Consulting Civil Engineers

# Water Neutrality Report

## Clayfield Farm, Valewood Lane, Barns Green, West Sussex RH13 0QJ

## For

## Mr John Forster

Rev – **P5**

Reference **C2201**

Date **13th August 2024**

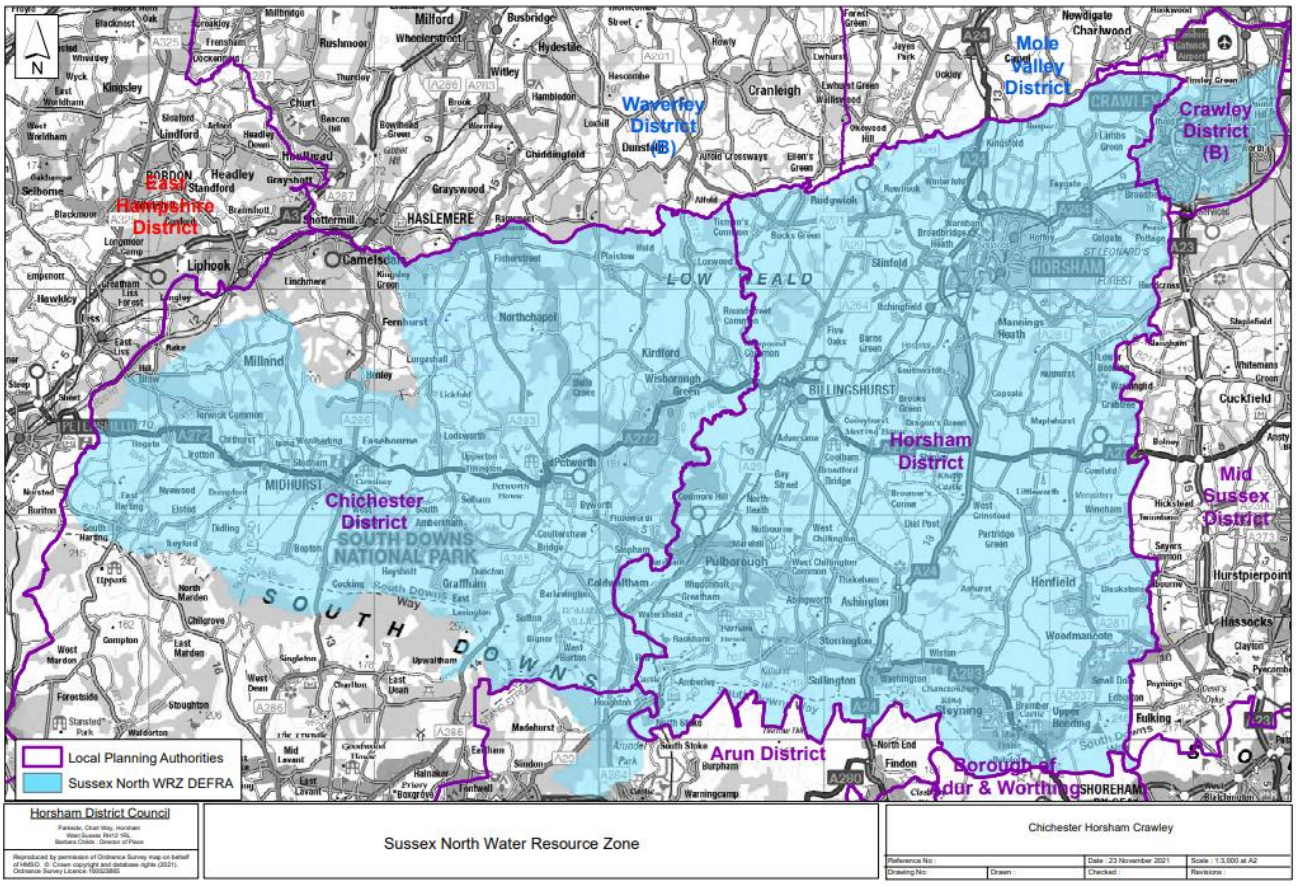
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| **P1** | 18.11.2022 | Revised | LH | CS |
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Richard Cobden House, Lion Street, Chichester, West Sussex, PO19 1LW
Tel: 01243 933253 E: mail@cgscivils.co.uk W: www.cgscivils.co.uk

# 1 Introduction

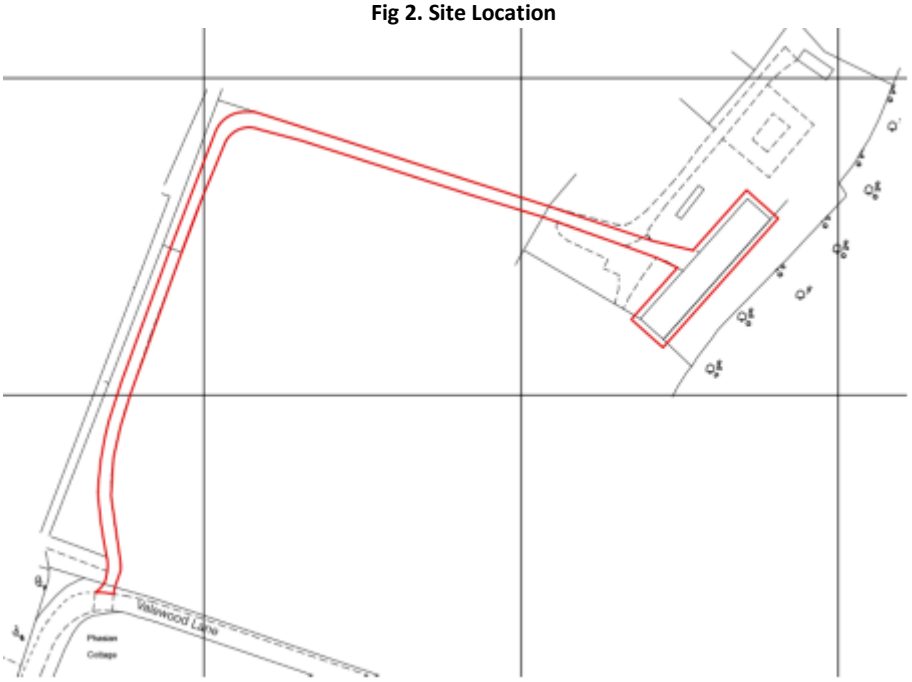
1.1.1 CGS Civils Ltd has been appointed by John Forster to undertake a Water Neutrality Report for a proposed development at Clayfield Farm in Barns Green, West Sussex. Planning permission is sought for the conversion of an existing agricultural barn to form 2 No. 4-bedroom dwellings. The site falls within the Sussex North Water Supply Zone, in which Natural England have written to all authorities within the zone providing a position statement for applications which may place increased pressure on this zone. This explains that recent case law has established that abstraction from the Supply Zone may be having an impact on protected sites (Arun Valley Special Area of Conservations (SAC), Special Protection Area (SPA) and Ramsar site). As a result, developments within this zone must not add to this impact, as such, 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.

**Fig 1. Sussex North Water Supply Zone Area**



1.1.2 The proposed development is located at OS Grid Reference TQ 11855 26542 and has the post code RH13 0QJ

**Fig 2. Site Location**




1.1.3 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.'*

1.1.4 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.

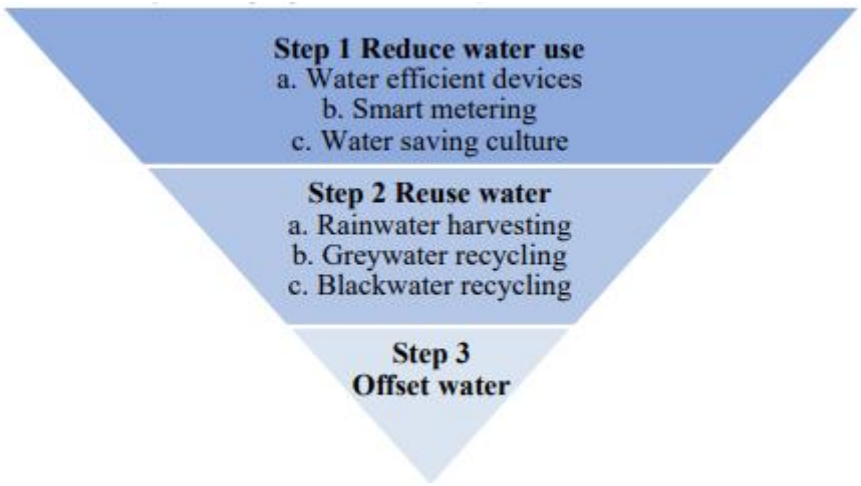
- Reduce water demand in the new development through improvement in efficiency.
- Re-use water, wherever possible.
- Offset the remaining water demand from the new development if required.

1.1.5 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.

1.1.6 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**




1.1.7 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.

1.1.8 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 measured 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. Homes without a water meter consume on average 160 l/p/d and for homes with a water meter, consume on average 131 l/p/d.

1.1.9 Part G of the Building regulations currently states that new build housing should achieve a minimum of 125 l/p/d. A tighter target of 110 l/p/d can be requested if the local authority can establish a clear need based on available evidence.

1.1.10 The table below indicates different demand scenarios including Southern Water's Target 100 Ambition to achieve 100 l/p/d, as well as further scenarios where water demand is cut more dramatically.

**Table 1 PCC Demand Scenarios**

| Demand Scenario | Per Capita Consumption (l/p/d) |
|---|---|
| **British Flows and Loads** | 150 |
| **Building Regulations Standard** | 125 |
| **Building Regulations Optional** | 110 |
| **Target 100** | 100 |
| **Realistic Achievable** | 85 |
| **Ambitious** | 62 |

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 Executive Summary

2.1.1 The existing barn was utilised for storage of equipment and machinery necessary for agricultural usages and as such, there is no existing usage within the barn itself. The proposed scheme consists of the conversion of an existing agricultural barn to form 2 No. 4-bedroom dwellings.

2.1.2 As proven within this report, the use of low water usage fittings and rainwater harvesting can demonstrate water neutrality on site.

**Table 2 Water Usage Comparison**

| | |
|---|---|
| **Existing Water usage** | **0 l/day** |
| **Proposed Scheme water usage** | 0 l/day |
| **Proposed Scheme water usage equal to or lower than existing site** | Yes |

# 3 Calculation of estimate water usage from the proposed development

3.1.1 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 a new 2 No. 4-bedroom dwellings. In accordance with the average occupancy levels set out by Horsham DC, the population for each property will be 2.86.

**Table 3 Average occupancy levels**

| Number of bedrooms | Average occupancy level |
|---|---|
| **1** | 1.32 |
| **2** | 1.89 |
| **3** | 2.47 |
| **4** | 2.86 |
| **5** | 3.09 |

3.1.2 As the proposed property will be a new dwelling, Policy 37 of the Horsham District Planning Framework (HDPF) triggers the requirement for the optional building regulations standard of 110 litres per person per day (l/p/d), therefore:

5.72 x 110 l/p/d
**= 629.2 l/day**

3.1.3 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 for the 'Ambitious' PCC of 62/l/p/d.

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

4.1.1 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 homes with efficient products, such as:
  - Aerated Taps
  - Aerated Shower heads
  - Low Flush Toilets, or air flush toilets
  - Water efficient white goods
- Installing Smart Meters, this allows the consumer to see how much water they are using, and how this affects their water saving bill. This can help consumers to reduce water usage, identify leaks, and meet water saving targets, with the bonus of reduced bills.
- Designing home to encourage water saving behaviours, this can also help reduce water use and help ensure that other measures that are put in place are effective. Education and awareness are important components of achieving water neutrality.

4.1.2 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 4 below:

**Table 4 Maximum Fittings Consumption from Building Regulations Part G**

| Water Fitting | Maximum Rating |
|---|---|
| **WC** | 6.4/4 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 |

4.1.3 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 5 below:

**Table 5 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 |

4.1.4 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 6 below:

**Table 6 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 |

Please note that by accepting this report, you accept the low flow rates of the proposed fittings required to achieve water neutrality. CGS Civils cannot be held responsible for any reduced comfort levels that may arise from the use of these fittings.

4.1.5 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 7 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 |

4.1.6 By installing the water efficient devices listed above, it is possible to reduce the water demand on site from **629.2 l/day** down to **509.31 l/day**

5.72 x 89.04 l/p/d

= **509.31 l/day**

- *5.72 (average occupancy level for 2 No. 4-bedroom dwellings) x 89.04 (Appendix A – Water Calculator for Proposed fittings)*

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

5.1.1 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.

5.1.2 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 8 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 |

5.1.3 In this instance however, rainwater harvesting is proposed to enable total self-sufficiency within the building to provide water to all fittings including drinking water. The installation of water reusing technologies will further reduce the water demand on site, depending on the harvesting tank installed. The proposed roof area is sufficient to provide the required water to the property via a rainwater harvesting tank as well as has sufficient capacity for a 35-day drought period. **See Appendix C**.

5.1.4 By installing the water efficient devices listed above as well as the rainwater and greywater harvesting technologies listed above, the total demand will be reduced to:

5.72 x 0

**= 0 l/day**

- *5.72 (average occupancy level for 2 No. 4-bedroom dwellings) x 0 (Appendix B – Water calculator for proposed fittings with RWH)*

**Table 9 Part G rainwater collection calculator (Per dwelling)**

| **Rainwater Collection Calculation** | |
|---|---|
| **Collection Area (m²)** | 235 |
| **Yield Coefficient** | 0.8 |
| **Depth of rainfall (mm/year)** | 820 |
| **Daily rainwater collection (litres)** | 422.3 |
| **Number of occupants** | 2.86 |
| **Daily Rainwater per person (litres)** | 147.66 |

5.1.5 A calculation is to be made to ensure that the rainwater harvested is greater than the rainwater demand within the dwelling. The following is a calculation for 5% of the annual rainwater yield and has been calculated using Rainfall data from the National River Flow Archive which provides annual rainfall data as recorded by the Met office and follows the intermediate approach as detailed within BS 8515:2009.

5.1.6 Using the rainfall catchment data provided by the National River Flow Archives, the closest station point to the site is 41018 – Kird at Tanyards:




5.1.7 The latest data available for this station is SAAR 1961-1990, which shows that the depth of rainfall in the area is 820mm.

5.1.8 The following calculations have been carried out on a per dwelling basis.

$$Y_R = A \times e \times h \times n \times 0.05$$

Where:

$Y_R$ = the annual rainwater yield (l)
A = The collecting area ($m^2$)
e = yield coefficient (%)
h = depth of rainfall (mm)
n = hydraulic filter efficiency

**6937.2** = 235 x 0.8 x 820 x 0.9 x 0.05

5.1.9 In order to ensure there is sufficient roof area, another calculation from BS 8515:2009 must be carried out in order to calculate the annual demand within the property. The following is a calculation for 5% of the annual non-potable water demand. (This will take into account full water usage within the property to ensure it can be entirely self-reliant).

$$D_N = P_d \times n \times 365 \times 0.05$$

Where:

$D_N$ = the annual non-potable water demand (l)
$P_d$ = The daily requirement per person (l)
n = number of persons

5115.11 = 98 x 2.86 x 365 x 0.05

5.1.10 To ensure there is sufficient area to allow a 35-day drought storage, an extra 35 days is to be included:

**5605.6** = 98 x 2.86 x 400 x 0.05

5.1.11 It should be noted that a mains water connection should still be made for use within an emergency. This emergency usage will not affect the water usage of the dwelling and will therefore not be included as part of the demand of the property. The water main will be connected to the rainwater harvesting tank through the use of an AB Cat 5 Break Tank that is fitted with a non-return valve. The tank will allow mains water to top of the rainwater harvesting tank if the water level falls below a certain point. The water level will be monitored using a ball valve. Further information can be supplied upon request by Silverline UK Ltd.

5.1.12 From the above water calculations, we have:

- Proposed water usage rate of 110 litres/person/day based on 'HDPF'
- Which can then be reduced to:
- Proposed water usage rate of 66.2 litres/person/day with water efficient devices and rainwater harvesting

5.1.13 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 HDPF – 110 l/p/d at an overall occupancy rate 5.72 people = **629.2 l/day.**
- Proposed Water Demand with water efficient devices listed in **Table 4** and Rainwater harvesting recycling – 0 l/p/d at an overall occupancy rate of 5.72 people = **0 l/day**

5.1.14 The client is willing to install a 7,500l rainwater harvesting tank per dwelling in order to achieve total self-sufficiency within the property. The harvesting tank is to be fitted with the following equipment in order to get the rainwater to a level safe for human consumption.

- Aerator
- Lowara 0.55 kW variable speed booster set
- PREFILT103/4 10" prefilter housing
- CRT10SW-05 5 micro sediment filter
- UV-CS165 ultraviolet steriliser
- WH1MH Whole house water filter
- 10" x 54" pH correction unit
- The reverse osmosis unit – This is fitted as a precaution only to treat just the drinking water point and not the entire house.

5.1.15 The likely contaminants associated with rainwater harvesting systems and how to treat them are:

- Dust – Sediment Filter
- Bacteria, including Clostridium Prefringers – High dose of UV treatment
- Nitrates – Heavy Metal reduction filter
- Organics – Carbon Filter

5.1.16 It is suggested that the supply is tested once the equipment is initially fitted to ensure effective operation then test the water every 6 months to ensure continued performance. The water treatment equipment will need to be maintained as per the manufacturers guidelines which are all laid out clearly in the equipment quote from Silverline Ltd. They will also send the end user reminders when the equipment needs servicing. The water is to be tested every 6 months, and results kept, there should be a record kept of all maintenance undertaken on the equipment as per the manufacturer's guidelines.

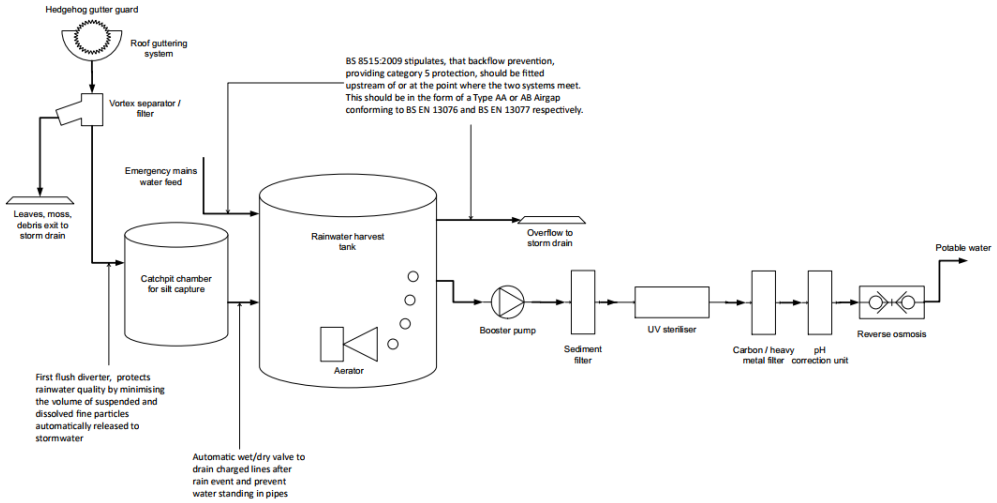
5.1.17 It has been confirmed by Silverline UK Ltd that the only maintenance of the system that is required is to replace filters are certain intervals. It is recommended that the:

- Aerator
- Lowara 0.55 kW variable speed booster set
- PREFILT103/4 10" prefilter housing
- CRT10SW-05 5 micro sediment filter is to be replaced every 6 months, or more frequently if it reduced water flow is experienced.
- UV-CS165 ultraviolet steriliser will need the lamps replacing every 12 months. It is also recommended that the quartz sleeve is removed and cleaned every 12 months to ensure light can get to the water.
- WH1MH Whole house water filter will require having the filter media replaced every 12 months.
- 10" x 54" pH correction unit will be required having the media topped up every year.
- The reverse osmosis unit will require the prefilters replacing every 6 months and the post filter every 12 months. In addition to this, the membrane will need replacing when the water production slows, however, this is dependent on the water used but it is generally every 3-6 years.

5.1.18 Due to the proposed rainwater harvesting tank and filtration system, there is no need to install a water main to the property, however, one should be installed in case of emergancy – as such this means the proposed site will not require a Water Neutrality report (based on Natural England's definition below) and will also be water neutral.

"The water neutrality approach applies to all development that uses water from the Sussex North water supply zone and specifically the Pulborough abstractions it is not restricted to new residential dwellings and may include other forms of development that use the public water supply. Whether an application is included would depend on what water supply is chosen. **Only development that uses public water supply from Sussex North water supply zone is included in the Statement. Many of the types of development that use water that the County Council permit do not use public water supply and would therefore not be covered by the Statement.** It is for the local planning authorities including the County Council to identify which types of development they believe may be captured."

**Fig. 3 Schematic view of treatment system**




5.1.19 Despite the proposed rainwater harvesting tank being below ground, extra precautions can be undertaken by ensuring that the rainwater harvesting tank is to be black in order to stop sunlight reaching the stored water, keeping the temperatures lower and allowing for higher oxygen concentration whilst also preventing algae and bacteria growth. The filters in place are implemented post storage.

5.1.20 The system will be considered as a private water supply and therefore it will be governed by the Private Water Supply Regulations 2016, which is regulated by the local council's Environmental Health officer or Pollution Control Officer. Following completion of the system, a treated water sample will be taken and tested by an independent UKAS accredited lab. The sample will be collected by a suitably qualified person with Drinking Water Inspectorate (DWI) certification for sampling water supplies. The system will be inspected every 6 months and maintenance procedures will be carried out to ensure that the water is treated property.

5.1.21 Inspection and sampling for E.Coli, TVC and Coliforms will be carried out twice yearly. The UV Steriliser will have lamps replaced every year, the filter media in the water filter will be replaced every 2 years and the media within the pH correction unit will be replaced every year.

**Table 10 Schedule of Example Fittings**

| Water Fitting | Water Usage | Example Fitting: |
|---|---|---|
| **WC** | 4/2.6 litres dual flush | E8967 Sandringham 21 |
| **Shower** | 7 l/min | Hansgrohe Hand Shower Croma S110 |
| **Bath** | 145 litres | Carron Shallow Single Bath |
| **Basin Taps** | 2.5 l/min | Grohe Eurosmart Cosmopolitan |
| **Sink Taps** | 5 l/min | Carron Phoenix Pura Plus |
| **Dishwasher** | 0.73 l/place setting | Bosch SMS6EDI02G |
| **Washing Machine** | 5.5 l/kilogram | Fisher & Paykel WM1490F1 |

Please note that the above fittings are examples only. Ensure that your chosen fittings meet the required water usage. All basin and Kitchen taps can be fitted with flow restrictors instead of a reduced flow tap in order to achieve necessary reduced water usage.

# 6 Step 3 – Offsetting remaining water demand

6.1.1 There is no need to offset the water usage from the proposed site due to the above.

# 7 Conclusion

7.1.1 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 being water neutral.

7.1.2 The client is willing to install a 7,500l rainwater harvesting tank with a filter system per dwelling which will make the rainwater harvested from the roofs suitable for all household use including drinking.

7.1.3 To summarise:

- The proposed development will use on average **629.2 l/day**.
- This water demand can be reduced to **509.31 l/day** through the installation of water reducing appliances
- Re-using the water through rainwater harvesting tanks can further reduce the water demand down to **0 l/day**
- The overall water demand will be reduced, and the site will become water neutral.

# 8 Appendices

## 8.1 Appendix A:

**Table 11 – Water Calculator from Building Regulations Part G – Information input from proposed site with water efficient devices from Table 6.**

| 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) | 145 | 0.11 | 0 | 15.95 |
| Shower (bath also present) | Flow rate (l/min) | 7 | 4.37 | 0 | 30.6 |
| Bath only | Capacity to overflow (l) | 0 | 0.5 | 0 | 0 |
| Shower only | Flow rate (l/min) | | 5.6 | 0 | 0 |
| Kitchen sink taps | Flow rate (l/min) | 5 | 0.44 | 10.36 | 12.56 |
| Washing Machine | Litres/kg dry load | 5.5 | 2.1 | 0 | 11.55 |
| Dishwasher | litres/place setting | 0.73 | 3.6 | 0 | 2.62 |
| 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) | | | 92.358 |
| | | 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) | | | 89.045 |

## 8.2 Appendix B:

**Table 12 – Water Calculator from Building Regulations Part G – Information input from proposed site with water efficient devices from Table 6 with Rainwater Harvesting.**

| 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) | 145 | 0.11 | 0 | 15.95 |
| Shower (bath also present) | Flow rate (l/min) | 7 | 4.37 | 0 | 30.6 |
| Bath only | Capacity to overflow (l) | 0 | 0.5 | 0 | 0 |
| Shower only | Flow rate (l/min) | | 5.6 | 0 | 0 |
| Kitchen sink taps | Flow rate (l/min) | 5 | 0.44 | 10.36 | 12.56 |
| Washing Machine | Litres/kg dry load | 5.5 | 2.1 | 0 | 11.55 |
| Dishwasher | litres/place setting | 0.73 | 3.6 | 0 | 2.62 |
| 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) | | | 92.358 |
| | | Contribution from greywater (l/p/d) | | | 0 |
| | | Contribution from rainwater (l/p/d) | | | 98 |
| | | Normalisation factor | | | 0.91 |
| | | External water use | | | 5 |
| | | Total water consumption (36(1)) (l/p/d) | | | 0 |

## 8.3 Appendix C:

**Rainwater harvesting tank size calculator per plot (note the total demand from the plot is added to external areas):**

### COLLECTABLE ROOF AREA (M²)

| | | | | | | |
|---|---|---|---|---|---|---|
| Main Building | Width: | | Length: | | Rain Collection Area: | 0 m² |
| Extension one | Width: | | Length: | | Rain Collection Area: | 0 m² |
| Extension Two | Width: | | Length: | | Rain Collection Area: | 0 m² |
| Extension Three | Width: | | Length: | | Rain Collection Area: | 0 m² |
| *Or the total roof area, if you already know it:* | | | | 235 | Total area of collectable roof space: | 235 m² |
| Select Your Region | | England SE & Central | | | Average rainfall per year in your region: | 64 L |
| **Collectable rainwater per annum in litres - discounted by 20% to account for water loss** | | | | | | **120320 L** |

### USE OF RAINWATER IN THE BUILDING

| | people: | bedrooms: | |
|---|---|---|---|
| Number of people or bedrooms in the building - | 1 | 0 | |
| ☐ Number of clothes washing cycles per day (*50 litres each*) | 0.00 Cycles | 0.00 | L |
| ☐ Number of toilet flushes per day (*4.42 flushes per person, average 5 litres each*) | 0.00 Flushes | 0.00 | L |
| Outdoor use in litres, per person per day (*recommended 5 litres per person per day*) | 190 | 190.00 | L |
| Amount of water you require every day | | 190 | L |
| **Amount of water you require every year** | **DEMAND** | **69350** | **L** |

### FINAL FIGURES

| | | |
|---|---|---|
| How many days drought protection do you need? Typically 21 (18 minimum) | 35 | |
| Capacity of water storage in litres required for drought protection | 6650.00 | L |
| The lesser of YIELD (blue) or DEMAND (green) per annum | 69350 | L |
| **Therefore, volume of rainwater storage required** | **6650** | **L** |

### CONCLUSION

| | | |
|---|---|---|
| Is there sufficient roof water available: | | YES |
| Recommended tank size from our shallow dig range: | F-Line Range: | 7500 LITRE F-LINE TANK |