Gondar Gardens Briefing Note – 29st October 2018
Sustainability

CBC Response to GLA Energy Memo: Stage 1 Consultation – 05/12/2017

BE LEAN

Energy efficiency standards

1. A range of passive design features and demand reduction measures are proposed to reduce the carbon emissions of the proposed development. Both air permeability and heat loss parameters will be improved beyond the minimum backstop values required by building regulations. Other features include low energy lighting and variable speed pumps and fans.

Noted

2. The demand for cooling will be minimised through low g-value double glazed units, openable windows and MVHR units. The area weighted average actual and notional cooling demand for the non-domestic building (MJ/m2) should be provided and the applicant should demonstrate that the actual building's cooling demand is lower than the notional.

In a previous GLA response[1] dated 21st December 2017, the following table was presented which demonstrates the weighted average actual and notational cooling demand, and that the actual building cooling demand is lower than the notational.

Area Weighted Average Building Cooling Demand (MJ/m²)		
	Commercial Space	**Nursing Home**
Actual	258.94 MJ/m²	199.78 MJ/m²
Notional	259.52 MJ/m²	218.22 MJ/m²

Table 1 - Area weighted average cooling demands for non domestic building elements

3. An Overheating Assessment using thermal dynamic modelling should be undertaken to assess the overheating risk in line with the relevant CIBSE guidance. This should be submitted for full review.

[1] 4830 - 17.12.12 - Persephone Gardens GLA Comments Briefing Note Ver1

In a previous GLA response[2] dated 21st December 2017, Appendix A contains the comprehensive overheating assessment of the development following the CIBSE overheating guidance TM 52 which contains proposed mitigation methods to overcome overheating.

4. A domestic overheating checklist is included in the GLA's energy guidance which should also be completed and submitted for review.

In a previous GLA response[2] dated 21st December 2017, Appendix C contains the domestic overheating checklist that was conducted in compliance with the GLA's energy guidance.

5. The development is estimated to achieve a reduction of 9 tonnes per annum (3%) in regulated CO_2 emissions compared to a 2013 Building Regulations compliant development.

Noted

6. It is not clear from the report provided which elements should be assessed using Part L 1A and which Part L 2A methodologies. The applicant should provide the Class Use for each element of the site as well as the relevant calculation methodology used.

Please see Table 2 below which details the class use and the relevant calculation methodology used:

Site Element	Class Use	Calculation Methodology
82 self-contained extra care apartments	C2	Part L1A
15 bed nursing home	C2	Part L2A
Associated communal facilities	C2	Part L2A

Table 2 - Calculation methodologies Used

7. Sample SAP calculation worksheets (both DER and TER sheets) and BRUKL sheets including efficiency measures alone should be provided to support the savings claimed.

In a GLA response[2] dated 21st December 2017, 'be lean' BRUKLs are presented in Appendix B and the sample DER/TER worksheets are presented in Appendix C

[2] 4830 - 17.12.12 - Persephone Gardens GLA Comments Briefing Note Ver1

BE CLEAN

District heating

8. The applicant has carried out an investigation and there are no existing or planned district heating networks within the vicinity of the proposed development. The applicant has, however, provided a commitment to ensuring that the development is designed to allow future connection to a district heating network should one become available.

I can confirm that The CHP units and gas boilers specified are to be 'future proofed' to allow for a connection to any prospective district heating network installed at a later date, in line with the London plan hierarchy.

9. The applicant should be proposing a site heat network where all uses will be connected. A drawing showing the route of the heat network linking all uses on the site should be provided.

In the GLA response[3] dated 21st December 2017, a drawing which displayed the route of the heating network linking all uses on site was provided within Appendix D.

10. The site heat network will be supplied from a single energy centre. Further information on the internal layout of the energy centre should be provided.

Similarly, in the GLA response[3] dated 21st December 2017, Appendix E provides further information regarding the internal layout of the energy centre.

Combined Heat and Power

11. The applicant is proposing to install a gas fired CHP unit as the lead heat source for the site heat network. The CHP is sized to provide the domestic hot water load, as well as a proportion of the space heating. A reduction in regulated CO_2 emissions of 66 tonnes per annum (22%) will be achieved through this second part of the energy hierarchy.

Noted

12. Further information on the CHP should be provided including the thermal and electrical output of the engine proposed (kWth/kWe), the total space heating and domestic hot water (DHW) demand of the development (MWh annually), the anticipated running hours of the engine, the engine's efficiency and the proportion of heat met by the CHP.

It is proposed to use four CHP engines with the following capacity each:

- $40kW_{th}$
- $20kW_{e}$

The total space heating and domestic hot water demand for the development have been calculated as 821.31 MWh/annum. The anticipated running hours is 4,704 hours, as per table 8.1 within the Energy Statement.

The engines efficiency used as part of the calculation was 85% and it is anticipated the CHP will meet 55% of the residential heating and hot water demand. For the non-residential is was proposed that the CHP provides 20% of the heating load and 100% of its hot water load.

13. The applicant should also provide the analysis used to determine the size of the CHP including, suitable monthly demand profiles for heating, cooling and electrical loads. The plant efficiencies used when modelling carbon savings should be based on the gross fuel input for gas rather than the net values often provided by manufacturers.

The CHP system is designed to contribute 55% of the combined residential heating and hot water demand, as well as 20% of the heating load and 100% of the hot water load for the non-residential element. *Figure 1* and *Table 3*, below, displays the calculated combined monthly heating and hot water load profile for the residential and commercial elements of the Gondar Gardens development and the contribution of both the CHP system and gas boilers. The CHP units (displayed in blue in Figure 1) provides the baseload and gas boilers providing the top up requirements.

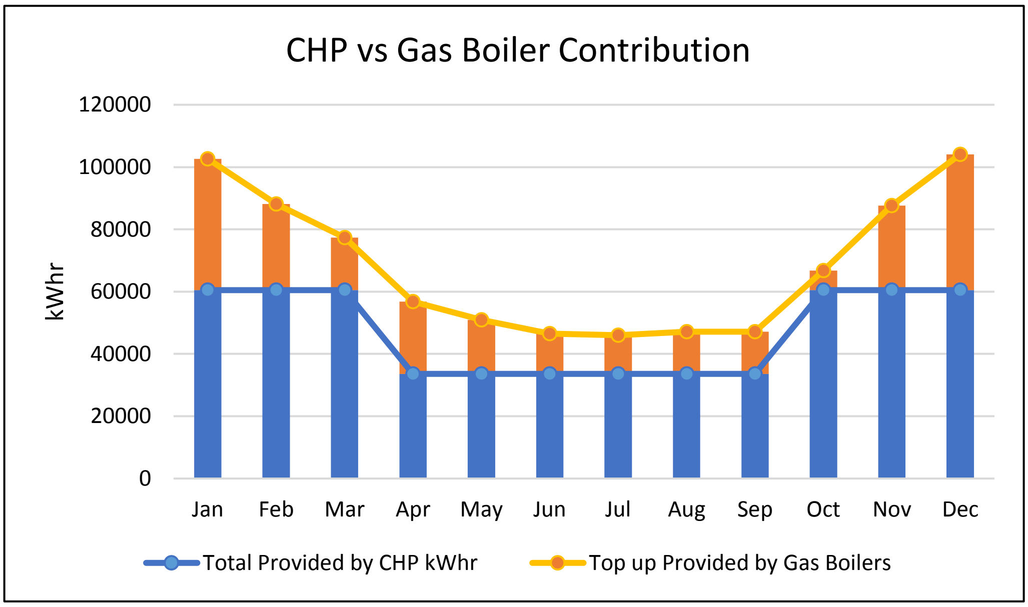

Figure 1 – The Monthly Heating Demand and CHP/Boiler Contribution.

Month	Total Residential / Commercial kWhr	Total provided by CHP kWhr	Top up provided by Gas Boilers kWhr
Jan	102589	60480	42109
Feb	88123	60480	27643
Mar	77395	60480	16915
Apr	56758	33600	23158
May	50990	33600	17390
Jun	46517	33600	12917
Jul	46008	33600	12408
Aug	47190	33600	13590
Sep	47174	33600	13574
Oct	66805	60480	6325
Nov	87664	60480	27184
Dec	104099	60480	43619

Table 3 - Monthly Heating Load Calculations

14. Sample 'be clean' DER calculation worksheets and BRUKL sheets should be provided to support the savings claimed.

In the GLA response[3] dated 21st December 2017, 'be clean' BRUKLs are provided within Appendix F and a sample of DER worksheets in Appendix G.

BE GREEN

Renewable energy technologies

15. The applicant has investigated the feasibility of a range of renewable energy technologies and is proposing to install a 5kWp Photovoltaic (PV) panels' system, equating to circa 32sq.m.

Noted

16. A reduction in regulated CO_2 emissions of 2 tonnes per annum (1%) will be achieved through this third element of the energy hierarchy.

Noted

[3] 4830 - 17.12.12 - Persephone Gardens GLA Comments Briefing Note Ver1

17. Based on the roof layout provided there seem to be much more roof areas available for a PV installation. Given the shortfall in CO_2 emissions, the applicant should ensure that the on-site PV provision has been maximised.

The inclusion of additional PV panels beyond the 5 kWp array currently proposed at roof level has been investigated. Figure 2, below, displays a sketch showing the roof areas that are currently specified to house the 5 kWp PV system and the areas that could potentially house further PV panels that are not intended to house plant equipment or are not exposed to shading.

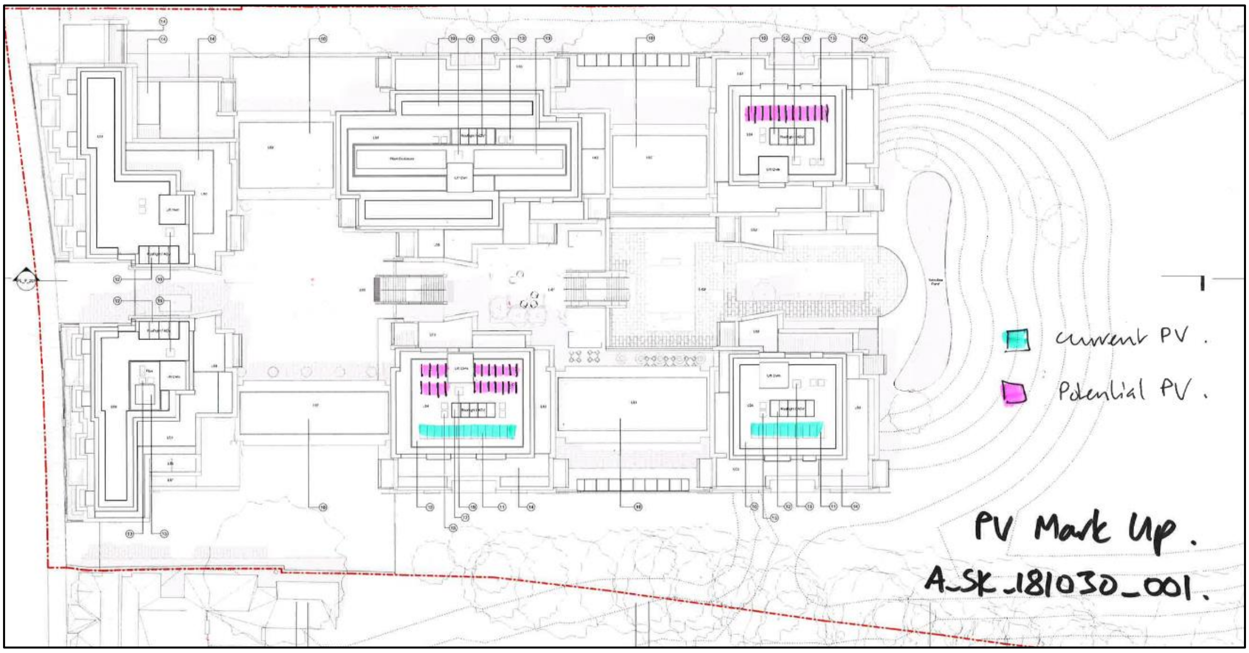

Figure 2 - Current vs Potential PV Area

If the potential PV areas are utilised, the PV array would increase from 20 panels to 49 panels, thus increasing the array to a 13.475 kWP array from the proposed 5 kWp system. Within Appendix A, an updated BRUKL is presented for the 13.475 kWp PV 'stage'. Similarly, updated calculations are displayed within Appendix A, accounting for the increase in PV cells, which shows an annual total CO_2 saving of 4.79 Tonnes from PV which is an increase of 2.13 tonnes saved by the initial 5 kWp system proposed.

18. Sample 'be green' DER calculation worksheets and BRUKL sheets should be provided to support the savings claimed.

In the GLA response[4] dated 21st December 2017, 'be green' BRUKL are displayed in Appendix F and the sample DER worksheets in Appendix H. =Similarly, BRUKL reports are delivered within the Appendix section of the GLA response[4] at each stage (Be Lean, Be Clean, Be Green).

CBC Response to Email (From: John Diver ; To: Sushil Pathak – 18/1-/18)

19. Concerns Surrounding a Year-Round Heat load Requirement.

The specified CHP units, outlined in point 12, is designed to provide the annual hot water requirement of the development site. The CHP system is anticipated to operate for additional hours to provide heating in the colder months. The size of the buffer vessel shall ensure adequate running hours for the CHP are achieved. More importantly, as the CHP system consists of 4 individual units, the CHP plant will also have the option to be modulated down to 25% of its full capacity during periods of low demand. The development is expected to have be a consistent domestic hot water demand throughout the year. The care home within the development is expected to require a larger hot water demand than a standard residential equivalent, as is stated within the Plumbing Engineering Services Design Guide. Furthermore, the site is expected to house on-site facilities that will require a year-round hot water demand that can be provided for via the proposed CHP unit. For example, the facilities that will require a year-round hot water demand are the following: a swimming pool and spa, a bar and restaurant, a gym and shower/changing facilities, a gym, a library, a café, a salon, and first aid base.

Figure 1 and table 3 further outline the monthly anticipated heat and hot water demands that shall be met through the installation of a central CHP plant.

20. Feasibility of Alternate and Renewable Energy Technologies.

In terms of the viability of renewable energy technologies, a 5 kWp Solar Photovoltaic (PV) array installed at roof level is currently proposed, this has now increased to a 11.475kWp system. The feasibility of further renewable energy technologies has been explored.

The implementation of ground source heat pumps is deemed to be in direct conflict with the proposed central CHP plant, which is compliance with the preferred energy hierarchy as part of The London Plan (2016). The recommended strategy, as outlined in the Energy Statement (Version 6), states that a central CHP/Boiler Plant will be used for the heating and hot water demands, and high efficiency chillers (with capacity to provide free cooling) will be used for the cooling demand for the development. The primary heating and hot water source is a site wide CHP system in accordance with the London Plan energy hierarchy.

Initial calculations indicate a 2,324kW heating/hot water demand and a 913kW cooling load. Data shows that collectors can provide 25 (dry loose gravel) and 60-70 (saturated stone) watts per metre of active collector, based on this an average of 47.5 w/m was used in the calculation below. Good practice is to space the boreholes between 6 and 10m apart from each other, an average of 8m have been used for the calculation. The following parameters were used as an estimate to determine the number of boreholes required to provide 1,000kW of the heating / hot water requirement which is circa 43% of the total requirement therefore the technology will need to be supplemented by gas boilers to meet the remaining heat load:

- 47.5W/m per borehole ;
- Boreholes to be 100m deep;
- Boreholes to be 8m from each other;
- Not taking into account the presence of piling

Based on the above, it has been calculated that approximately 212 boreholes would be required. Maintaining a distance of 8m between each borehole, an area of approximately 15,421m^2 would be required. The area of the site is circa 12,500m^2 and therefore there is not enough space for the required boreholes to meet even circa 43% of the heating load. In this circumstance 43% of the heating demand cannot be fully met by ground source heat pumps and a larger, secondary heating system would be required. Furthermore, the cost to drill, excavate and maintain the boreholes necessary at the development is likely to be extremely prohibitive, as well as being highly disruptive to the area.

The implementation of solar thermal collectors would be in direct conflict with the proposed CHP and solar PV system, which are compliant with the preferred energy hierarchy as part of The London Plan (2016).

The implementation of air source heat pumps (AHSP) would be in direct conflict with the proposed strategy of the CHP system to provide heating and high efficiency chillers (with capacity to provide free cooling) to provide cooling, which are compliant with the preferred energy hierarchy as part of The London Plan (2016). The high efficiency chillers specified have a Seasonal Energy Efficiency Ratio (SEER) of 5.12 which is increased when utilising free cooling, which is an equivalent if not more efficient then utilising an ASHP to provide cooling. Furthermore, utilising ASHP for heating and hot water would not have the ability to connect to a district heating network in the future as it will be an electrically driven system.

21. The Potential for additional Solar PV cells.

Refer to point 17.

22. The sample selection of units modelled.

The rationale behind for the selection of the sample unit was to ensure that every unit type present at each level was modelled. By modelling each unit present at each level of the development a comprehensive and broad set of results were generated for the development. The following 9 sample units, which represent circa 11% of the residential elements, were modelled:

- 1 bed ground floor
- 1 bed mid floor
- 1 bed top floor
- 2 bed ground floor
- 2 bed mid floor
- 2 bed top floor
- 3 bed ground floor
- 3 bed mid floor
- 3 bed top floor

Updated calculation for the residential element are displayed in Appendix A which account for the additional units modelled for.

23. Clarification regarding the applicable part of development modelled & confirm relevant floor areas (quantum in data sheet shows shortfall from total commercial areas stated).

The commercial zones of the development have been modelled in entirety by a Cudd Bentley CIBSE Low Carbon Energy Assessor, who are registered to carry Level 5 Energy Assessments. The software used to carry out the modelling is Bentley, HEVACOMP, Version V8i, SS1 SP5 which is an accredited software. Below in Figure 3 is the commercial model. The floor areas accounted for within the commercial part of the development are as follows:

- Front of House = 1,866 m^2
- Back of House = 490 m^2
- Other (Circulation/lifts/stairs) = 2,356 m^2

Therefore, Total commercial area = 4,712 m^2

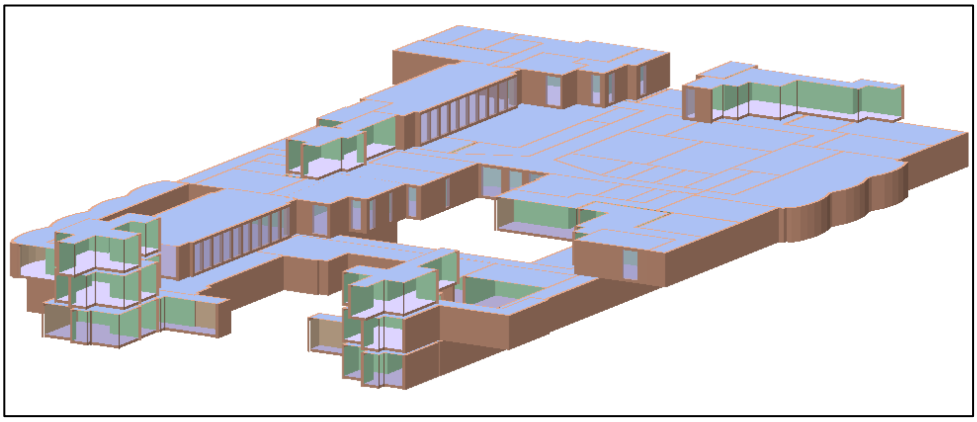

Figure 3 – Commercial SBEM Model

The residential element of the development, which comprises of 82 units was modelled using SAP JPA Designer 990.

Level	1 Bed No.	2 Bed No.	3 Bed No.
-02	2	1	1
-01	-	5	2
00	3	13	1
01	1	23	2
02	1	16	3
03	-	4	4
Total	7	62	13

Figure 4 - Residential Units

A sample of 9 residential units, which is approximately 11% of the total residential development, has been modelled. The unit types modelled are as follows:

- 1 bed ground floor
- 1 bed mid floor
- 1 bed top floor
- 2 bed ground floor
- 2 bed mid floor
- 2 bed top floor
- 3 bed ground floor
- 3 bed mid floor
- 3 bed top floor

24. Building proforma:

In order to achieve compliance with Building Regulations the following 'U' values shall be incorporated within the residential element of the development, in accordance with Part L1A (2013), these 'U' values go beyond the minimum requirements of Part L1A 2013.

- External Walls - U = 0.18 W/m².K;
- Exposed Floors - U = 0.13 W/m².K;
- Exposed Roofs - U = 0.13 W/m².K;

- Glazing - U = 1.4 W/m².K; G' value of 0.63;
- Air Permeability - 4 $m^3/hr/m^2$@ 50 Pa.

Accredited Construction Details in accordance with Table K1 of Appendix K, SAP 2012

The following 'U' values shall be incorporated within the commercial element of the development, in accordance with Part L2A (2013), these 'U' values go beyond the minimum requirements of Part L2A 2013.

- External Walls - U = 0.22 W/m².K;
- Exposed Floors - U = 0.20 W/m².K;
- Exposed Roofs - U = 0.16 W/m².K;
- Glazing - U = 1.4 W/m².K; G' value of 0.43;
- Air Permeability - 4 $m^3/hr/m^2$@ 50 Pa.

In terms of the modelling approach to thermal bridging, accredited construction details in accordance with Table K1 of Appendix K1 SAP 2012 will be targeted within the design of the development.

25. Details regarding energy monitoring.

Energy metering will be provided that follows the methodology of Approved Document Part L and the BREEM 2014 (fully fit out) requirement of credit Ene02. This requires automatic meter reading and data collection facilities to be provided on site, as well as the provision for energy metering systems that shall enable at least 90% of the estimated annual energy consumption of each fuel to be assigned to various end use categories (e.g. heating, cooling, lighting) will be provided. Furthermore, the output of the proposed 13.475 kWp solar array will be monitored and metered separately.

26. Cooling hierarchy assessment

In order to minimise internal heat generation, the following energy efficiency design techniques have been proposed for the development:

- The provision of energy efficient lighting to achieve 2.4 W/m^2 @ 100 lux delivered,
- 100% energy efficient light fittings to the residential units;
- The provision of energy efficient lighting control (PIR controls, daylight sensing and occupancy sensing in relevant areas);

- The provision of zonal thermal controls;
- The provision of energy and light metering, to warn out of range values;
- The provision of variable speed pumps and fans;
- The enhancement of pipework and ductwork, thermal insulation;
- The use of energy efficient heat recovery, to achieve 80% η;
- Electric Power Factor correction;
- LENI calculations to be carried out;

The minimisation of heat entering the building has been mitigated through incorporating a double glazing with a low G value (0.43) and shading co-efficient (51%) to limit the effects of solar gain within the development. Similarly, high performance blinds are expected to be implemented within the development to further limit solar gain. Furthermore, Green roofs have been proposed at roof level which will acts as a mitigative measure to overheating.

The heat retention within the building is designed to be managed through an exposed internal thermal mass and high ceilings. The high thermal mass of existing brick reservoir structure will result in heat retained within the restaurant, lounge and pool areas. Furthermore, passive ventilation has been allowed for where possible via openable windows throughout the residential and commercial areas.

Despite the measures outlined previously, which will minimise the amount of cooling required, in order to ensure a thermally comfortable environment for the potentially vulnerable and elderly residential tenants, mechanical cooling has been deemed a necessity. Therefore, the specification of high efficiency chillers to provide cooling to the commercial and residential areas has been proposed.

27. Confirmation from you that the scheme could commit to the usual target of 105 (+5 external) litres/person/day consumption in terms of water consumption

Confirmation is provided that the water consumption target of 105 l/s/p will be achieved. In accordance with Approved Document G (2015), the table below displays the water fitting standard that shall be targeted.

Table 2.2 **Maximum fittings consumption optional requirement level**	
Water fitting	**Maximum consumption**
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	170 litres
Basin taps	5 l/min
Sink taps	6 l/min
Dishwasher	1.25 l/place setting
Washing machine	8.17 l/kilogram

28. Confirmation that rainwater harvesting systems have been fully explored.

The development site is located within a hollow, and as such has the potential for overland flows to collect and pond. This source of flood risk has been considered in the design of the development, which will incorporate sump pumps to ensure any water entering the site will be pumped away from the properties. In addition, any water falling on the site will be utilised on site with the use of rainwater harvesting systems.

CBC Response to Delegated Officer Report (Officer: Jenifer Walsh ; Expiry Date: 30/01/18)

29. Shortfall in CO_2 Reduction Requirements

CBC is aware that the target carbon reductions have not been fully met in line with both the London Plan Policy 5.2E and the Mayor's Housing Standards' Viability Assessment. Assuming a carbon off-set price of £60 per tonne of carbon dioxide for a period of 30 years, the contribution required for offsite renewable solutions is calculated and displayed below:

Development Element	Annual Shortfall Tonnes CO_2 per Annum	Carbon Off-set Contribution (£)
Non-residential	23.91	£43,038.00
Residential	77.85	£140,130.00

Total	**101.76**	**£183,168.00**

30. Clarification of Building Fabric U values

The building fabric U-Values, as well as the approach to thermal bridging, for the proposed development are discussed within point 24 (building proforma).

31. Concern of annual CHP heat demand

Concerns surrounding the lack of an annual heat demand is discussed within point 19, with several on-site facilities requiring a year-round heat demand presented.

32. The Feasibility of Other Renewable Energy Sources.

The feasibility of alternative and renewable energy technologies is discussed within point 20.

33. Additional information regarding the Cooling Hierarchy.

The cooling hierarchy strategy proposed for the development is discussed within point 26.

34. Design for Climate Change Mitigation

In response to CCS1 Mitigating Climate Change, CBC have produced an overheating assessment, discussed in point 3, to review the proposed buildings overheating and cooling performance considering the threat of climate change. A sample of 5 proposed residential units representing a typical floor were assessed, with the results and recommended mitigation measures then capable of being extrapolated over all floors. The overheating study was undertaken in accordance with Policy 5.9 of the London Plan (overheating and cooling), using the datasets of CIBSE TM52 in order to identify the overheating risk.

35. Details of grey and/or rainwater harvesting

Refer to point 28.

36. SuDs and Drainage

a. The submitted information only considers the runoff from the building and no consideration has been made to the rest of the site. Various sources of flow are shown entering the surface water system, most of which have not been included in the design. There are fundamental flaws with many parts of the design and when Officers work out the attenuation volume from the stated proposed dimensions, the volume is much smaller than they have stated it will be. The design needs to account for the whole site, which is especially true in this case as various sources of flow from across the wider site are shown as having a potential impact, but the applicants have made no attempt to allow for this.

It is unclear which 'various sources of flow' point 38a above refers to. The preliminary drainage design has been designed to drain all the impermeable surfaces on the site. The flows from the soft landscaping in the east of the site will likely generate a minimal flow which is not required to be quantified as part of the planning phase design. If, at the detailed design phase, groundwater is encountered, then specific mitigation can be recommended, however, any displacement to groundwater within the London Clay is expected to be minimal as stated in the BIA and copied below for reference.

"p.19 of the ARUP guidance document (ref: 213923) which supports CPG4, ARUP states:

"Although groundwater is contained within the microscopic pores of the clayey strata of the London Clay, it permeates so slowly, due to the narrow pores, that in practice it is generally considered a barrier to groundwater".

Therefore, the site does not lie above an aquifer."

b. The developer has not yet received notification from Thames Water with regard to a permissible discharge rate. The design has been based on previous (no longer valid) correspondence which indicated a maximum flow of 5 l/s would be acceptable, however it is necessary for Thames Water to confirm the current capacity, which may impact on the proposed drainage design.

A pre-development enquiry was submitted and a response from Thames Water (dated 5th July 2017) was included in the Flood Risk Assessment (FRA) of the site. This confirms that a surface water discharge of up to 5 litres per second is acceptable. The FRA uses a precautionary approach and limits surface water to the calculated greenfield runoff rate (QBAR) of 4.8 litres per second.

c. No consideration of the proposed balancing/retention pond, which is a prime landscaping proposal for the site has been incorporated into the design of the SuDS system. The use of this pond would be higher up the SuDS hierarchy than underground attenuation, but it needs to be considered as part of the overall design (especially as it connects to the rest of the system).

The proposed pond could potentially be integrated into the drainage system, however, at this stage the pond is purely an ornamental feature. Any integration of the pond into the SuDS scheme should be considered at detailed design stage.

d. The design of the site shows a planned perimeter land drainage channel surrounding the proposed building (at two levels below ground), stating that this is to capture groundwater ingress which will then drain into their proposed surface water network. The developer has made no attempt to quantify the likely groundwater ingress, or supplied any information as to how they will prevent ingress. The attenuation is not designed to cope with groundwater ingress. This calls into question the whole design of the system.

Groundwater ingress from the underlying London Clay is predicted to be minimal confirmed by the hydrogeological study included in the BIA. The detail of this drainage system should be conditioned and calculations providing further quantification (if required) can be undertaken at the detailed design phase.

e. Land drainage does not seem to be sufficiently addressed in the proposal. The presence of a balancing pond so close to the building, and the proposed groundwater channel indicate that there are significant drainage issues in the area of the building, and these are not being sufficiently considered in the design. All of the flows across the entire site will need to be considered.

As previously stated, the pond is not a balancing pond, but an ornamental feature that serves no formal drainage function. The land drainage from the eastern site area containing the soft landscaping will be intercepted by the perimeter drain and flows are not predicted to be significant due to the underlying essentially impermeable London Clay.

f. The 5 l/s discharge rate previously stated by Thames Water was for a combined foul and surface water flow from the site. The SuDS report makes no mention of peak foul flows or their proposed discharge method.

Please refer to the update pre-development enquiry dated 7th July 2017 (included within Appendix G of the FRA) which confirms the preliminary acceptance of a foul discharge rate of 3.94l/s and a surface water discharge rate of 5l/s. These rates should be taken in the context of the current site drainage regime (as stated in the FRA), currently in the 100 year storm event an offsite discharge of 87.7 litres per second would occur and no onsite attenuation is provided. Post development an offsite surface water discharge rate of 4.8 litres per second is proposed and 436m^3 of attenuation is proposed to cater for the 1 in 100 year storm with an allowance for climate change.

g. The developer was advised that storage needed to be provided to allow for a 1 in 100 year storm with a 20% climate change allowance, but that it should be increased to 40% climate change to allow for exceedance events to be accommodated. This follows on from previous advice given by the Council outside of the pre-application process. However, this advice is subsequently out of date and therefore the 20% the developers were previously advised to include for climate change is insufficient for a building with a proposed lifespan of 100 years. The 40% climate change is more appropriate, however this should not be linked to exceedance events, for which no information has been provided.

The preliminary drainage strategy allows for the attenuation of the 1 in 100 yr + 40% climate change event on site (refer to Appendix E and Appendix F of the FRA).

h. No information has been provided on drainage during construction nor with regard to a maintenance plan/regime. This is something that will need to be addressed with the relevant contractor during construction. Maintenance will need to be addressed once design has been undertaken.

6.19 Due to these findings there are considerable issues with the overall strategy, as well as the finer details, and Officers are not satisfied that the proposal will prevent increased flood risk, particularly within the site boundary. The proposals are therefore contrary to policies CC1, CC2 and CC3 of the Camden Local Plan 2017, the London Plan and the NPPF.

The runoff rates should be taken in the context of the current site drainage regime (as stated in the FRA). The preliminary surface water drainage strategy has calculated the current brownfield QBar off site discharge rate to be 23.1l/s (rising to

87.7l/s in the 100 year event) this will be reduced to 4.8l/s as part of the proposed strategy.

Currently there is no surface water attenuation provided on the site. Post development 436m^3 of attenuation is proposed to cater for the 1 in 100 year storm with an allowance for climate change.

Therefore, far from increasing flood risk as stated in 6.19 above, this scheme will offer a significant betterment in terms of overall flood risk on the site, both in terms of offsite discharges and attenuation.

The finer details of the strategy will be developed as part of the detailed design.

Appendix A – Updated Energy/Carbon Calculations

Updated Residential Calculations

kWh/annum Baseline													
Typical Unit	Area m^2	Quantity	Total Area m^2	DER	TER	Heating	Cooling	Auxillary	Lighitng	Hot Water	Total Kwh/Annum	Carbon kg Co2 / Annum	Tonnes
1 Bed Ground Floor	69	2	138	17.15	17.15	1448.81	43.08	33.71	278.22	1922.57	7452.78	2366.7	2.37
1 Bed Mid Floor	69	5	345	15.58	15.58	1134.93	37.35	30.57	278.22	1922.57	17018.2	5375.1	5.38
2 Bed Ground Floor	91	1	91	16.28	16.28	2388.62	23.77	45.33	368.82	2144.14	4970.68	1481.48	1.48
2 Bed Mid Floor	91	57	5187	14.65	14.65	1898.9	28.24	40.43	368.22	2144.14	255356.01	75989.55	75.99
2 Bed Top Floor	91	4	364	16.6	16.6	2342.46	67.97	46.04	368.82	2042.04	19469.32	6042.4	6.04
3 Bed Ground Floor	123	1	123	15.38	15.38	3810.38	35.39	60.65	453.11	2254.9	6614.43	1891.74	1.89
3 Bed Mid Floor	123	8	984	13.7	13.7	3046.19	58.74	53.01	453.11	2254.9	46927.6	13480.8	13.48
3 Bed Top Floor	123	4	492	15.67	15.67	4100.82	31.02	63.56	453.11	2254.9	27613.64	7709.64	7.71
Total		82	7724								385422.66	114337.41	114.34

kWh/annum Baseline + Passive/Energy Efficiency Measures													
Typical Unit	Area m^2	Quantity	Total Area m^2	DER	TER	Heating	Cooling	Auxillary	Lighitng	Hot Water	Total Kwh/Annum	Carbon kg Co2 / Annum	Tonnes
1 Bed Ground Floor	69	2	138	16.8	17.15	1425.66	33.76	33.48	278.22	1922.57	7319.86	2318.40	2.32
1 Bed Mid Floor	69	5	345	15.44	15.58	1099.91	37.35	30.22	278.22	1922.57	16841.35	5326.80	5.33
2 Bed Ground Floor	91	1	91	15.95	16.28	2268.33	24.14	44.12	368.82	2144.14	4849.55	1451.45	1.45
2 Bed Mid Floor	91	57	5187	14.33	14.65	1787.7	28.61	39.32	368.82	2144.14	249009.63	74329.71	74.33
2 Bed Top Floor	91	4	364	15.65	16.6	2255.09	26.11	43.99	368.22	2144.14	19350.2	5696.60	5.70
3 Bed Ground Floor	123	1	123	15.28	15.38	3787.33	21.29	60.43	453.11	2254.9	6577.06	1879.44	1.88
3 Bed Mid Floor	123	8	984	13.52	13.7	3001.72	35.39	52.57	453.11	2254.9	46381.52	13303.68	13.30
3 Bed Top Floor	123	4	492	14.88	15.67	3693.84	32.11	59.49	453.11	2254.9	25973.8	7320.96	7.32
Total		82	7724			149038.89				13457.99	376302.97	111627.04	111.63

kWh/annum Baseline + Passive/Energy Efficiency Measures + CHP													
Typical Unit	**Area m²**	**Quantity**	**Total Area m²**	**DER**	**TER**	**Heating**	**Cooling**	**Auxillary**	**Lighitng**	**Hot Water**	**Total Kwh/Annum**	**Carbon kg Co2 / Annum**	**Tonnes**
1 Bed Ground Floor	69	2	138	11.83	17.15	1425.66	20.82	33.48	278.22	1922.57	6072.53	1632.54	1.63
1 Bed Mid Floor	69	5	345	10.96	15.58	1099.91	37.35	30.22	278.22	1922.57	14026.41363	3781.20	3.78
2 Bed Ground Floor	91	1	91	11.11	16.82	2268.33	14.76	44.12	368.82	2144.14	4849.55	1011.01	1.01
2 Bed Mid Floor	91	57	5187	10.06	14.65	1787.7	17.5	39.32	368.22	2144.14	207264.4984	52181.22	52.18
2 Bed Top Floor	91	4	364	10.92	16.6	2255.09	15.97	43.99	368.02	2144.14	16072.48037	3974.88	3.97
3 Bed Ground Floor	123	1	123	10.61	15.38	3797.83	17.8	60.43	453.11	2254.9	6577.06	1305.03	1.31
3 Bed Mid Floor	123	8	984	9.44	13.7	3001.72	21.65	52.57	453.11	2254.9	38548.45532	9288.96	9.29
3 Bed Top Floor	123	4	492	10.33	15.67	3693.84	19.64	59.49	453.11	2254.9	21541.59212	5082.36	5.08
Total		**82**	**7724**								**314952.58**	**78257.2**	**78.26**

Quantity	**Total Area**	**BaselineTotal kWh/annum**	**Baseline kgCO2/annum**	**Improved Emissions after Passive Energy Efficiency kgCO2 /annum**	**Improved Emissions after CHP kgCO2/annum**	**Total kgCO2/annum displaced**	**Total TonsCO2/annum displaced**	**Total % TonsCO2/annum displaced**	**kgCO2/annum displaced by CHP**	**TonsCO2/annum displaced by CHP**	**% TonsCO2/annum displaced by CHP**
2	138	7,453	2,367	2318.40	1,633	734.16	0.73	31.02	685.86	0.67	28.98
5	345	17,018	5,375	5326.80	3,781	1593.90	1.59	29.65	1545.60	1.52	28.75
1	91	4,971	1,481	1451.45	1,011	470.47	0.47	31.76	440.44	0.43	29.73
57	5187	255,356	75,990	74329.71	52,181	23808.33	23.81	31.33	22148.49	21.79	29.15
4	364	19,469	6,042	5696.60	3,975	2067.52	2.07	34.22	1721.72	1.69	28.49
1	123	6,614	1,892	1879.44	1,305	586.71	0.59	31.01	574.41	0.57	30.36
8	984	46,928	13,481	13303.68	9,289	4191.84	4.19	31.09	4014.72	3.95	29.78
4	492	27,614	7,710	7320.96	5,082	2627.28	2.63	34.08	2238.60	2.20	29.04
82	**7,724**	**385,422.66**	**114,337.41**	**111,627.04**	**78,257**	**36,080**	**36.08**	**31.56**	**33,370**	**0.67**	**29.19**

Quantity	Total Area	BaselineTotal kWh/annum	Baseline kgCO2/annum	Passive Energy Efficiency kwh /annum	Improved Emissions after CHP kwh/ annum	Total kwh/annum displaced	Total % kwh/annum displaced	Total Kwh / annum displaced by CHP	Total % kwh/annum displaced by CHP
2	138	7,453	2,367	7320	6,073	1,380	18.52	1247	16.74
5	345	17,018	5,375	16841	14,026	2,992	17.58	2815	16.54
1	91	4,971	1,481	4850	4,850	121	2.44	0	0.00
57	5187	255,356	75,990	249010	207,264	48,092	18.83	41745	16.35
4	364	19,469	6,042	19350	16,072	3,397	17.45	3278	16.84
1	123	6,614	1,892	6577	6,577	37	0.56	0	0.00
8	984	46,928	13,481	46382	38,548	8,379	17.86	7833	16.69
4	492	27,614	7,710	25974	21,542	6,072	21.99	4432	16.05
82	**7,724**	**385,423**	**114,337**	**376303**	**314,953**	**70,470**	**18.28**	**61350**	**15.92**

Updated Commercial Calculations

kWh/m²/annum Baseline											
Typical Unit	Area	Heating	Cooling	Auxillary	Lighting	Hotwater	Total	kWh/Annum	kgCO2/m²/ Annum	Total kgCO2/ Annum	Total TonsCO2/ Annum
FOH	4712.00m²	2.96	9.29	25.76	15.91	49.33	103.24	486466.88	37.8	178113.60	178.11
Nursing Home	353.00m²	4.41	10.33	27.14	13.90	100.9	156.67	55304.51	48.70	17191.10	17.19
Total	**5,065**							**541,771**		**195,305**	**195.30**

kWh/m²/annum Baseline with Passive/Energy Efficiency Measures											
Typical Unit	Area	Heating	Cooling	Auxillary	Lighting	Hotwater	Total	kWh/Annum	kgCO2/m²/ Annum	Total kgCO2/ Annum	Total TonsCO2/ Annum
FOH	4712.00m²	2.38	8.79	24.79	15.27	49.33	100.55	473791.60	36.6	172459.20	172.46
Nursing Home	353.00m²	3.73	9.79	25.69	13.53	100.9	153.64	54234.92	47.4	16732.20	16.73
Total	**5,065**							**528,027**		**189,191**	**189.19**

kWh/m²/annum Baseline with Passive/Energy Efficiency Measures & CHP											
Typical Unit	Area	Heating	Cooling	Auxillary	Lighting	Hotwater	Total	kWh/Annum	kgCO2/m²/ Annum	Total kgCO2/ Annum	Total TonsCO2/ Annum
FOH	4712.00m²	2.77	8.79	24.79	15.27	76.32	110.77	415686.01	30.2	142302.40	142.30
Nursing Home	353.00m²	4.24	12.43	25.69	13.53	155.84	177.02	46073.07	35.40	12496.20	12.50
Total	**5,065**							**461,759**		**154,799**	**154.80**

kWh/m²/annum Baseline with Passive/Energy Efficiency Measures & CHP & PV											
Typical Unit	Area	Heating	Cooling	Auxillary	Lighting	Hotwater	Total	kWh/Annum	kgCO2/m²/ Annum	Total kgCO2/ Annum	Total TonsCO2/ Annum
FOH	4712.00m²	7.32	6.56	24.64	13.82	96.03	118.99	411256.73	29.2	137590.40	137.59
Nursing Home	353.00m²	4.24	12.43	25.69	13.53	155.84	177.02	46073.07	35.40	12496.20	12.50
Total	**5,065**							**457,330**		**150,087**	**150.09**

Energy Calculations (Regulated Energy Demands) Carbon

Typical Unit	Total Area	BaselineTotal kWh/annum	Baseline kgCO2/annum	Improved Emissions after Passive Energy Efficiency kgCO2 /annum	Improved Emissions after CHP kgCO2/annum	Improved Emissions after PV kgCO2/ annum	Total kgCO2/ annum displaced	Total TonsCO2/ annum displaced	Total % TonsCO2/ annum displaced
FOH	4712.00m²	486,467	178113.60	172459.20	142302.40	137590.40	40523.20	40.52	22.75
Nursing Home	353.00m²	55,305	17191.10	16732.20	12496.20	12496.20	4694.90	4.69	27.31
Total	**5,065**	**541,771**	**195,305**	**189,191**	**154,799**	**150,087**	**45,218**	**45.22**	**23.15**

Energy Calculations (Regulated Energy Demands) Energy

Typical Unit	Total Area	BaselineTotal kWh/annum	Baseline kgCO2/annum	Passive Energy Efficiency kwh /annum	Energy provided by CHP kwh/annum	Improved Emissions after PV kwh/annum	Total displaced kwh/annum after CHP & PV	Total % kwh/annum displaced
FOH	4712.00m²	486,467	178113.60	473791.60	415686.01	411256.73	75210.15	15.46
Nursing Home	353.00m²	55,305	17191.10	54234.92	46073.07	46073.07	9231.44	16.69
Total	**5,065**	**541,771**	**195,305**	**528,027**	**461,759**	**457330**	**84,442**	**15.59**