Water Neutrality Statement

New House adjacent to Flagstones,
North Heath Lane, Horsham, West Sussex, RH12 5PQ

Contents

1. Introduction

This water neutrality statement has been prepared to support the planning application to develop a new dwelling house adjacent to the existing property located at Flagstones, North Heath Lane, Horsham, West Sussex, RH12 5PQ.

This document has been prepared in response to Natural England's Position Statement related to water usage received in September 2021. The site for the development is within the Sussex North Water Supply Zone (see appendix A). As developments within the area may have a negative impact on the Arun Valley, new developments should not add an additional water demand burden. In order to ensure this, Horsham District Council currently requires that developments within the Sussex North Water Supply Zone demonstrate water neutrality, defined as showing that the development 'does not increase the rate of water abstraction for water supplies above existing levels.'

The purpose of this statement is to demonstrate that the proposed development fulfils the requirements of water neutrality by creating a net negative water demand. This is achieved by ensuring that the new development is highly water efficient and by introducing efficiency measures at the existing property to offset the remaining additional demand of the new development.

2. Background

This water neutrality statement supports the proposal to develop a new three-bedroom dwelling house on the land adjacent to the existing property known and referred to as Flagstones. This includes the demolition of the existing garage added in 1983, as well as provision of additional parking for the current property utilising the existing dropped curb. Aside from the garage, the existing buildings will remain in place following the new development.

The construction of an additional dwelling on the site creates an additional demand for water. In order to achieve water neutrality, a three-phase approach will be employed:

1. Reducing the additional water demand from the new dwelling by including water efficiency measures in the design
2. Further increasing the water efficiency of the new dwelling through the installation of a water recycling system
3. Offsetting the remaining additional demand created by the new dwelling with savings generated by implementing water efficiency measures at the existing property

3. Baseline Calculations

The existing property, referred to as 'Flagstones' is made up of a substantial four-bedroom main house, together with a self-contained one-bedroom annexe, incorporating separate kitchen and bathroom facilities - which drive water use. In the updates to guidance on the approach to water neutrality for planning applications issued by Horsham District Council on 19th August 2022[1], it was clarified that annexes should be treated separately for calculating water demand when assessing water neutrality.

Metered bills for the last three years are not available for the property. As such, the methodology used follows the preferred approach for residential uses given by Horsham District Council[1],

[1] Water Neutrality and Planning Applications, Horsham District Council, accessed on 27th August 2022 at https://www.horsham.gov.uk/planning/water-neutrality-in-horsham-district/water-neutrality-and-planning-applications

which reflects average occupancy for dwellings based on extrapolated 2011 census data for Horsham District. This is shown in figure 1 below.

Figure 1: Average Occupancy Rates

Type of Dwelling	Number of Occupants
One-Bedroom Dwellings	1.32
Two-Bedroom Dwellings	1.88
Three-Bedroom Dwellings	2.47
Four-Bedroom Dwellings	2.86
Five-Bedroom Dwellings	3.09

Horsham District Council provides guidance on the best figures to use for establishing existing consumption rates, which is a rate of 135 litres per day (l/p/d). This is based on work carried out for the council's Local Plan and using this basis enables a consistent approach based on known data. As such, the baseline water usage at the site currently is 564 litres per day, as shown below in figure 2.

Figure 2: Baseline Water Consumption

	Water usage l/p/d per person	Bedrooms	Occupancy	Total Consumption (l/p/d)
Main House	135	4	2.86	386.1
Annexe	135	1	1.32	178.2
Total				**564.3**

4. Proposal Demand Baseline

The proposed new dwelling is a three-bedroom house. Following the standard calculation for water demand as employed above, with the base water usage of 125 l/p/d for new developments, the baseline additional water demand of the proposed development would be 309 litres per day as shown in figure 3 below.

Figure 3: Baseline Water Consumption-1

	Water usage l/p/d per person	Bedrooms	Occupancy	Total Consumption (l/p/d)
New Dwelling	125	3	2.47	**308.75**

In order to achieve water neutrality, suitable measures need to be introduced to at least offset the water demand of the proposed new dwelling. These measures are split into two categories as explained in the following two sections:

- Water reduction and recycling measures to be incorporated into the new dwelling (section 5)
- Offsetting measures to be incorporated into the existing property (section 6)

5. Water Reduction Measures

The baseline expected consumption of the new dwelling will be 309 litres per day, as shown in the previous section. However, this will be significantly reduced by taking a strong approach to water efficiency at the design stage.

5.1 Efficiency Measures

Efficiency measures will be incorporated to ensure a low water consumption rate. These include the following:

- Low flow taps using no more than 5 litres per minute of water
- Low flow showers using no more than 8 litres per minute of water
- Dual-flush toilet cisterns allowing full or partial flush

5.2 Water Recycling

To further ensure that water consumption will be significantly ahead of standard demand and of national guidance for efficient water use, a greywater recycling system will be installed at the new dwelling. This will provide recycled water for toilet flushing and clothes washing. The specifications of the proposed Hydraloop H300 greywater recycling unit to be installed can be found in appendix B.

5.3 Water Demand Calculations

In order to accurately assess the expected water consumption of the proposed development after incorporating the efficiency measures described above, a water usage calculation has been carried out following the guidance set out in part G of the building regulations (2010). The calculation is shown on the next page (figures 4 and 5).

As can be seen, water usage per person per day can be reduced to a very low level of 67 l/p/d for the new development.

Note that the methodology as defined in the building regulations does not allow for external water usage to be offset by a greywater system. However, the greywater system to be installed is capable of also being used for external water and there is sufficient recycled greywater available for this. As such, the actual water usage would be even lower than it is shown in the calculations, reducing demand by a further 5 l/p/d.

Figure 4 - Calculation of water usage with efficiency measures at new dwelling

Table A1 calculator from Part G Annex A					
		(1)	(2)	(3)	(4)
Installation Type	**Unit of Measure**	**Capacity/ flow rate**	**Use factor**	**Fixed use (litres/ person/ day)**	**Litres/ person/day = [(1) x (2)] + (3)**
WC (single flush)	Flush Volume (litres)		4.42	0.00	0
WC (dual flush)	Full flush Volume (litres)	6	1.46	0.00	8.76
	Part flush Volume (litres)	3	2.96	0.00	8.88
WC (multiple fittings)	Average effective flushing Volume (litres)		4.42	0.00	0
Taps (excluding kitchen/utility room taps)	Flow rate (litres/min)	5	1.58	1.58	7.9
Bath (where shower also present)	Capacity to overflow (litres)	170	0.11	0.00	18.7
Shower (where bath also present)	Flow Rate (litres/minute)	8	4.37	0.00	34.96
Bath Only	Capacity to overflow (litres)		0.50	0.00	0.00
Shower Only	Flow Rate (litres/minute)		5.60	0.00	0.00
Kitchen/Utility room sink taps	Flow rate (litres/minute)	5	0.44	10.36	2.2
Washing Machine	(Litres/kg dry load)	8.17	2.1	0.00	17.16
Dishwasher	(Litres/place setting)	1.25	3.6	0.00	4.5
Waste disposal unit	(Litres/use)		3.08	0.00	0
Water Softener	(Litres/person/day)	0	1.00	0.00	0
	(5)	**Total Calculated use = (SUM column 4)**			**103.06**
	(6)	Contribution from greywater (litres/person/day)			34.80
	(7)	Contribution from rainwater (litres/person/day)			0
	(8)	Normalisation factor			0.91
	(9)	Total internal water consumption = [(5) - (6) - (7)] x (8)			62.12
	(10)	External water use			5.0
	(11)	**Total water consumption = (9) + (10) (litres/person/day)**			**67.12**

Figure 5 - Calculation of Greywater usage as used in figure 4

Table A4.6: **Greywater Calculation**				
(a)	**(b)**	**(c)**	**(d)**	**(e)**
Bath, shower and wash hand basin usages (litres/person/ day)	**Percentage of used water (a) to be recycled**	**Greywater available for use (litres/person/day (a) x [(b)/100]**	**Greywater demand (litres/person/day)** **(From table A1)**	**Greywater savings (litres/person/day)** **Where (c) is greater than (d), (e) = (d), otherwise (e) = (c)**
63.8	95	60.6	34.8	**34.8**

Figure 6 below shows the total water usage for the new dwelling according to the occupancy rate of 2.47 from figure 1. The total water usage with the implementation of efficiency measures is reduced to 166 litres per day. This is a saving of 143 litres per day compared to the baseline demand of the new development of 309 litres per day.

Figure 6: New dwelling water consumption with efficiency measures

	Water usage l/p/d per person	Bedrooms	Occupancy	Total Consumption (l/p/d)
New Dwelling	67.12	3	2.47	**165.8**

Note that, in line with the building regulations part G guidance, the calculations in this section do not include the additional savings that can be generated by utilising the greywater system for external water demands, which would save an additional 12.4 litres per day. There will be sufficient greywater collected to fulfil external uses, with 26 litres per day of recycled water provided by the system in excess of the internal greywater demand (as shown in figure 5). As such, the expected water demand from the new dwelling shown in figure 6 can be considered conservative.

The water demand of 166 litres per day must be absorbed through offsetting measures in order to achieve water neutrality. This is to be achieved by applying efficiency measures at the existing property, as shown in the following section.

6. Offsetting measures

In order to offset the additional water demand of 166 litres per day created by the construction of the new dwelling, additional efficiency measures will be introduced to the existing property on the site. These are as follows:

- Installation of low flow taps or flow rate limiting devices restricting the flow rate of taps to no more than 5 litres per minute of water
- Installation of low flow shower heads or flow rate limiting devices restricting the flow rate of showers to no more than 8 litres per minute of water
- Installation of dual-flush toilet cisterns allowing full or part flush

In order to accurately assess the expected water consumption following the implementation of efficiency measures, a water usage calculation has been carried out following the guidance set out in building regulations part G. The calculation is shown below in figures 7 and 8.

Figure 7 - Calculation of water usage with efficiency measures, main house

Table A1 calculator from Part G Annex A					
		(1)	(2)	(3)	(4)
Installation Type	**Unit of Measure**	**Capacity/ flow rate**	**Use factor**	**Fixed use (litres/ person/ day)**	**Litres/ person/day = [(1) x (2)] + (3)**
WC (single flush)	Flush Volume (litres)		4.42	0.00	0
WC (dual flush)	Full flush Volume (litres)	6	1.46	0.00	8.76
	Part flush Volume (litres)	3	2.96	0.00	8.88
WC (multiple fittings)	Average effective flushing Volume (litres)		4.42	0.00	0
Taps (excluding kitchen/utility room taps)	Flow rate (litres/min)	5	1.58	1.58	7.9
Bath (where shower also present)	Capacity to overflow (litres)		0.11	0.00	0
Shower (where bath also present)	Flow Rate (litres/minute)		4.37	0.00	0
Bath Only	Capacity to overflow (litres)		0.50	0.00	0.00
Shower Only	Flow Rate (litres/minute)	8	5.60	0.00	44.8
Kitchen/Utility room sink taps	Flow rate (litres/minute)	5	0.44	10.36	2.2
Washing Machine	(Litres/kg dry load)	8.17	2.1	0.00	17.157
Dishwasher	(Litres/place setting)	1.25	3.6	0.00	4.5
Waste disposal unit	(Litres/use)		3.08	0.00	0
Water Softener	(Litres/person/day)	0	1.00	0.00	0
	(5)	**Total Calculated use = (SUM column 4)**			**94.20**
	(6)	Contribution from greywater (litres/person/day)			0
	(7)	Contribution from rainwater (litres/person/day)			0
	(8)	Normalisation factor			0.91
	(9)	Total internal water consumption = [(5) - (6) - (7)] x (8)			85.72
	(10)	External water use			5.0
	(11)	**Total water consumption = (9) + (10) (litres/person/day)**			**90.72**

Figure 8 - Calculation of water usage with efficiency measures, annexe

Table A1 calculator from Part G Annex A					
		(1)	(2)	(3)	(4)
Installation Type	**Unit of Measure**	**Capacity/ flow rate**	**Use factor**	**Fixed use (litres/ person/ day)**	**Litres/ person/day = [(1) x (2)] + (3)**
WC (single flush)	Flush Volume (litres)		4.42	0.00	0
WC (dual flush)	Full flush Volume (litres)	6	1.46	0.00	8.76
	Part flush Volume (litres)	3	2.96	0.00	8.88
WC (multiple fittings)	Average effective flushing Volume (litres)		4.42	0.00	0
Taps (excluding kitchen/utility room taps)	Flow rate (litres/min)	5	1.58	1.58	7.9
Bath (where shower also present)	Capacity to overflow (litres)	220	0.11	0.00	24.2
Shower (where bath also present)	Flow Rate (litres/minute)	8	4.37	0.00	34.96
Bath Only	Capacity to overflow (litres)		0.50	0.00	0.00
Shower Only	Flow Rate (litres/minute)		5.60	0.00	0.00
Kitchen/Utility room sink taps	Flow rate (litres/minute)	5	0.44	10.36	2.2
Washing Machine	(Litres/kg dry load)	8.17	2.1	0.00	17.16
Dishwasher	(Litres/place setting)	1.25	3.6	0.00	4.5
Waste disposal unit	(Litres/use)		3.08	0.00	0
Water Softener	(Litres/person/day)	0	1.00	0.00	0
	(5)	**Total Calculated use = (SUM column 4)**			**108.56**
	(6)	Contribution from greywater (litres/person/day)			0
	(7)	Contribution from rainwater (litres/person/day)			0
	(8)	Normalisation factor			0.91
	(9)	Total internal water consumption = [(5) - (6) - (7)] x (8)			98.79
	(10)	External water use			5.0
	(11)	**Total water consumption = (9) + (10) (litres/person/day)**			**103.79**

Figure 9 - Total water usage with efficiency measures at existing property

	Water usage l/p/d per person	Bedrooms	Occupancy	Total Consumption (l/p/d)
Main House	90.72	4	2.86	259.46
Annexe	103.79	1	1.32	137.00
Total				**396.46**

The total water usage at the existing property following the implementation of the efficiency measures described will be 396 litres per day (figure 9). This is a saving of 168 litres per day compared to the baseline water usage at the site as shown in section 3 (figure 2). This saving will more than offset the 166 litres per day generated by the new development with the implementation of efficiency measures and water recycling.

7. Conclusion

The baseline water usage at the site is currently **564 litres per day** in total.

With the implementation of efficiency measures and greywater recycling for the proposed new dwelling, as well as efficiency measures introduced at the existing property, the total water consumption across the site will be **562 litres per day**, as shown in figure 10 below.

Figure 10 - Total water usage following development

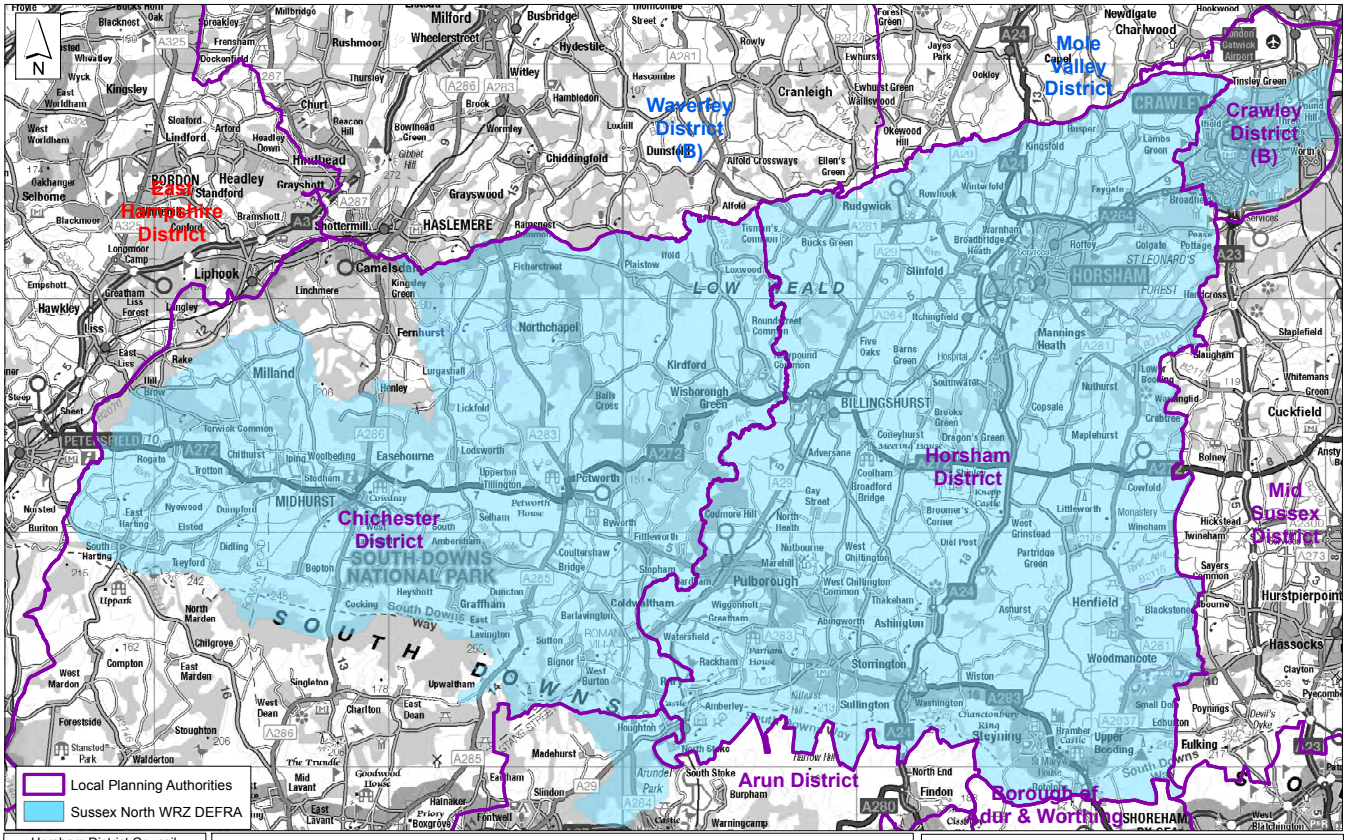
	Water usage l/p/d per person	Bedrooms	Occupancy	Total Consumption (l/p/d)
New House	67.12	3	2.47	165.79
Existing Main House	90.72	4	2.86	259.46
Existing Annexe	103.79	1	1.32	137.00
Total				**562.25**

The water demand of 562 litres per day for the site is slightly below the current usage of 564 litres. As such, the proposed development should be considered water neutral.

The building regulations part G calculation does not include allowance for greywater usage for external water use. However, as shown in section 5, this would deliver an additional real-world water saving of 12.3 litres per day, which is not captured in the standard methodology. This additional use of recycled water usage means the total saving for the development is above and beyond the existing neutral position and provides a buffer to the existing neutral position. As such, water neutrality should be considered to have been well demonstrated.

8. Appendix

Appendix A - Sussex North Water Resource Zone map



Horsham District Council
Parkside, Chart Way, Horsham
West Sussex RH12 1RL
Barbara Childs : Director of Place

Sussex North Water Resource Zone

Chichester Horsham Crawley

Reference No :		Date : 23 November 2021	Scale : 1:3,000 at A2
Drawing No:	Drawn :	Checked :	Revisions :

Appendix B - Greywater Recycling System Specifications

HYDRALOOP
USE WATER TWICE

FACT SHEET - Residential Water Recycling

With a Hydraloop system, you can recycle up to 95% of shower & bath water and optionally 50% of washing machine water – which enables you to reuse up to 85% of the total in-house domestic water. Due to its innovative and breakthrough technology, Hydraloop water is clean, clear, safe and certified and for toilet flushing, washing machine, garden irrigation and/or to top-up a swimming pool.

Hydraloop H300

H300	Input: Greywater from shower and bath Output: Two (2) valves for recycled water to the toilets and the washing machine Colour: Stone Front Plate: Stainless-steel front plate with white coloured logo and small status light
H300 Premium	Input: Greywater from shower and bath Output: Two (2) valves for recycled water to the toilets and the washing machine Choose from three colours: Dew, Chili and Stone Front Plate: Premium stainless-steel front plate with Hydraloop LED logo lights

Add-ons

Output Garden	One (1) extra valve for recycled water in the garden
Output Pool	One (1) extra valve for recycled water for the pool
Washing Machine Option	Option to recycle 50% of greywater from washing machine, including sanitary lift pump
Lift pumps *	DAB Novabox 30/300. This lift pump is submerged underneath the floor DAB Genix VT 030. This lift pump is on the floor

A lift pump is only necessary if the Hydraloop is positioned on the same floor or a storey higher as the shower/bathtub

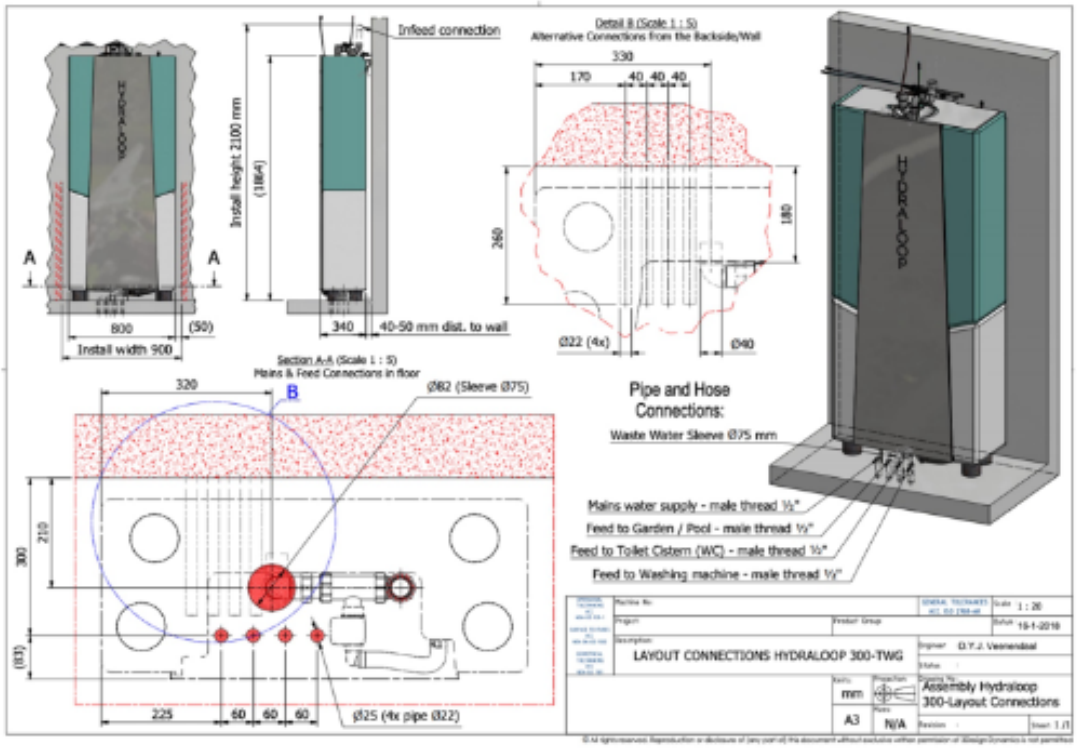
Hydraloop H300 Specifications

Volume	300 liters / 80 gallons
Cleaning capacity	530 liters / 140 gallons per day
Dimensions	80 cm wide, 34 cm deep, 187 cm high 31,5" wide, 13,4" deep, 74" high
Voltage	100/240 Volt, 24 Volt internal
Usage	20 watts during treatment. Average power consumption: 200kWh/year
WIFI	The Hydraloop unit needs to be connected with an internal WIFI-network
Average recycled water quality	non-potable water CBOD5 (mg/L) < 10 TSS (mg/L) <10 Turbidity (NTU < 5) E. coli (MPN/100ml.) < 14 PH (SU) 6.0 – 9.0
Noise Level	± 44 dB.

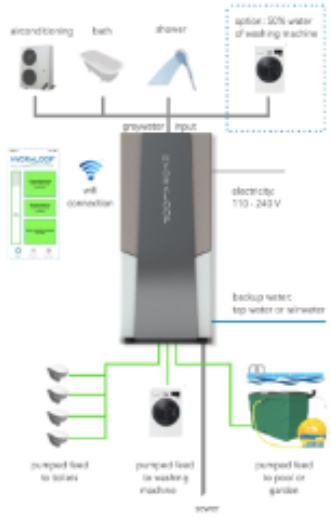
LED Light Indications

White	Hydraloop provides recycled water.
Blue	Hydraloop provides mains water (until recycled water becomes available).
Purple	The washing machine mode is active.
Green	In self-cleaning mode.
Orange + two (2) short sound signals per minute	The UV disinfection lamp is not functioning properly.
Red + three (3) short sound signals/minute	The water distribution pump has switched itself off. Which might happen when water is leaking somewhere in-house.

Sizes



Schematic overview



- Input from wastewater of bath & shower
- Output for toilet flushing, washing machine, garden irrigation and / or pool
- Wifi connected for Smartphone app, over the air updates and remote support

- 'Fit & Forget turnkey product
- No filters, membranes or chemicals
- Fully automatic, self-cleaning, low maintenance
- BREEAM and LEED certification points
- No compromise on hygiene and living comfort
- Contribute towards sustainable and off grid living


HYDRALOOP

The NSF/ANSI 350 standard verifies that all design and performance requirements of the standard have been met, and confirms through testing that effluent reuse water meets the stringent quality criteria. The NSF/ANSI 350 standard also sets water quality requirements for the reduction of chemical and microbiological contaminants for non-potable water use.

During the 26 week NSF/ANSI 350 testing period, the Hydraloop product was dosed daily with a greywater mix that contained raw wastewater, secondary effluent, body wash, shampoo, conditioner, soap, toothpaste, deodorant, bath cleaner, boric acid, liquid handsoap, laundry detergent & softener, Na_2SO_4, $NaHCO_3$, $NaPO_4$ and test dust. The incoming greywater and the treated recycled water was lab tested for 26 weeks, typically 3 days a week.

Influent values of the incoming greywater used for the 26 week test

Parameter	Required range
TSS (mg/L)	50 - 100 mg/L
BOD5	100 - 250 mg/L
Temperature	25 - 35 Celcius
PH (SU)	6.0 - 8.0
Turbidity	50 - 100 NTU
Total phosphorus as P	1.0 - 3.0 mg/L
Total Ammonia as N	3.0 - 5.0 mg/L
COD	250 - 600 mg/L
Total coliforms	10^6 - 10^7 cfu/100 ml
E.coli	10^5 - 10^6 cfu/100 ml

Effluent values NSF 350 requirements and Hydraloop treated water test results

NSF/ANSI 350 requirements		HYDRALOOP average results	
cBOD5 (mg/L)	< 10	cBOD5 (mg/L)	4
TSS (mg/L)	< 10	TSS (mg/L)	3.0
Turbidity (NTU)	< 5	Turbidity (NTU)	2.0
E. coli (MPN/100ml)	< 14	E. coli (MPN/100ml)	< 1
PH (SU)	6.0 - 9.0	PH (SU)	6.0 - 9.0


CERTIFICATE

kiwa

Safety certificate
K102335/01

Water recycling system

Hydraloop International B.V.