Delta Green
environmental design

WATER NEUTRALITY
ASSESSMENT REPORT

South Lodge, The Reeds
Waterside Lodges

Water Neutrality Report

Suitability: S2

Revision: P02

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CONTENTS

1.0 INTRODUCTION 3

2.0 BACKGROUND 4

3.0 EXISTING SITE WATER USEAGE 6

4.0 ESTIMATED WATER DEMAND TO LODGES AND CONCIERGE BUILDING 7

5.0 RAINWATER HARVESTING 10

6.0 IMPROVEMENTS TO THE EXISTING SITE 11

7.0 WATER BUDGET 13

1.0 INTRODUCTION

South Lodge is a luxury spa hotel located in Lower Beeding, Horsham, West Sussex, RH13 6PS. The hotel is looking to provide eight luxury Lodges and a Concierge building with yoga studio to the site.

The Lodges will typically comprise of a double bedroom, bathroom, kitchen space and living space. Two lodges will also include a sauna and one lodge will be accessible.

The Concierge building will comprise a reception, yoga room, WC, external terrace, plant space and storage.

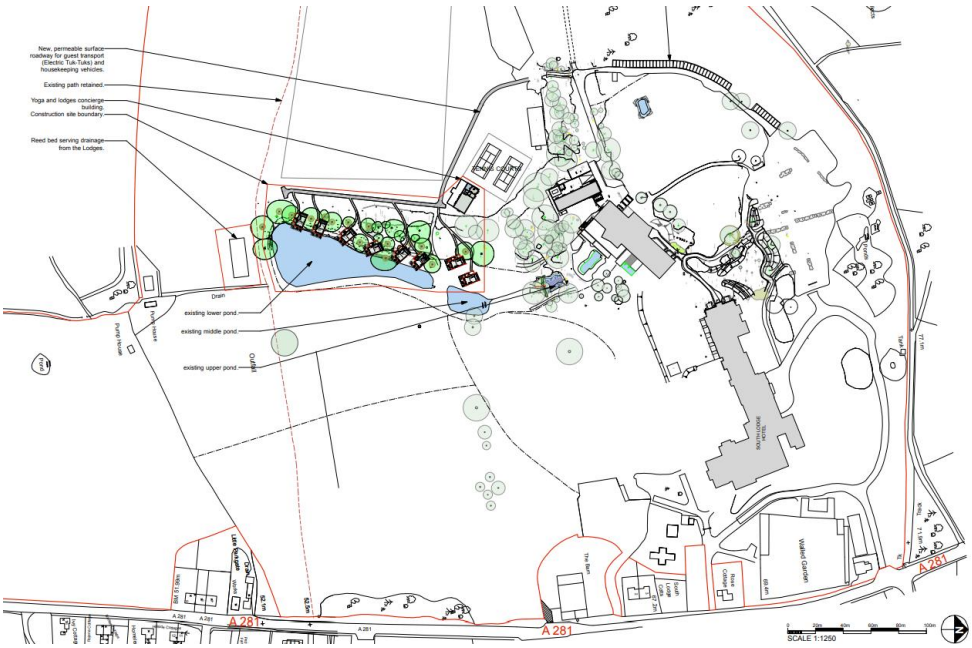

Figure 1.1: Excerpt from Architects Site Location Plan indicating the proposed new Lodges and Concierge building.

This report has been prepared to review the existing water consumption at South Lodge Hotel and assess the impact of the proposed development at the site.

The hotel is currently implementing several improvements to reduce water consumption to the existing site which will aid in minimising the impact of the proposed development.

This report demonstrates that the works being undertaken to improve water efficiency at the hotel enable water neutrality to be met to enable the new Lodges and concierge building to have no impact to the water consumption on the site.

2.0 BACKGROUND

Horsham District is situated in an area of serious water stress, as identified by the Environmental Agency Water Stressed Areas Classification.

Horsham District is supplied with water by Southern Water as indicated on the Southern Water Map below, identifying that the area sits within the Sussex North Water Resource Zone.

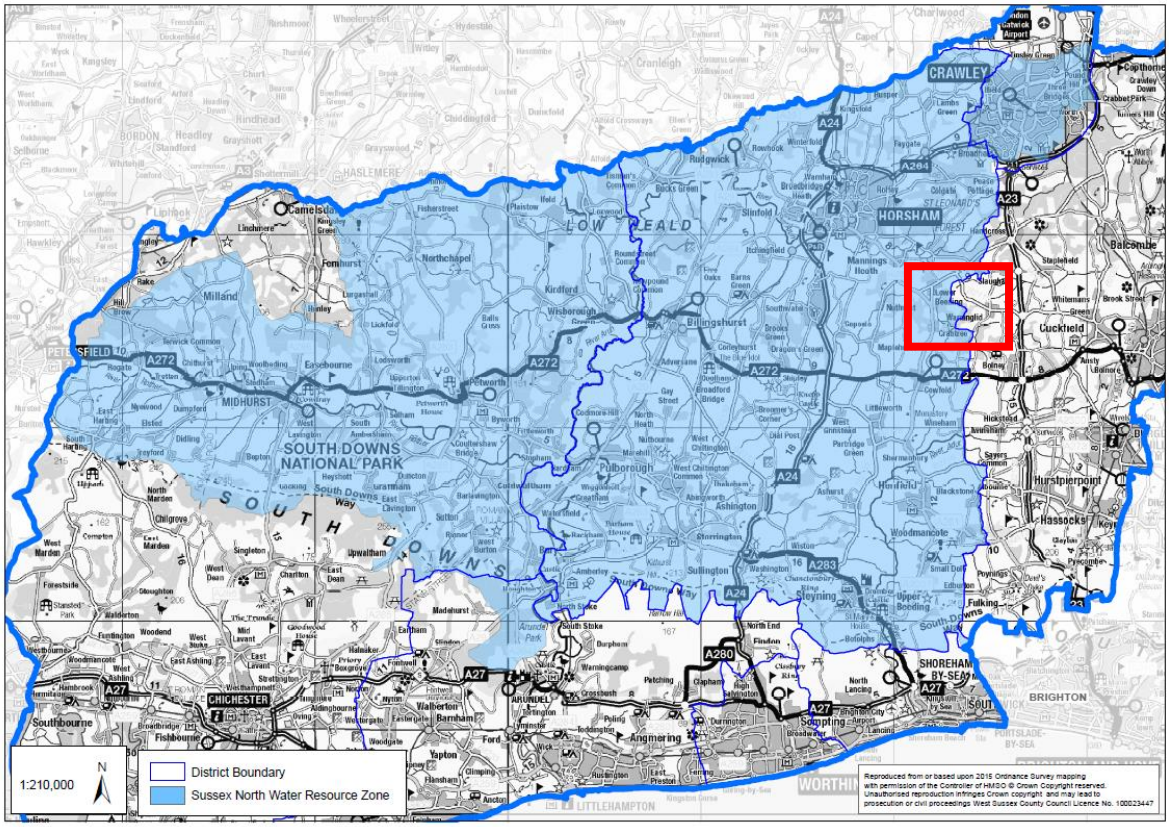

Figure 2.1: Southern Water Map highlighting the Sussex North Water Resource Zone. The red box indicates the approximate location of South Lodge.

The water supply to South Lodge is sourced from abstraction points in the Arun Valley, which includes locations such as Amberley Wild Brooks Site of Special Scientific Interest (SSSI), Pulborough Brooks SSSI and Arun Valley Special Protection Area/Special Area of Conservation and Ramsar site.

On 14th September 2021, the council received a Position Statement from Natural England. To summarise, the Natural England position is that it cannot be concluded that the existing abstraction within the Sussex North Water Supply Zone is not having an impact on the Arun Valley sites. It advises that developments within this zone must not add to this impact.

Natural England is working in partnership with all the relevant authorities to secure water neutrality collectively through a water neutrality strategy however in the meantime, whilst the strategy is evolving, Natural England advises that decisions on planning applications should await its completion. However, if there are applications

which a planning authority deems critical to proceed in the absence of the strategy, then Natural England advises that any application needs to demonstrate water neutrality.

The definition of water neutrality in Natural England's Statement is taken from that used in the final report of Water Neutrality Study: Part A – Individual Local Authority Areas: *"For every new development, total water use in the region after the development must be equal to or less than the total water-use in the region before the new development".*

Natural England have provided the following agreed interim approach for demonstrating water neutrality;

Minimising water use of new builds.

- Complete a water budget (based on occupancy)
- All new builds to demonstrate that they can achieve strict water targets (e.g., 85L/pp/day)

This can be achieved by measures such as:

- Grey water recycling (advantage of being reliable in hot dry weather);
- Rainwater harvesting;
- Water efficient fixings (such as shower aerators) to demonstrably reduce demand-this would need to be suitably certain.

In addition, water offsetting is required

One way to achieve this is to offset the demand for water in existing developments. Examples include:

- Grey water recycling;
- Rainwater harvesting;
- Installation of water reduction fittings.

These measures need to be implemented until such time as a more sustainable water supply has been secured.

Water neutrality aims to minimise the impact of a development, reducing the strains on the existing water resources, infrastructure and the environment. For a development to demonstrate that it is water neutral, it must show that it does not add to the overall existing water demand to the area.

3.0 EXISTING SITE WATER USEAGE

The existing hotel comprises 88 en-suite bedrooms, with main kitchen, a staff house (the Gatehouse) and a spa. The site has three incoming mains water meters serving each the main hotel, spa and Gatehouse and the hotel have provided monthly meter readings between March 2018 to March 2022 together with occupancy figures (as a percentage) to enable an assessment of the existing water use to the site.

The hotel typically has an annual occupancy of 70%, however, the site had been impacted due to lockdowns during the Covid pandemic, hence the reduced occupancies for some of the reported figures. Levels were starting to reduce in February 2020 just prior to the first lockdown and the hotel was closed between April and July 2020, November 2020 and between January to April 2021.

Water consumption to the main hotel has been assessed based on the annual consumption of the main hotel building and the occupancy figures provided as illustrated in table 3.1 below. It has been assumed that rooms have generally been occupied by two people per night for the purposes of this assessment.

Date	Days	Meter Reading (m^3) Main Hotel	Annual m^3	Daily litres	Occupancy %	Annual Occupancy	Litres / occupant / day
04/03/2018		95975					
04/03/2019	365	113192	17,217	47,170	55.7	35,782	481
02/03/2020	364	130857	17,665	48,530	66	42,398	418
28/03/2021	391	141687	10,830	27,698	53.8	34,561	293
27/03/2022	364	157785	16,098	44,225	60.39	38,795	416

Table 3.1: Water consumption and occupancy to main hotel for 2018 – 2022.

It is assumed that the majority of water consumption to the main hotel will be for guest use in the bathrooms, and to the main kitchen. Table 3.1 indicates that the litres per occupant range between 293 to 481 litres per person per day. The period between March 2020 to March 2021 is unusually low and is likely due to the hotel being closed during lockdowns. Assessing the remaining three periods, the average daily water consumption is 438 litres per person. The Building Services Research and Information Association (BSRIA) Rules of Thumb Guidelines for building services (5th edition) suggests a maximum daily water consumption of 200 litres per person for a 5 star hotel, which indicates that there is room for improved water efficiencies within the main hotel.

4.0 ESTIMATED WATER DEMAND TO LODGES AND CONCIERGE BUILDING

The eight Lodges are provided with en-suite facilities comprising typically a bath, shower, WC and two basins, the exception being to the Accessible Lodge, where the en-suite bath is excluded. A small, basic kitchenette area is provided for tea making, with a microwave, fridge and small kitchen sink. The two Sauna Lodges are provided with 250 litre external baths, while the Accessible and Standard Lodges are provided with 550 litre soak baths.

An assessment on water demand to the Lodges has been based on sanitaryware meeting the flow rates identified in table 4.1 and an estimated daily use. It would normally be expected to carry out a water assessment using the water efficiency calculator for new dwellings, as published in Building Regulations, Part G, Sanitation, Hot Water Safety and Water Efficiency, however, this calculator does not lend itself to the commercial environment of a luxury hotel, and therefore an assessment has been based on professional opinion and anticipated occupancy for the development.

Water Fitting	**Specification**	**Estimated Daily demand**
WC	6/4 litre dual flush cistern.	5 flushes per day per person with average flush at 4.5 litres
Wash hand basins	3.5 litres / minute mixer tap	5 uses per day per person at 20 seconds per use
Ensuite Bath (7 no. lodges)	370 litre luxury bath	1 use every 2 days per lodge - allow 250 litres to fill
External Bath (2no. lodges)	250 litre luxury bath	1 use every 2 days per lodge - allow 180 litres to fill
Soak Bath (6 no. lodges)	550 litre external bath	1 use every 2 days per lodge – allow 430 litres to fill
Shower	12 litres per minute	Average 8 minute shower per person
Kitchen Taps	Mixer tap with limiter	Allowance of 1 litre per day for tea making

Table 4.1: Table of sanitary ware specifications and estimated daily usage to each Lodge

Installation Type	Unit of measure	Volume (litres)	Daily uses	Litres / day
WC (dual flush)	Average flush volume (litres)	4.5	10	45
Taps (wash basins)	Flow Rate (Litres per use)	1.1667	10	11.667
Ensuite Bath	Fill volume	250	0.5	125
External Bath	Fill volume	180	0.5	90
Shower	Volume per shower	96	2	192
Kitchen Sink	Capacity	1	1	1
			TOTAL	464.7 litres / day
				232.3 litres per person

Table 4.2: Estimated daily water consumption to double occupancy, Sauna Lodge (Lodges 1&2).

Installation Type	Unit of measure	Volume (litres)	Daily uses	Litres / day
WC (dual flush)	Average flush volume (litres)	4.5	10	45
Taps (wash basins)	Flow Rate (Litres per use)	1.1667	10	11.667
Soak Bath	Fill volume	430	0.5	215
Shower	Volume per shower	96	2	192
Kitchen Sink	Capacity	1	1	1
			TOTAL	464.7 litres / day
				232.3 litres per person

Table 4.3: Estimated daily water consumption to double occupancy, Accessible Lodge (Lodge 3).

Installation Type	Unit of measure	Volume (litres)	Daily uses	Litres / day
WC (dual flush)	Average flush volume (litres)	4.5	10	45
Taps (wash basins)	Flow Rate (Litres per use)	1.1667	10	11.667
Ensuite Bath	Fill volume	250	0.5	125
Soak Bath	Fill volume	430	0.5	215
Shower	Volume per shower	96	2	192
Kitchen Sink	Capacity	1	1	1
			TOTAL	589.7 litres / day
				294.8 litres per person

Table 4.4: Estimated daily water consumption to double occupancy, Standard Lodge (Lodges 4,5,6,7&8).

The average water consumption across the eight lodges equates to 271.4 litres per person per day, which indicates a saving of around 28% per person based on the existing main hotel consumption, although the main hotel does also include the main kitchen water consumption.

The Concierge Building is to be provided with a coffee point and WC. It is not anticipated that this building will have a high demand on water consumption; based on an estimated usage of 5 people per day to the WC and for tea and coffee provision of around 20 cups per day, the water consumption would be around 31 litres per day. It is estimated that the annual water consumption to this building would be around 11,300 litres per year.

The hotel are anticipating 50% occupancy to the Lodges due to the high room rate that will be charged. Based on the estimated daily demand and the eight lodges having double occupancy, the annual water consumption to the lodges is estimated to be 803,678 litres.

5.0 RAINWATER HARVESTING

The Lodges have been provided with rainwater harvesting for the purposes of toilet flushing. Lodges 1 – 6 inclusive are each provided with a dedicated system, while, due to site constraints, lodges 7 & 8 share a common system. The systems collect water from the roofs of lodges 1 – 7, filtering leaves and debris before storing the water in a 1,000 litre, above ground tank, located either below or adjacent to the lodge served. A floating extraction device ensures that only clean water is delivered from the tank to the building via a stainless steel transfer pump. During periods of low rainfall, a mains water top-up controller prevents the tank from running empty.

Historic rainfall data has been used to estimate the potential volume of rainwater that may be collected and reused for toilet flushing. The website 'timeanddate.com' publish local data from a nearby weather station based at Gatwick Airport, 14km from Horsham. This data is based on average monthly rainfall for the period 1992 – 2021 and has been derived from the World Meteorological Association and MADIS weather stations.

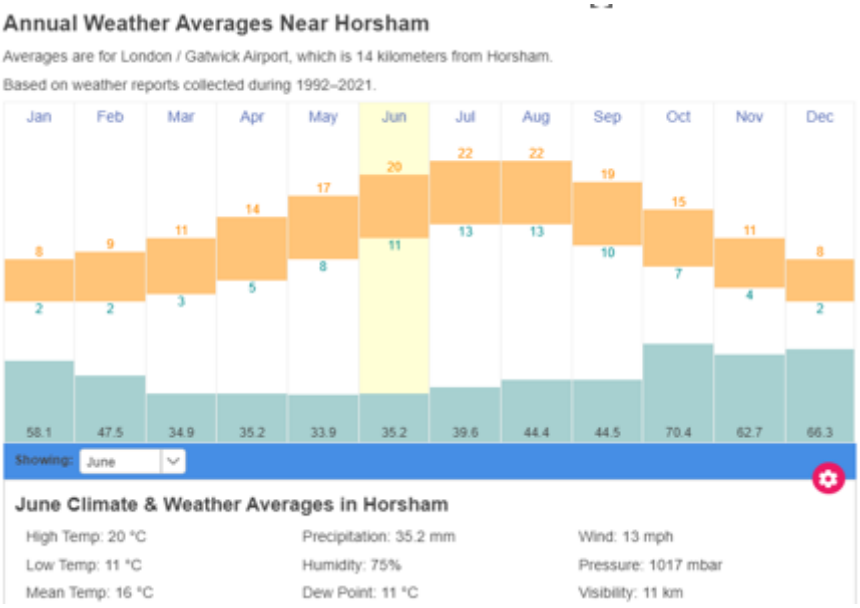

Figure 5.1: Average precipitation data for Horsham for years 1992 – 2021. Reference 'fimeanddate.com'

Based on the anticipated 50% occupancy to the lodges, with 2 persons staying per night per lodge with WC usage of 5 flushes per day per person, it is estimated that the total water usage for WC flushing will be circa 67,160 litres. Reviewing the average rainfall data for the Horsham area and the potential rainwater collection, it is estimated that the rainwater harvesting systems serving lodges 1-6 will be able to provide 100% of the WC flushing needs, while the system serving lodges 7 & 8 might achieve 90% of the demand. It is therefore expected that the rainwater harvesting systems will enable the development to save in the region of 64,000 litres of mains water per year.

6.0 IMPROVEMENTS TO THE EXISTING SITE

The hotel has recently implemented a programme of refurbishments, updating a number of bathrooms and replacing sanitaryware with more water efficient fittings. Old 15 litre flush WC's have been replaced with more efficient dual flush cisterns having 6 and 4 litre flushes and flow rates to taps and shower heads are being reduced from up to 30 litres per minute to 8 litres per minute. Some bathrooms are to have baths removed in favour of showers which will further reduce the overall water consumption. There are currently nine bedrooms being updated.

The estimated water demands to each en-suite bedroom are indicated in tables 5.1, 5.2 and 5.3 below.

Water Fitting	**Specification**	**Estimated Daily demand**
WC	15 litre cistern.	5 flushes per day per person
Wash hand basins	5 litres / minute mixer tap	5 uses per day per person
Bath	149 litre luxury bath	1 use every 2 days per room
Shower	30 litres per minute	Average 8 minute shower per person

Table 5.1: Table of sanitary ware specifications used to assess the estimated daily usage to each existing bedroom.

Installation Type	Unit of measure	Volume (litres)	Daily uses	Litres / day	
WC	Average flush volume (litres)	15	10	150	
Taps (wash basins)	Flow Rate (Litres per use)	5	10	50	
Bath	Capacity	149	0.5	149	
Shower	Volume per shower	240	2	480	
			TOTAL	755	litres / day / room
				377	litres per person

Table 5.2: Estimated daily water demand to a double occupancy bedroom prior to upgrading sanitary ware.

Installation Type	Unit of measure	Volume (litres)	Daily uses	Litres / day	
WC (dual flush)	Average flush volume (litres)	4.5	10	45	
Taps (wash basins)	Flow Rate (Litres per use)	1.1667	10	11.667	
Bath	Capacity	149	0.5	74.5	
Shower	Volume per shower	64	2	128	
			TOTAL	259	litres / day / room
				130	litres per person

Table 5.3: Estimated daily water demand to a double occupancy bedroom following the upgrade of sanitary ware.

Tables 5.1 and 5.2 indicate that by changing the WC's to dual flush type and reducing the flow rates to taps and shower heads, a substantial saving of 249 litres per person can be realised. Based on 70% occupancy to the 9 bedrooms being refurbished, this equates to a total saving of 1,139,018 litres per year.

The Gatehouse provides staff accommodation for up to 36 members of staff. As the hotel have refurbished rooms in the Gatehouse, sanitary ware fittings have been replaced with low flow rate fittings. The annual consumption for the periods March 2018 to March 2022 is indicated in Table 5.4 below. This table indicates that water saving measures have significantly reduced water consumption in the staff accommodation.

Date	Days	Meter Readings (m^3) Gate House	Annual litres	Daily litres
04/03/2018		6477		
04/03/2019	365	7388	911,000	2496
02/03/2020	364	8131	743,000	2041
28/03/2021	391	8510	379,000	969
27/03/2022	364	8968	458,000	1258

Table 5.4: Water consumption to Gatehouse for 2018 – 2022.

The spa was completed in March 2019 and includes an indoor pool, hydrotherapy pool, sauna room, steam room and showers. All installed sanitary ware are high efficiency. The annual consumption for the periods October 2018 to March 2022 are indicated in figure 5.5 below. The high usage in the first two years of operation will be due to filling the pools. The daily usage for the periods March 2020 – March 2021 (404 litres) and March 2021 to March 2022 (415 litres) appear to be exceptionally good considering it is a spa facility.

Date	Days	Meter Readings (m^3) Spa	Annual litres	Daily litres
30/09/2018				
04/03/2019	365	1871	1,871,000	5126
02/03/2020	364	5561	3,690,000	10137
28/03/2021	391	5719	158,000	404
27/03/2022	364	5870	151,000	415

Table 5.5: Water consumption to Spa for 2018 – 2022.

7.0 WATER BUDGET

The addition of the Lodges and Concierge Building at South Lodge Hotel will add an estimated 803,840 litres of water consumption to the site. However, the hotel have implemented a programme of improvements to reduce the existing water consumption to the site, by changing existing 15 litre WC cisterns for more efficient 6/4 litre dual flush cisterns and replacing shower heads for more efficient shower heads restricted to 8 litres per minute rather than up to 30 litres per minute and wash basin taps are being replaced to low flow rate type.

These changes will realise annual water savings of over 1.1 million litres when applied across the 9 en-suite bedrooms being refurbished, based on double occupancy to these bedrooms with 70% occupancy across the year.

It is anticipated that around 64,000 litres of mains water will be saved per year due to the rainwater harvesting systems.

As a result of the improvements to the main hotel, the Lodges make no impact to the water consumption on the site as indicated in table 7.1 below.

Item	Litres / year
Additional Water Consumption due to Lodges and Concierge Building	803,840
Water Savings to Lodges due to Rainwater Harvesting System	-64,000
Water Savings to existing Hotel building following refurbishment	-1,139,018
Overall water savings	**-399,178**

Table 7.1: Impact to annual water consumption

Table 7.1 illustrates that the impact of changing the existing sanitary ware to the en-suite accommodation in the main hotel building out-weighs the impact of the additional water consumption due to the proposed Lodges and Concierge Building, resulting in an overall reduction of water consumption across the site of 399,178 litres per annum.