Consulting Civil Engineers

Water Neutrality Report

Park House Hotel, Bepton, Midhurst, West Sussex GU29 0JB

For

Sloane & Brown

Rev - **P**

Reference **C1980**

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1 Introduction

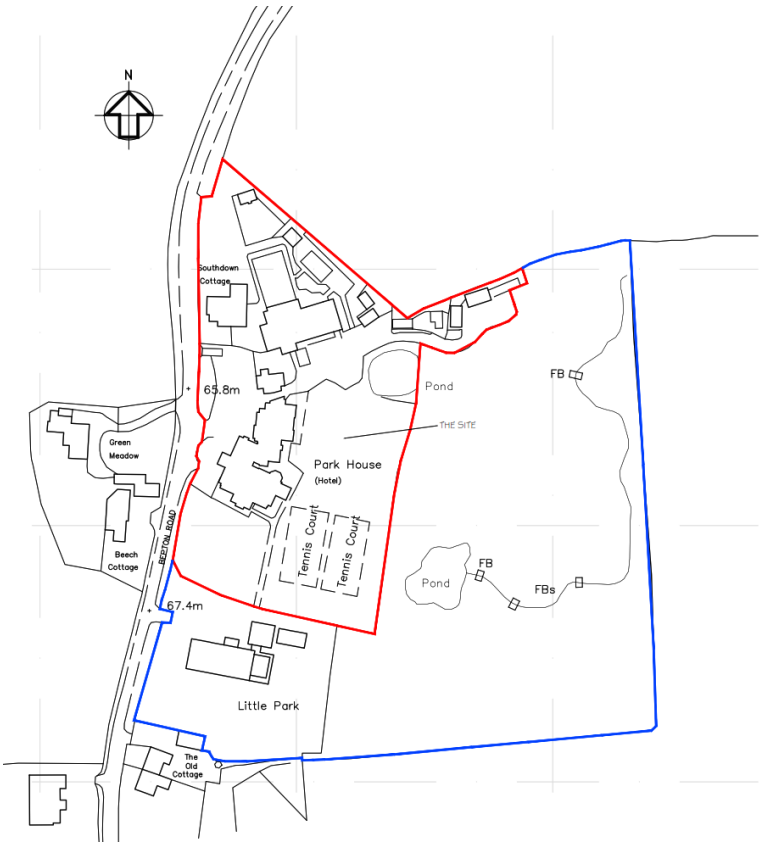
1.1.1 CGS Civils Ltd has been appointed by Sloane & Brown to undertake a Water Neutrality Report for a proposed development at Park House Hotel in Bepton, Midhurst, West Sussex.

1.1.2 The purpose of this report is to therefore provide an overview on the potential water usage changes on the site as a result of the proposed development, and to confirm that the site is water neutral.

1.1.3 The current site has a water demand of **4067.5 l/day** which is greater than the proposed 'improved' demand of **3660.7 l/day** between both the existing and proposed properties.

1.1.4 The proposed development is located at OS Grid Reference SU86181862 and has the post code GU29 0JB

Fig 1. Site Location



1.1.5 Waterwise defined Water Neutrality as:

'For every new development, total water use in the region after the development must be equal to or less than the total water uses in the region before the new development.'

1.1.6 Achieving water neutrality involves using a three-step approach. First, the demand for water from the new development must be reduced as far as is practicable, followed by the re-use of water; then the remaining demand should be offset within the region. Following this three-step approach allows the volume that requires offsetting to be reduced which ultimately reduces the cost of the overall scheme. This is noted within the Waterwise neutrality definition, which defines the three steps which should be undertaken in order to achieve water neutrality in their recent review dated January 2021.

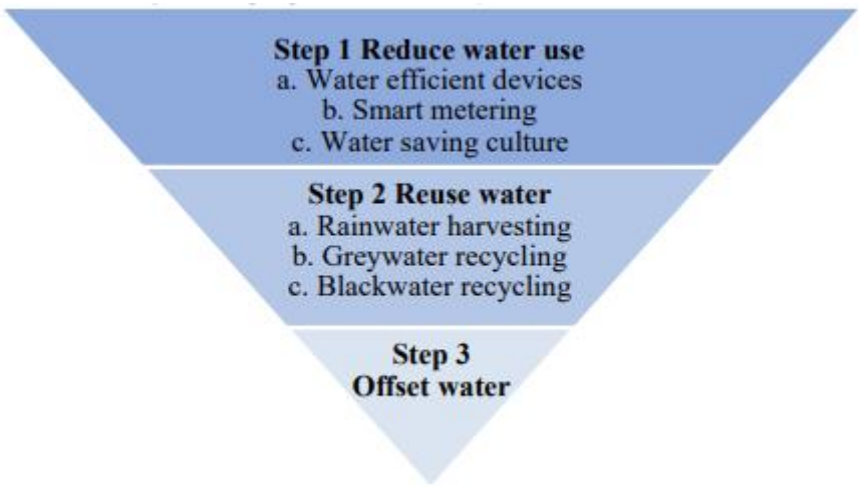
- Reduce water demand in the new development through improvement in efficiency.
- Re-use water, wherever possible.
- Offset the remaining water demand from the new development if required.

1.1.7 The report will be split into the following sections:

- A Review of Water Neutrality demand reduction
- A calculation of estimate water usage from proposed development
- Identification of measures that can be first used to reduce this demand
- Identification of measures that can be used to re-use water
- Establish solutions to offset that demand in order to achieve neutrality.

1.1.8 This report will follow the methods documented within *'A Review of Water Neutrality in the UK'* carried out by Waterwise in January 2021. The document provides details on how developments can achieve water neutrality by utilising the 3-stage approach.

Fig 2. 3-stage approach



1.1.9 Some increase in water demand within the region from planned development during the local plan period is inevitable. However, it can be minimised by making the site as water efficient as possible.

1.1.10 Per Capita Consumption (PCC) is used as a measure of water use and is the volume of water that is used by one person in one day. It is usually measures in litres per person per day (l/p/d). The average PCC within Southern Water's 'Sussex North Water Resource Zones (WRZ)' is 135 l/p/d.

1.1.11 The benefits of water neutrality are wide ranging, from financial and reputational to environment and social. For a new domestic building, they could include:

- **Saving Water** – Over 100,000 litres of water can be saved per year for each water neutral home built
- **Saving Carbon** – A significant CO2 saving can be achieved by reducing the demand for hot water for baths, showers, basins, dishwashers and washing machines
- **Saving Money** – Both water and energy bills will reduce
- **Reducing environmental impact** – Decreasing water abstracted from rivers and groundwater sources
- **Improved Resilience** – For the future by minimising the additional pressure on water resources
- **Enabling future housing growth** – In water scarce areas by reducing the impact of new homes and buildings
- **Reducing discharge to sewage** – by using less water, collecting rainwater and recycling greywater, less water is discharged to the drainage network
- **Short pay-back time** – After approximately 5 years the saving of water neutrality will outweigh the costs of doing so.

2 Calculation of estimate water usage from the proposed development

2.1.1 Before any necessary steps to achieve water neutrality can be determined, the total water demand for the proposed development must first be calculated. The proposed scheme will consist of the replacement of existing plant room with a new Hotel Room. In accordance with '*British Flows and Loads'* the total population, based on the 1 bedrooms, would be 3 i.e. number of bedrooms + 2. However, as the proposed development will consist of a new hotel bedroom, the population used will be 2.

2.1.2 As per the PCC demand scenario located in 1.1.10, the water usage should be in accordance with what is listed within the '*British Flows and Loads'* section for Hotel Guests i.e., 250 l/p/d. However, the water usage by guests vary greatly due to the nature of a hotel. As the proposed room has an en-suite, it is safe to say these will be used daily and the demand has been calculated below in Appendix A.

2 x 169.477 l/p/d
= 338.9 l/day

2.1.3 The following sections within this report will cover measures that can be undertaken in order to reduce the water consumption of the proposed property and aim to reduce the water demand to as low as possible.

3 Step 1 – Identifying measures that can be used to reduce this demand

3.1.1 The first and most important step in achieving water neutrality will be to ensure that the water used by the proposed development is used as efficiently as possible; the smaller the water demand of the building due to the design and fittings, the less water is needed to be reused and offset. There are a number of ways of achieving a smaller water demand:

- Fitting rooms with efficient products, such as:

  - Aerated Taps

  - Aerated Shower heads

  - Low Flush Toilets, or air flush toilets

3.1.2 Building Regulations Part G states that when the new fittings approach is used, the water consumption of the fittings must not exceed a total of 125 l/p/day/. The values are listed in the table 2 below:

Table 2 Maximum Fittings Consumption from Building Regulations Part G

Water Fitting	Maximum Rating
WC	6.4/ litres dual flush or 4.5 litres single flush
Shower	10 l/min
Bath	185 litres
Basin Taps	6 l/min
Sink Taps	8 l/min
Dishwasher	1.25 l/place setting
Washing Machine	8.17 l/kilogram

3.1.3 Should the proposed development be required to comply with the optional water efficiency as part of the conditions for planning permission, the estimated consumption of water can be calculated via the Optional requirement level of fittings consumption. This is listed within Building Regulations Part G, which also states that the water consumption must not exceed 110 l/p/day, and the maximum fittings consumption for optional requirement can be found in Table 3 below:

Table 3 Maximum fittings consumption optional requirement level from Building Regulations Part G

Water Fitting	National Base Level
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

3.1.4 However, to improve on the above requirements, the proposed site can implement the following measures in order to focus on becoming a water efficient development. By installing the following features, the development can achieve a water demand of around 85 l/p/d, which aligns with a 'Realistic Achievable' PCC. See Table 4 below:

Table 4 Water efficient fittings consumption

Water Fitting	Consumption Level
WC	4/2.6 litres dual flush
Shower	7 l/min
Bath	145 litres
Basin Taps	2.5 l/min
Sink Taps	5 l/min
Dishwasher	0.67 l/place setting
Washing Machine	5.5 l/kilogram

3.1.5 Water demand can also be reduced through fitting metres, which help to identify leaks and track water consumption as a way to support and encourage behavioural changes such as, not leaving the tap running when brushing teeth and using eco settings on the washing machine and dishwasher. It should be noted that behavioural changed have not been used within the calculations within this report as it is impossible to enforce.

Table 5 Practical Summary of Step 1

Step 1: Reduce Water				
Toilets	Cistern displacement devices (toilet hippos)	Retrofit flush devices to dual flush	Fix leaky toilets	
Taps	Tap inserts (aerators)	Low flow restrictors	Push taps	Infrared Taps
Showers/baths	Low flow shower heads (less than 8litres/min)	Shower timers	Reduced bath frequency & volume	
Outdoors	Hosepipe flow restrictors	Hosepipe siphons	Water butts	Mulches and composting to keep soil moist
Smart Metering	Leakage information	Encourage behavioural changes	Innovative tariffs	Savings estimates

3.1.6 By installing the water efficient devices listed above, it is possible to reduce the water demand from the en-suite down from **338.954 l/day** to **247.994 l/day.**

2 x 123.9

= 247.9 l/day

- *2 (Occupancy of proposed hotel room) x 123.9 (Appendix B – Water calculator for proposed fittings)*

4 Step 2 – Identify measures that can be used to re-use water

4.1.1 Once the water demand has been reduced via the installation of water efficient products, water reuse should be considered. The term 'water reused' refers to the capture, treatment (if it is required) and the use of alternative water supplies for non-potable purposes. It includes:

- Rainwater and surface water harvesting
- Greywater recycling (typically the used water from baths, showers and hand basins)
- Wastewater recycling.

4.1.2 The installation of water reusing technology has the potential to save significant amounts of water; for example, 24% of water in the home is used for flushing the toilet and only 4% externally in the garden meaning a water reuse system could save at least a quarter of the demand if it was installed for these purposes. Depending on the quality and the system installed, it could also be possible to re-use water for a washing machine which accounts for 12% of total water usage.

Table 6 Practical Summary of Step 2

Step 2: Reuse Water			
Rainwater Harvesting	Small scale water butt	Rainwater Harvesting system for individual homes and buildings	Large scale surface water harvesting
Greywater Recycling	Small systems for individual homes	Largest scale systems for commercial and mixed-use sites	

4.1.3 Whilst water demand can generally be reduced even further through the use of Rainwater Harvesting and Greywater Recycling, it is not deemed viable on the proposed development due to the nature of the works.

4.1.4 From the above water calculations, we have:

- Proposed water usage rate of 169.4 litres/person/day based on Appendix A
- Which can then be reduced to:
- Proposed water usage rate of 123.9 litres/person/day with water efficient devices in Appendix B.

4.1.5 In order to provide a cumulative consumption comparison between the existing and the proposed water usage, the occupancy rates would be for 'as existing' and 'as proposed':

- Proposed water demand from Appendix A – 169.4 l/p/d at an overall occupancy rate of 2 people = **338.9 l/day.**
- Proposed Water Demand with water efficient devices listed in Appendix B – 123.9 l/p/d at an overall occupancy rate of 2 people = **247.9 l/day**

5 Step 3 – Offsetting remaining water demand

5.1.1 Finally, the remaining water requirements for new homes or developments which cannot be satisfied with non-potable sources must be offset. Offsetting can be done by investing in schemes that save water within the local region such as retrofitting existing buildings with water efficient devices or water reuse systems.

5.1.2 In this instance however, the existing rooms at Park House Hotel may also be retrofitted with Water Efficient devices in order to offset this demand. Each room within Park House Hotel has an en-suite bathroom, by retrofitting the taps and shower heads as well as replacing the toilers within each en-suite, the water demand can be reduced by as much as 27.28 l/p/d.

5.1.3 The water demand for the other 12 rooms as they currently are is **4067.4 l/day** (Based on the water demand from Appendix A – with 2 guests per room all year round). If the rooms are to be retrofitted with the devices listed in 5.1.2, the total water demand will be reduced down to **3412.7 l/day**. This is a total reduction of **654.7056 l/day**, which is greater than the water demand of the proposed development stated above in 4.1.5, which results in the proposed development being **water neutral.**

6 Conclusion

6.1.1 The overall water demand can be reduced by utilising methods listed in the sections above to reduce and re-used water for the proposed development. This results in the site not only being water neutral, but will also provide a degree of betterment over the existing site's water demand.

6.1.2 To summarise:

- The new en-suite hotel room will use on average **338.9 l/day** prior to any reduction measures.
- The water demand for the en-suite hotel room can be reduced down to **247.9 l/day** through the installation of water reducing appliances.
- Re-using the water through rainwater harvesting tanks and greywater recycling is not a viable option for the site.
- The water demand for the existing rooms at Park House Hotel is **338.9 l/day**, which results in an overall demand of **4067.4 l/day**. By undertaking the 'reduce' measures that are listed above, the water demand can be reduced down to **142.2 l/day per room or 3412.7 l/day** for all 12 rooms. This is a total reduction of **654.7 l/day** which is greater than the water demand of the proposed development.
- The overall water demand will be reduced and the existing rooms at Park House Hotel will be retrofitted with the 'reduce' measures listed above in order to offset this demand. The proposed site will therefore be Water Neutral.

7 Appendices

7.1 Appendix A:

Table 7 – Water Calculator from Building Regulations Part G – Information input from proposed site with standard devices from Table 2.

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	0	4.42	0	0
WC (Dual Flush)	Full Flush Vol.	6.4	1.46	0	9.344
	Part Flush vol.	4	2.96	0	11.84
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	6	1.58	1.58	11.06
Bath (shower also present)	Capacity to overflow (l)	0	0.11	0	0
Shower (bath also present)	Flow rate (l/min)	0	4.37	0	0
Bath only	Capacity to overflow (l)	185	0.5	0	92.5
Shower only	Flow rate (l/min)	10	5.6	0	56
Kitchen sink taps	Flow rate (l/min)	0	0.44	10.36	0
Washing Machine	Litres/kg dry load	0	2.1	0	0
Dishwasher	litres/place setting	0	3.6	0	0
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			180.744
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			0
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			169.4

7.2 Appendix B:

Table 8 – Water Calculator from Building Regulations Part G – Information input from proposed site with water efficient devices listed in Table 4.

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	0	4.42	0	0
WC (Dual Flush)	Full Flush Vol.	4	1.46	0	5.84
	Part Flush vol.	2.6	2.96	0	7.696
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	2.5	1.58	1.58	5.53
Bath (shower also present)	Capacity to overflow (l)	0	0.11	0	0
Shower (bath also present)	Flow rate (l/min)	0	4.37	0	0
Bath only	Capacity to overflow (l)	145	0.5	0	72.5
Shower only	Flow rate (l/min)	7	5.6	0	39.2
Kitchen sink taps	Flow rate (l/min)	0	0.44	10.36	0
Washing Machine	Litres/kg dry load	0	2.1	0	0
Dishwasher	litres/place setting	0	3.6	0	0
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			130.766
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			0
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			123.9

7.3 Appendix C:

Table 9 – Water Calculator from Building Regulations Part G – Information input for existing rooms with devices listed in Table 2 and 4.

The Water Calculator for New Dwellings with Water efficient measures					
Installation Type	Unit of measure	Volume/ flow rate	Use factor	Fixed use	Litres/person/day
WC (Single Use)	Flush volume (l)	0	4.42	0	0
WC (Dual Flush)	Full Flush Vol.	4	1.46	0	5.84
	Part Flush vol.	2.6	2.96	0	7.696
WC (Multiple Fittings)	Average effective flush volume (l)	0	4.42	0	0
Taps (excl. Kitchen)	Flow rate (l/min)	2.5	1.58	1.58	5.53
Bath (shower also present)	Capacity to overflow (l)	0	0.11	0	0
Shower (bath also present)	Flow rate (l/min)	0	4.37	0	0
Bath only	Capacity to overflow (l)	185	0.5	0	92.5
Shower only	Flow rate (l/min)	7	5.6	0	39.2
Kitchen sink taps	Flow rate (l/min)	0	0.44	10.36	0
Washing Machine	Litres/kg dry load	0	2.1	0	0
Dishwasher	litres/place setting	0	3.6	0	0
Waste disposal unit	litres/use	0	3.08	0	0
Water softener	litres/person/day	0	1	0	0
		Total Calculated use (l/p/d)			150.766
		Contribution from greywater (l/p/d)			0
		Contribution from rainwater (l/p/d)			0
		Normalisation factor			0.91
		External water use			5
		Total water consumption (36(1)) (l/p/d)			142.1