force of flowing or falling water. However, there are no rivers of sufficient scale in the vicinity of the Littlehampton development to facilitate a hydroelectric power installation.

Wind Turbines

- 2.14 Wind turbines are a modern, high-technology descendant of the windmills that have been around for centuries. In modern windmills the kinetic energy of the wind is used to turn a turbine to generate electricity as opposed to moving water or turning a grist mill wheel. A site with an average wind speed of 5m/s or more is generally considered to be suitable for installing a wind turbine. The average wind speed at the Littlehampton development is 4.5m/s at 10m AOD and is below the level required to generate significant carbon dioxide reductions or commercial take-up. The installation of a single, large wind turbine to serve the development would also be controversial due to the nature of the locality. Even if space could be found within the development to accommodate a very high (15-20m) turbine, their installation would then present a significant visual blight to neighbours.

Solar thermal and photovoltaic panels

- 2.15 Solar thermal heating panels contribute to the hot water demand of a dwelling. Water or glycol (heat transfer liquid) is circulated to roof level where it is heated using solar energy before being returned to a thermal store where heat is exchanged with water from the conventional system. The proposed dwellings generally contain suitable attributes (orientation, available roof-space and limited shadowing) for solar photovoltaic installations to be designed-in, although solar thermal installations are unsuitable. In part this is because the smaller dwelling types – for example, the Danbury – have very little space to accommodate a hot water cylinder, however, even if this was not the case, the technology is unable to deliver a 10% reduction in carbon dioxide emissions from the theoretical baseline – only around an 8% reduction on average can be obtained due to the limits of hot water demand. The specification of gas combination boilers also reduces the energy demand for heating and storing hot water.
- 2.16 However, there are few constraints on the capacity for solar photovoltaic panels to deliver reductions in emissions. For all dwellings on the site, roof-space is available at no worse than a west-east orientation, sufficient for solar photovoltaic installations to be effective at delivering emissions reductions. Further SAP calculations have been carried out, which show the reductions in emissions that could be secured given the installation of **56.44 kWp** of solar PV output, with priority given to installing arrays on seventeen optimally orientated (south-facing) dwellings. As shown in the marked-up layout of solar panel locations and additional calculations in the Appendix, these are Plots 8, 9, 10, 12-17, 101, 102, 105, 106 and 222-225.

Modelling of Solar PV Installations and Emissions Reductions

- 2.17 Further SAP calculations have been carried out to model the effects on site-wide emissions of introducing 56.44 kWp of solar PV panels to Phase 5 of the Littlehampton development. Overall, the introduction of 56.44 kWp of solar PV output to optimally orientated dwellings will reduce emissions across the site by **32,435 kgCO₂/year**. In addition, to the reductions secured via best practice energy efficiency measures, which were **8,560 kgCO₂/year**, this amasses to a total reduction of **40,955 kgCO₂/year**.
- 2.18 Compared to baseline emissions of **407,605 kgCO₂/year**, this is equivalent to an overall reduction in emissions of **10.06%**. This is summarised in Table 4 overleaf. At the detailed design stage, the number of installations may reduce due to optimisation of plot design and the rated output of the specified panels, however, the reduction in carbon dioxide emissions will remain the same.

Table 4: Emissions Reduction from Energy Efficiency Measures and Solar PV Installations – Phase 5, Littlehampton

	Emissions (kgCO ₂ /year)
Baseline	407,605
Reduction from energy efficiency measures	(8,560)
Reduction from 56.44 kWp solar PV output	(32,435)
Total reduction	(40,955)
Emissions after reductions	366,650
Overall percentage reduction from baseline	10.06%

3.0 Layout, Access and Landscaping

- 3.1 The quantum of development and height and scale of the new dwellings has taken into account the prevailing characteristics of communities adjacent to the site. Two-and-a-half and three storey dwellings are located on the central spine road and most two storey homes closer to the periphery. Buildings are massed to enable them to be articulated in a sensitive manner with respect to the street scene, whilst enabling the land to be maximised with respect to its potential to provide much needed accommodation for people of all ages, including young families and the elderly.

- 3.2 The Applicant's movement strategy for Phase 5 seeks to integrate with existing and future phases, linking to cycle and pedestrian paths. Key desire lines connect to earlier phases, the Central Woodland and pedestrian paths. Access to the development parcels will be taken from the proposed new spine road, which will then transition into the minor access roads and private drives.
- 3.3 All houses will be provided with fully accessible private space in the form of rear gardens. Access to the private and communal green spaces will be facilitated in accordance with the principles of inclusive design. The following measures will be introduced to ensure that those with mobility difficulties can access all areas of the development:
- A pedestrian friendly environment
 - Carefully designed landscaping
- 3.4 The Applicant's commitment to inclusivity will be demonstrated through their attitude towards movement and equality. The Applicant will ensure that the development is scaled appropriately so as to respond to the needs of all of its users. They will incorporate the requirements of the Equality Act (2010) into their design, making reasonable adjustments to enable disabled access, regularly reviewing whether the buildings are accessible and effective, and providing necessary design adjustments where it is practicable to do so.
- 3.5 It is important that future residents feel secure and free from the fear of crime. The Applicant and their design team will pay particular attention to the passive surveillance of streets, communal spaces and parking areas. Generous rear garden depths will ensure substantial separation distances between the Applicant's proposed dwellings, minimising overlooking. The design proposals also integrate sound urban design principles in locating circulation routes so that they are overlooked by ground floor active windows from habitable rooms, maximising the surveillance of the public realm. Security standards in respect of external doors and windows in the dwellings will comply with the requirements set out in AD Q: Security – Dwellings.
- 3.6 Dwellings have been afforded generous set-backs from the road and are open and largely laid to lawn with shrub planting. Extensive soft landscaping will be used to provide 'defensible' areas to the front and flanks of dwellings, and this approach will contribute to the sustainable management of surface water runoff on site.

- 3.7 All dwellings will be provided with secure cycle storage facilities in either communal stores, garages or sheds. This will help to promote sustainable travel to employment and amenity sites in the local area. In addition, the use of sustainable modes of transport will be further encouraged through the provision of 209 electric car charging points to communal parking spaces and houses with on-plot parking. Overall, Phase 5 will be provided with 547 car parking spaces in accordance with the requirements set out in Arun District Council's Parking Standards Supplementary Guidance (January 2020).
- 3.8 The landscaping proposals for Phase 5 have been developed with reference to its natural features, ecological habitats and opportunities for ecological enhancement. The Applicant's emphasis is on identifying opportunities to enhance the ecological value of the site and deliver a net gain in biodiversity. Indigenous trees, hedges and native plant species will be introduced to supplement the existing landscaping, encouraging the development of local biodiversity. The following measures will be adopted by the Applicant:
- Planting within swales.
 - Wetland areas to include aquatic plants, reeds and rushes.
 - A tree-lined spine road.
 - Tree planting at the top of the bank to provide an edge to the development and the wetland area.
 - Provision of parkland areas, where retained trees are supplemented with new native shrub and tree planting.
 - Long grass and species rich grass and wildflowers will be introduced to the parkland areas.
 - Pedestrian paths.

4.0 Materials

- 4.1 While a major consideration in materials selection is maintaining a distinct and local architectural style (such as the use of traditional red brick), from a sustainability perspective the Applicant is equally committed to minimising the environmental impact of the materials used over the lifetime of the building – from manufacture, to eventual demolition, to disposal. All four architectural character areas proposed for Phase 5 will mix contemporary and modern design features, whilst seeking to integrate with green lines and the wetland zone. For building materials, the Applicant will,

in the main, specify 'A+' or 'A' rated materials using the online BRE Green Guide to Housing Specification, with all materials rated at least 'C'.

- 4.2 Wherever feasible, the Applicant will commit to using materials that are locally sourced, from renewable sources and recycled from the demolition of existing buildings on site. Innovative techniques for the recycling of materials on site will be employed, including re-use of hardcore and chipping wood for footpaths. The use of recycled materials (e.g. crushed concrete from waste used for hard-standing or recycled fibreglass insulation) has zero embodied energy impact, other than that expended in their processing or transport.
- 4.3 The Applicant will also endeavour to employ local labour wherever possible, minimising transport distances and related greenhouse gas emissions.

5.0 Noise and Dust Pollution

- 5.1 Mitigation measures will be investigated during the M&E design and construction phase to ensure that the baseline ambient noise levels are not overtly increased by the proposed development.
- 5.2 The development will generate an increase in the amount of traffic in comparison to existing traffic levels on nearby roads. In order to best mitigate the development's contribution to local air pollution, the Applicant is specifying Class 5 gas boilers for Nitrous Oxide emissions. Furthermore, best practice mitigation procedures will be adopted on-site during the construction phase, which will include the following measures:
- Dampening and sweeping roadways
 - Covering vehicles and skips when loaded with material
 - Locating stock piles to take into account the prevailing wind
 - Sealing and replanting completed earthworks as early as practicable
 - Using low emission vehicles and plant equipment
- 5.3 Air intakes and outlets within the proposed dwellings will all avoid any sources of external pollution in order to avoid internal air pollution.

6.0 Recycling and Waste Management

- 6.1 The Applicant's proposals have allocated sufficient space within external storage areas to satisfy the Arun District Council's waste bin specification for the deposition of general refuse, recyclable waste and garden waste respectively.
- 6.2 All dwellings will be provided with segregated internal recycling bins in the kitchen to facilitate the recycling of various waste streams. In addition, all houses will be provided with small internal caddy bins for the transfer of compostable waste; private gardens will be provided with composting bins.
- 6.3 The Applicant will ensure that best practice procedures are followed on site in relation to the segregation of various waste streams, setting appropriate targets for reduction, recycling and re-use with respect to each of these.

7.0 Avoiding Flooding and Water Use

- 7.1 The proposed development at Littlehampton has a low risk of flooding according to the Environment Agency's flood mapping system. Although the proposed development is already located in Flood Zone 1, the Applicant will implement a drainage strategy that seeks to utilise the natural drainage features of the site and, in so doing, encourage percolation rather than runoff. For all storm events up to the 1 in 100 year flood (including a 40% allowance for climate change and an allowance for urban creep), rates of surface water runoff will be no more than their pre-development levels. This objective will be facilitated in part through Phase 5's Central Wetland Area and the swale network.
- 7.2 During the construction phase, the Applicant will adopt best practice procedures on site in relation to the potential for water pollution. Detailed procedural guidance will be disseminated to site operatives having been prepared in accordance with Environment Agency advice.
- 7.3 In terms of internal potable water consumption, The Applicant is committed to delivering performance of not more than 110 litres per person per day in all dwellings (see calculation in Appendix), which is considerably lower than the 125 litres per person per day requirement under Approved Document G of the Building Regulations. In order to meet these targets, a combination of

reduced-flow taps and showers, dual-flush toilets and moderately sized baths will be installed. In addition, all houses and apartments will be provided with water butts to help conserve supplies, especially for the purposes of irrigating gardens during the increasingly dry summers in the south-east of England.

8.0 Conclusion

- 8.1 This Energy and Sustainability Statement has set out the Applicant's detailed energy strategy pertaining to Phase 5 of their development at Littlehampton. The Applicant intends to deliver a sustainable development by providing a range of accommodation for individuals of all ages – from first-time buyers to families. The design of the new dwellings will reflect the character of other communities in the local area, while the provision of extensive areas of green and wetland space for leisure and relaxation will encourage the community to integrate and flourish, and help to advance the ecological prosperity and vibrancy of the area.
- 8.2 The energy strategy has been developed to comply in full with the requirements of Planning Condition 31 and the NPPF by delivering a 10% reduction in carbon dioxide emissions compared to the target standard set by Part L1a of Building Regulations (2013). The focus of the strategy has been to first reduce energy consumption at the point of demand by introducing a robust fabric specification and efficient heating and ventilation systems. Secondly, renewable energy installations, in the form of **56.44 kWp** of solar PV output, will be installed to further reduce carbon dioxide emissions on a site-wide basis. SAP calculations, carried out by an accredited energy assessor, have verified that the Applicant's proposed approach will deliver a **10.06%** reduction in carbon dioxide emissions compared to the baseline scenario. Once the dwellings are built, as built compliance reports will be compiled to verify that the development has been built out in accordance with the energy efficiency measures and renewable energy installations proposed in this Statement.
- 8.3 Additional sustainability measures proposed by the Applicant will ensure that biodiversity flourishes, whilst waste and water is managed and consumed efficiently. Emphasis is placed on reducing the generation and consumption of waste and water resources, respectively, at the point of demand and during construction activities.

Appendix

Solar PV Panel Location Plan

Viridian Solar – Solar PV Emissions Reduction Calculation

Internal potable water efficiency – Part G calculation

Solar PV Energy Calculation



Littlehampton Phase 5 - Persimmon

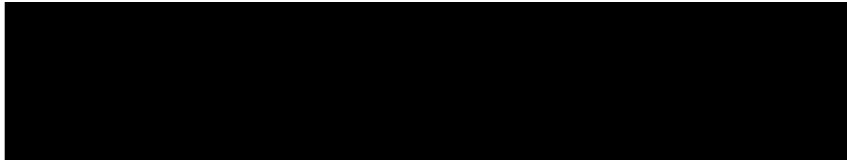
Project Postcode BN17
Irradiation Zone Zone 2 - Brighton

MIS 3002 Methodology

Array 1											
House type	Elevation	Plot	Annual Energy Saving kWh	Annual CO2 Saving kgCO2	PV16-340-G1W	kWp	Roof Orientation deg from S	Tilt Angle deg from horiz	Overshading Factor	Kk kWh / kWp	Annual Energy kWh
Sherwood	Rear	8	3,828	1,987	10	3,400	10	35	1	3324	3,828
Whiteleaf	Rear	9	4,525	2,348	12	4,080	25	40	1	3399	4,525
Whiteleaf	Rear	10	4,525	2,348	12	4,080	25	40	1	3399	4,525
Charnwood	Rear	12	2,957	1,534	8	2,720	35	40	1	3387	2,957
Whiteleaf	Rear	13	4,435	2,302	12	4,080	35	40	1	3387	4,435
Kielder	Rear	14	4,435	2,302	12	4,080	35	35	1	3387	4,435
Kielder	Rear	15	4,521	2,346	12	4,080	25	35	1	3388	4,521
Sherwood	Rear	16	3,767	1,955	10	3,400	25	35	1	3368	3,767
Sherwood	Rear	17	3,767	1,955	10	3,400	25	35	1	3368	3,767
Danbury	Rear	101	3,052	1,584	8	2,720	15	35	1	3329	3,052
Danbury	Rear	102	3,052	1,584	8	2,720	15	35	1	3329	3,052
Danbury	Rear	105	3,036	1,575	8	2,720	20	35	1	3319	3,036
Danbury	Rear	106	3,036	1,575	8	2,720	20	35	1	3319	3,036
Sherwood	Rear	222	3,767	1,955	10	3,400	25	35	1	3368	3,767
Danbury	Rear	223	3,014	1,564	8	2,720	25	35	1	3368	3,014
Danbury	Rear	224	3,014	1,564	8	2,720	25	35	1	3368	3,014
Sherwood	Rear	225	3,767	1,955	10	3,400	25	35	1	3368	3,767
TOTAL			62,496	32,435							
TARGET*				32,201							
			kWh	kgCO2							

The performance of solar PV systems is impossible to predict with certainty due to the variability in the amount of solar radiation (sunlight) from location to location and from year to year. This estimate is based upon the Government's standard assessment procedure for the energy rating of buildings (SAP) and is given as guidance only. It should not be considered as a guarantee of performance.

* TARGET -





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Papworth Everard, Cambs.
Tel: 01480 839 845
enquiries@viridiansolar.co.uk
www.viridiansolar.co.uk

Note:

Viridian Solar has produced this design based on information and drawings supplied by the client. It remains the client's responsibility to ensure that shading from nearby buildings and trees does not affect the system.

Weight of solar panels:

PV16 (Fusion PV) 21kg

Where the panels are fitted into a pitched tiled/slate roof, they sit directly on the roof battens with a uniformly distributed load of 13kg per m² for PV16. Therefore, they almost certainly weigh less than the roof covering they are replacing. Roof structure modifications are unlikely to be necessary.

Setting Out:

Roof Installation typically starts with the bottom left panel. Setting out dimensions are given to the bottom left corner of this panel. Please refer to Viridian Installation Guides and standard roofing practices

Notes:

Denotes location of PV array

Source Drawing





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TITLE Viridian Clearline Fusion PV

Site Plan for
Littlehampton Phase 5

Checked
Persimmon

DRAWN	NP	N/A
DRAWING NUMBER	16344 / SK1	Sheet Number
DATE	24.03.21	SCALE
		NTS



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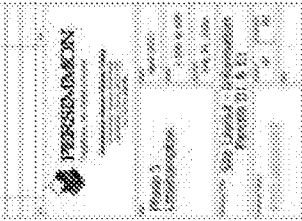
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Notes:

 Denotes location of PV array

Source Drawing





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TITLE Viridian Clearline Fusion PV Site Plan for Littlehampton Phase 5			
DRAWN	NP	CHECKED Persimmon	
		N/A	
		DRAWING NUMBER 16344 / SK1	
		Sheet Number 2 of 3	
DATE	24.03.21	SCALE	NTS

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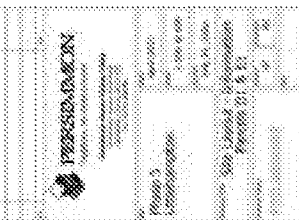
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TITLE Viridian Clearline Fusion PV

Site Plan for

Persimmon

Q14

N/A

DRAWING NUMBER
16344 / SK1

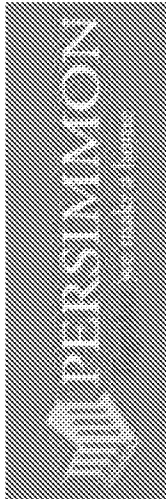
Number
3 of 3

DATE 24.03.21

NTS



Job no: 3668
Date: 27/05/2021
Calculated by: S.R.Smith
Client: Persimmon Homes Thames Valley
Development name: Littlehampton Phase 5



WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS - (BASIC CALCULATOR)

Installation Type	House Type	Type 1		Type 2		Type 3		Type 4		Type 5		Type 6		Type 7		Type 8		Type 9		Type 10	
		Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day	Capacity/ flow rate	Litres/ person/ day
Unit of measure	Description																				
Is a dual or single flush WC specified?		Dual	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:
WC	Full flush volume	4	5.84		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Part flush volume	2.6	7.70		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Flow rate (litres / minute)	5	9.48		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Taps (excluding kitchen and external taps)																					
Are both a Bath & Shower Present?		Bath & Shower	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:
Bath	Capacity to overflow	193	21.23		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Flow rate (litres / minute)	8	34.96		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
	Flow rate (litres / minute)	6	13.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Kitchen sink taps																					
Has a washing machine been specified?		No	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:
Washing Machine	Litres / kg	17.16		0.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a dishwasher been specified?		No	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:
Dishwasher	Litres / place setting	4.50		0.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Has a waste disposal unit been specified?		No	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:	Select option:
Water Softener	Litres / person / day	0.00		0.00	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00
Calculated Use		113.9		0.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
Normalisation factor		0.91		0.91	0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91		0.91
Total Consumption		103.6		0.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
Codes for Sustainable Homes	Mandatory level	Level 3																			
	External use	5.0		5.0	5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0		5.0
Building Regulations 17K	Total Consumption	108.8		0.0	0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0		0.0
	17K Compliance?	Yes																			

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