

Water Neutrality Study: Part B – In-combination

Final Report

April 2022

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**Crawley Borough Council
Chichester District Council
Horsham District Council**

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Revision History

Revision Ref/Date	Amendments	Issued to
S3-P01 18/08/21	Draft Report	Crawley Borough Council, Natural England, Southern Water
S3-P02 15/02/22	Updated Draft Report	Southern Water
S3-P03 21/02/22	Updated Draft Report	Crawley Borough Council
A1-C04 26-04-22	Final Report	Crawley Borough Council

Contract

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Purpose

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Executive summary

Significant concerns regarding the current Southern Water abstraction at Pulborough (and any within licence increase in abstraction required to serve planned development), have been raised by the Environment Agency and Natural England. The latter has advised that it cannot conclude with certainty that this process is not having an adverse impact on site integrity through a reduction in water levels and potential water quality impacts that are leading to deterioration of habitat at designations including Amberley Wild Brooks SSSI, Pulborough Brooks SSSI that are part of Arun Valley SPA, Arun Valley SAC and Arun Valley Ramsar site. Natural England has advised the Councils within the water resource zone, that development in the Sussex North part of the Gatwick sub-region must not add to this adverse effect. Water Neutrality is required to allow development to proceed without increasing abstraction from Pulborough during the interim period whilst an alternative water supply is sought.

The Pulborough groundwater abstraction supplies water to the Sussex North Water Resource Zone (WRZ). This zone covers the majority of Crawley (excluding Gatwick Airport and Maidenbower), Horsham District, part of Chichester local authority area and part of the South Downs National Park. Part A of this work introduced the concept of water neutrality and addressed growth in just Crawley and Chichester individually. Part B builds on this work, combining the growth forecasts of all LPAs in the water resource zone into an overall water demand. The theoretical contribution that may be achieved from each of the mitigation measures identified in Part A is then presented, alongside the latest information provided by Southern Water on their emerging plans.

Water neutrality is defined in this study as:

"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."

This study estimated the additional water demand from all local authorities in the water resource zone.

On 14 September 2021 Natural England published a position statement defining an interim position for applications in the Sussex North WRZ. NE advised that:

"...this matter should be resolved in partnership through Local Plans across the affected authorities, where policy and assessment can be agreed and secured to ensure water use is offset for all new developments within Sussex North. To achieve this Natural England is working in partnership with the relevant authorities to secure water neutrality collectively through a water neutrality strategy."

Whilst this 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."

Further clarification was provided in February 2022:

"For the avoidance of doubt, since the 2017 Regulations cannot be applied retrospectively, the requirement for Water Neutrality will not apply to any projects with full planning permission prior to the Natural England Statement being published on 14 September 2021, in addition this would equally apply to not requiring future developments to mitigate the impact of those developments already granted full permission at that point."

For this reason, only development that does not yet have full planning consent, or has been granted full consent after 14 September 2021, will be considered in this study. This development must demonstrate water neutrality, which is required to ensure that planned growth comes forward in compliance with the Habitats Regulations.

The estimated growth in the water resource zone up to 2037 from development that did not have full planning consent on 14 September 2021 is expected to be approximately 22,000 new houses, and 8,800 jobs as well as some other infrastructure such as schools.

New water demand during the plan period is found to be 5.5 Ml/d should LPAs adopt a water efficiency target of 100 litres per person per day for new build houses in planning policy. This can be significantly reduced if a more ambitious target of 85l/p/d or 62l/p/d were adopted (as discussed in the Part A report). These ambitious targets could be achieved with a combination of water efficient fittings, and/or the requirement for new build housing to incorporate rainwater harvesting and/or greywater recycling schemes where possible. The onus should be on developers to justify why these cannot be achieved and wording should be clear that only exceptional circumstances will count. In these cases, developers could be asked to pay a higher contribution to offset the water demand from their development elsewhere.

Should local plans only adopt the water efficiency targets contained in building regulations, then development will be significantly increasing the quantity of offsetting required to achieve water neutrality.

Southern Water (SW) have accounted for a significant proportion of growth within the Water Resource Management Plan (WRMP), and whilst the Local Plan growth forecasts are higher than originally anticipated, and SW must take additional measures to maintain supply-demand balance taking into account the likely reduction in abstraction from Pulborough, a

significant proportion of planned growth in Sussex North WRZ is already offset in SW's plan.

If a water efficiency target of 100 litres per person per day (l/p/d) for all new build houses were applied, the remaining water demand to offset would be 0.4MI/d. If a more ambitious target of 85l/p/d were adopted, the Local Plans would be water neutral by the end of the plan period, however there would be periods of the plan where water neutrality would not be achieved, and so further mitigation would still be required.

The remaining demand must be offset during the plan period using a combination of measures summarised below:

- Household visits – a theoretical maximum of 2.86MI/d – a realistic programme of 2,000 visits per year (2023 to 2037) would contribute 0.72 MI/d by the end of the plan period
- Extension of leakage reduction – a realistic contribution of 0.36MI/d
- Extension of metering programme – a theoretical maximum of 0.85MI/d
- Non-household visits – 0.16MI/d
- Non-household rainwater harvesting, or greywater recycling could also provide a significant contribution but would need to be assessed based on specific opportunities

Water neutrality is required throughout the Local Plan period. It is expected that Southern Water will address the supply-demand balance, taking into account any sustainability reductions required to prevent environmental damage in the catchment. This may include new water resources, or greater use of existing strategic transfers. This is likely to be included in the next WRMP but may not be delivered until 2028. Water neutrality will therefore be required at least up until this date and may be required beyond should it not be possible to deliver the measures planned by Southern Water on time. The water neutrality plan therefore should assume a significant buffer beyond 2028 where additional offsetting measures may be required and must be certain for this period.

Although the contribution from education and engagement is difficult to quantify, they will form an integral part of any neutrality plan, raising awareness of the need to save water, the reason and benefits of fitting water saving devices and the importance of maintaining existing efficient devices.

The next stage of this work is to produce a draft plan for how this will be delivered. This will include:

- A series of workshops to be held with stakeholders to develop the details of a water neutrality plan. These will build on the discussions to date and on stakeholder feedback to this report.
- A plan, signed up to by stakeholders, defining the measures required to reduce demand and offset growth. Each action must have an identified owner and agreed timescale.
- A technical document stating our assumptions for each mitigation measure included in the plan, and the evidence base to support it.
- A water budget showing the expected increase in demand year by year, and the contribution required from offsetting measures.

The measures already planned by Southern Water to reduce household demand go a significant proportion of the way to achieving water neutrality during the plan period. The size of the remaining demand that must be offset and the scope and complexity of any offsetting scheme depends on the water efficiency target for new build housing. Water-use should be reduced as low as possible, as early as possible to minimise the need for offsetting later in the plan.

The carbon reduction that can be achieved through a reduction in water use should not be forgotten and could provide a significant contribution towards net zero climate targets.

Contents

1	Introduction	1
1.1	Background	1
1.2	Water neutrality background	3
1.3	Natural England Position Statement	3
1.4	Geographic extent	4
1.5	Timeframe of neutrality strategy	5
2	Growth in Sussex North WRZ	6
2.1	Introduction	6
2.2	Crawley Borough Council	6
2.3	Chichester District Council	6
2.4	Horsham District Council	7
2.5	South Downs National Park	8
2.6	Waverley Borough Council	8
2.7	Arun District Council and Mid Sussex District Council	9
2.7.1	Demand from schools	9
2.8	Growth at Water Resource Zone level	10
2.9	Demand Scenarios	11
2.10	Achieving Water Neutrality	13
2.11	Southern Water	14
2.12	Impact of COVID-19	14
2.13	Education	15
3	Mitigation options	16
3.1	Introduction	16
3.2	Methodology	16
3.2.1	Overall approach	16
3.2.2	Available options	17
3.3	Demand reduction	19
3.3.1	Outline	19
3.3.2	Rainwater Harvesting	20
3.3.3	Greywater Recycling	22
3.4	Offsetting options	23
3.4.1	Outline	23
3.4.2	Re-zoning	23
3.4.3	SW's WRMP	23
3.4.4	Leakage reduction	25
3.4.5	Extension of metering programme	25
3.4.6	Household visits	26
3.4.7	Non-household visits	27
3.4.8	Application of BREEAM	28
3.4.9	Rainwater Harvesting and Greywater Recycling	28
4	Summary and conclusions	30
4.1	Summary	30

4.2	Impact on viability	36
4.2.1	Introduction	36
4.2.2	Demand reduction	36
4.2.3	Offsetting	37
4.2.4	Metering and leakage reduction	38
4.3	Conclusions and recommendations	39
A	Appendix: Stakeholder feedback	41

List of Tables

Table 2.1	Growth in Crawley	6
Table 2.2	Growth in Chichester	7
Table 2.3	Growth in Horsham District	7
Table 2.4	Growth within the SDNP	8
Table 2.5	Average water use for different school types (WSCC)	9
Table 2.6	Water demand scenarios	10
Table 2.7	Water demand by LPA area (MI/d)	11
Table 3.1	Mitigation options identified in Part A	18
Table 3.2	Remaining water demand to offset after SW's actions	24
Table 4.1	Offsetting options for WRZ	31
Table 4.2	Estimated cost of fitting RWH to new building housing	36
Table 4.3	Water demand from new housing	38

List of Figures

Figure 1.1	Sussex North Water Resource Zone	1
Figure 2.1	Forecast water demand from development during the plan period	10
Figure 2.2	Water demand by LPA area (Target 100 scenario)	11
Figure 3.1	Contribution from SW WRMP measures	24

1 Introduction

1.1 Background

Southern Water supplies water to Crawley Borough, Horsham District, the northern part of Chichester District and South Downs National Park Authority from its Sussex North Water Resource Zone (WRZ). Within this WRZ there are a number of water sources, one of which is a groundwater source at Pulborough – one of a number of groundwater and surface water abstractions in that area. Figure 1.1 shows the indicative extent of the WRZ. The exact boundary, including the area of re-zoning is currently being revised by Southern Water and was not available for this report. This will be published as part of the Part C report.

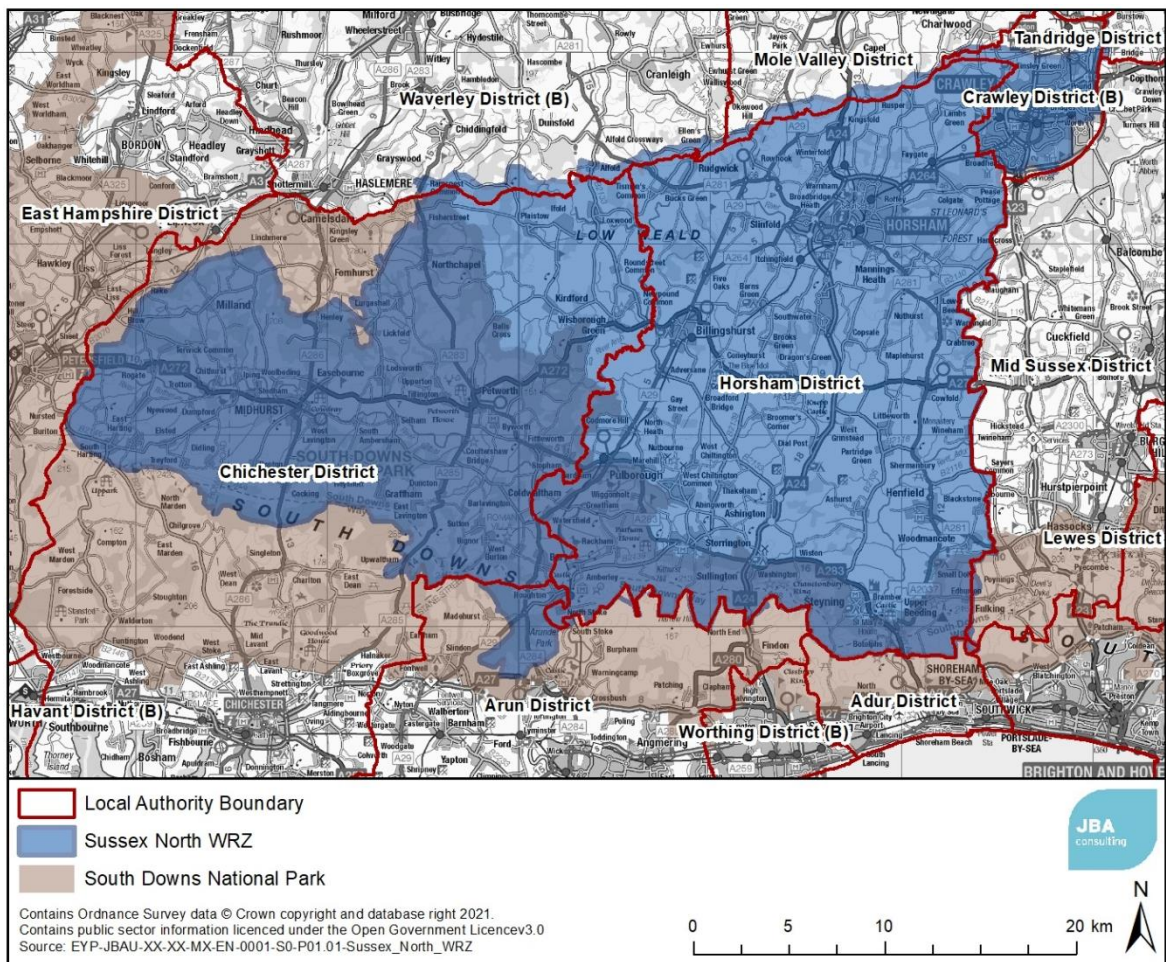


Figure 1.1 Sussex North Water Resource Zone

Natural England has raised significant concern regarding the current abstraction (and any increase in abstraction required to serve planned development), advising that it cannot conclude with certainty that this process is not having an adverse impact on site integrity through a reduction in water supply and deterioration of habitat at designations including Amberley Wild Brooks SSSI, Pulborough Brooks SSSI and Arun Valley SPA, Arun Valley SAC and Arun Valley Ramsar site.

Investigations and discussions between Southern Water, the Environment Agency and Natural England on the long-term sustainability of the Pulborough abstraction are ongoing, including a sustainability investigation to assess what level of ground and surface water abstractions are sustainable. In the meantime, Natural England has advised the Councils that development in the Sussex North WRZ part of the Gatwick sub-region must not add to this potential adverse effect. Water Neutrality is required as a means to allow development to proceed without increasing abstraction from Pulborough, but further evidence on how this might be achieved is required.

JBA Consulting has been commissioned to provide a water neutrality assessment to calculate the individual and in-combination impacts of the development currently proposed on water demand within Sussex North WRZ, providing advice on specific measures required to support and achieve water neutrality.

The study is divided into three parts:

Part A: Individual Local Authority Areas Assessment

Part A of this work introduces the concept of water neutrality and investigates the measures that may be possible in order to achieve it. It goes on to examine at a high level the feasibility of achieving neutrality in Crawley Borough and Chichester District (acting individually). Horsham District Council had previously commissioned a technical note on water neutrality as part of their Habitats Regulations Assessment (HRA) process and so did not take part in Part A. The contribution that could be theoretically possible from different measures (at this stage we are just considering the approximate order of magnitude impact of each measure), both under control of the council and other stakeholders was presented. Part A was completed in June 2021.

Part B: In-combination Assessment

This Part B report combines the individual authority assessments into a WRZ-wide assessment using the same methodology for assessment as Part A.

Part C: Determine Mitigation

The third part of this study will build on the analysis in Parts A and B and develop a draft strategy to achieve water neutrality. It will consist of:

- A technical report containing details of measures considered to be feasible from Parts A & B including clear defensible evidence for each measure;
- a draft strategy developed with stakeholders defining which measures will be adopted, who will be responsible, and how they will be funded, and over what timescale;
- a baseline water budget demonstrating how water neutrality could be maintained through the plan period based on the plan.

Further work will be required to implement the strategy that is not included within this scope of work. This will include setting up the appropriate governance structure, conducting a procurement exercise to obtain accurate costings for implementing mitigation measures or offsetting, and development of the detailed processes and procedures for running and reporting a neutrality scheme.

1.2 Water neutrality background

For the purpose of this study the simple definition of water neutrality was adopted:

"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."

Over the last decade, a number of Water Cycle Studies (WCSs) supporting Local Plans have included water neutrality assessments. To the best of our knowledge, this is, however, the first case in the UK where a Local Planning Authority may be required to demonstrate a deliverable plan for achieving water neutrality, in order to demonstrate that the Local Plan will not have an adverse impact on designated sites. In this respect, the technical assessments outlined in Part A & Part B are the first steps towards developing a water neutrality plan which will need to go well beyond the scope of previous water neutrality assessments, which have been desktop exercises presenting how water neutrality could be achieved. In order for a water neutrality plan to meet the tests of certainty required by the Habitats Regulations in light of caselaw, Natural England have confirmed that it will need to set out:

- A framework for the overall delivery and monitoring of the plan.
- Which measure(s) will be applied (allowing some flexibility for innovation and technological and societal change over the plan lifetime).
- Identification of which party will lead the delivery of each measure, and to what timescales – linked to development delivery timetables.
- How measures will be secured and delivered.
- Define how delivery of the plan will be financed.
- Identify how measures will go beyond or at a quicker pace than those already in Southern Water's business plan.

1.3 Natural England Position Statement

On 14 September 2021 Natural England published a position statement¹ defining an interim position for applications in the Sussex North WRZ. NE advised that:

1 Natural England's Position Statement for Applications within the Sussex North

"...this matter should be resolved in partnership through Local Plans across the affected authorities, where policy and assessment can be agreed and secured to ensure water use is offset for all new developments within Sussex North. To achieve this Natural England is working in partnership with the relevant authorities to secure water neutrality collectively through a water neutrality strategy.

Whilst this 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."

Further clarification² was provided in February 2022:

"For the avoidance of doubt, since the 2017 Regulations cannot be applied retrospectively, the requirement for Water Neutrality will not apply to any projects with full planning permission prior to the Natural England Statement being published on 14 September 2021, in addition this would equally apply to not requiring future developments to mitigate the impact of those developments already granted full permission at that point."

For this reason, only development that does not yet have full planning consent, or has been granted full consent after 14 September 2021, will be considered in this study. This development must demonstrate water neutrality, which is required to ensure that planned growth comes forward in compliance with the Habitats Regulations.

1.4 Geographic extent

Any development within the Sussex North WRZ must be water neutral for the whole of the period covered by the water neutrality strategy. As explained in 3.4.2, SW are re-zoning part of the north of the Sussex North WRZ to SES Water (SESW).

The agreement between SESW and SW is temporary and can be reversed should the transfer no longer be required, or SESW are unable to support it. It could also be re-zoned in response to an emergency or drought. A precautionary approach should therefore be taken whereby development within the re-zoned area must also achieve water neutrality and has been included in the calculations contained in this report. Offsetting measures delivered within the rezoned areas are

Water Supply Zone, September 2021 – Interim Approach, Natural England (2021). Received via email on 14/09/2021

2 Natural England's Advice Note regarding Water Neutrality within the Sussex North Water Supply Zone: February 2022 V2. Natural England (2022). Received via email on: 03/02/2022

unlikely to contribute towards neutrality in Sussex North and therefore cannot be included within the neutrality calculations.

1.5 Timeframe of neutrality strategy

Water neutrality is required as long as there is potential for an adverse effect on the sensitive habitats in the Arun Valley. In practise this means it is required until Southern Water can provide an alternative water source to replace groundwater abstraction at Pulborough. Time is required to allow SW to identify, design, obtain funding and construct an alternative source through their business plan and WRMP process. It is therefore unlikely that a new source could be available before 2028 at the earliest. This strategy will therefore take the approach that neutrality will be required throughout the time frame covered by the Local Plans of CBC, CDC and HDC; a period up until 2037/2038.

2 Growth in Sussex North WRZ

2.1 Introduction

Six local planning authorities lie either fully or partially within the Sussex North WRZ. Growth from each of these is summarised in the sections below before a total WRZ level forecast is produced in section 2.8. It is expected that this growth forecast will change over time as new development sites are proposed, and others rejected. The plan therefore needs to be flexible enough to manage changing demand. Other land uses such as leisure facilities and swimming pools may have bespoke water demands and may need to be considered on a case-by-case basis during the plan period with the requirement that they should also be water neutral. Water demand generated from new school places should also be considered and expected pupil numbers have been provided by West Sussex County Council.

2.2 Crawley Borough Council

CBC provided an up-to-date growth forecast for Part A of this study containing recent completions, sites already in the planning system and local plan allocations. An estimate of windfall was also included. Growth during the whole of the plan period was included (starting in 2021) and is summarised in Table 2.1 below.

Table 2.1 Growth in Crawley

Type	Growth 2021 to 2037
Housing (completions, extant planning and allocations)	5,504 dwellings
Employment	5,780 approx. new employees*
Local Plan Housing Sites with Full Planning Permission prior to issuing of NE position statement	1,169 dwellings
Remaining Local Plan Housing Delivery without Full Planning Permission during the plan period	4,335 dwellings

* Estimated based on employment use type and standard employment densities

2.3 Chichester District Council

Chichester District Council (CDC) provided growth figures for the area of Chichester supplied from the Sussex North WRZ. Since publication of the Part A report CDC have had to reconsider growth options in the north of their district and so the number of houses within the Sussex North WRZ has increased considerably. The council are testing

scenarios up to and including an additional 1,477 homes on top of those already identified in Part A, although the final figure is likely to be less than this. For the purpose of this study, a precautionary approach should be taken and the highest growth figure of 1,477 additional houses has been factored in. No employment land was identified. This is summarised in Table 2.2 below. Part of Chichester District also lies within the South Downs National Park (SDNP), where the Local Planning Authority is the National Park Authority, not Chichester District Council. Growth within the SDNP is summarised in 2.5.

Table 2.2 Growth in Chichester

Type	Growth 2021 to 2037
Housing (completions, extant planning and allocations)	361 to 1,838
Employment	No employment development planned in Sussex North WRZ
Local Plan Housing Sites with Full Planning Permission prior to issuing of NE position statement	183 dwellings
Remaining Local Plan Housing Delivery without Full Planning Permission during the plan period	178 to 1,655 dwellings

2.4 Horsham District Council

Growth figures for Horsham District were taken from the technical note on water neutrality prepared by Aecom³. This is summarised in Table 2.3 below.

Table 2.3 Growth in Horsham District

Type	Growth 2021 to 2037
Housing (completions, extant planning and allocations)	18,660 dwellings
Employment	111,700m ² employment floorspace split as 37,160m ² (Class E) and 74,500m ² (Class B2 and B8)
Local Plan Housing Sites with Full Planning	3,102 dwellings

Permission prior to issuing of NE position statement	
Remaining Local Plan Housing Delivery without Full Planning Permission during the plan period	15,558 dwellings

For the purposes of this study, water demand from employment land is estimated based on the number of employees. The same employment densities used for the Gatwick sub-region Water Cycle Study were applied to the employment floorspace forecast (from Table 2.3) in order to estimate a number of new employees in the region.

2.5 South Downs National Park

The South Downs National Park (SDNP) covers a large area of Sussex and Hampshire, including parts of Chichester, Horsham and Arun. Within these areas the LPA is the National Park Authority, who were approached to provide information for this study. Table 2.4 summarises the growth from the area of the SDNP that is within Sussex North WRZ.

Table 2.4 Growth within the SDNP

Type	Growth 2021 to 2033
Housing (completions, extant planning and allocations)	851 dwellings
Employment	17,800m ² of employment floorspace without full planning permission
Local Plan Housing Sites with Full Planning Permission prior to issuing of NE position statement	367 dwellings
Remaining Local Plan Housing Delivery without Full Planning Permission during the plan period	484 dwellings

2.6 Waverley Borough Council

A small section of the south of Waverley Borough Council (WBC) falls within the WRZ, and they were contacted to provide details of any growth that was expected during the plan period in this area. WBC advised, within this WRZ, there would be 45 dwellings, of which 25 did not have full planning permission, and no employment land.

2.7 Arun District Council and Mid Sussex District Council

A small section of the WRZ also covers an area within the north of Arun District Council (ADC), and Mid Sussex District Council runs adjacent to the WRZ and was part of the Gatwick sub-region WCS. Both LPAs were contacted about the study but advised that they had no growth expected within the WRZ. This may need to be re-visited should the WRZ boundary change.

2.7.1 Demand from schools

Growth in household population is expected to lead to an increase in the number of school places required, with a resulting increase in water demand, either from new schools, or from an increase in the number of pupils at existing schools. West Sussex County Council (WSSCC) provided an estimate of the number of new school places required during the plan period.

WSSCC also collated data from water meters for state schools in the county (not including academies) to calculate an average water use for different types of schools. The three years before the Covid-19 pandemic (April 2017 to March 2020) were chosen to provide the most up to date – but realistic figures. The results of this assessment are shown in Table 2.5.

Table 2.5 Average water use for different school types (WSSCC)

Education facility	Average water use for facility (l/p/d)
Nursery	49
Primary	14
Secondary & Sixth Form	10
Special Educational Needs School	37

The average water use, and estimated number of new school places were used to calculate a water demand from new school places in Sussex North. This was found to be 0.18MI/d by the end of the neutrality strategy period. It is possible that much of this could be offset within the existing school infrastructure through the retrofit of efficiency measures and Rainwater Harvesting (RwH). Efficiency measures applied in schools are less likely to be removed than in household settings, and the programme could have an additional educational / water use awareness benefit. Offsetting measures undertaken on school buildings should be under the management of WSSCC and priority given to offsetting the demand from new school places.

2.8 Growth at Water Resource Zone level

Growth information in each of the LPA areas was collated into a single forecast for residential and employment development. The water demand scenarios used in Part A were applied to the combined WRZ forecast and used to generate an additional water demand for the water resource zone. The overall demand in each scenario is summarised in Table 2.6, and the change in demand during the plan period is shown in Figure 2.1.

Table 2.6 Water demand scenarios

Demand scenario	Household PCC (l/p/d)	Non-household PCC (l/p/d)	Additional Water Demand (MI/d)
Building Regs. Standard	125	63	6.847
Building Regs. Optional (adopted 2015 Local Plan)	110	63	6.047
Target 100	100	63	5.514
Realistic achievable	85	37.9	4.714
Ambitious	62	22.1	3.488

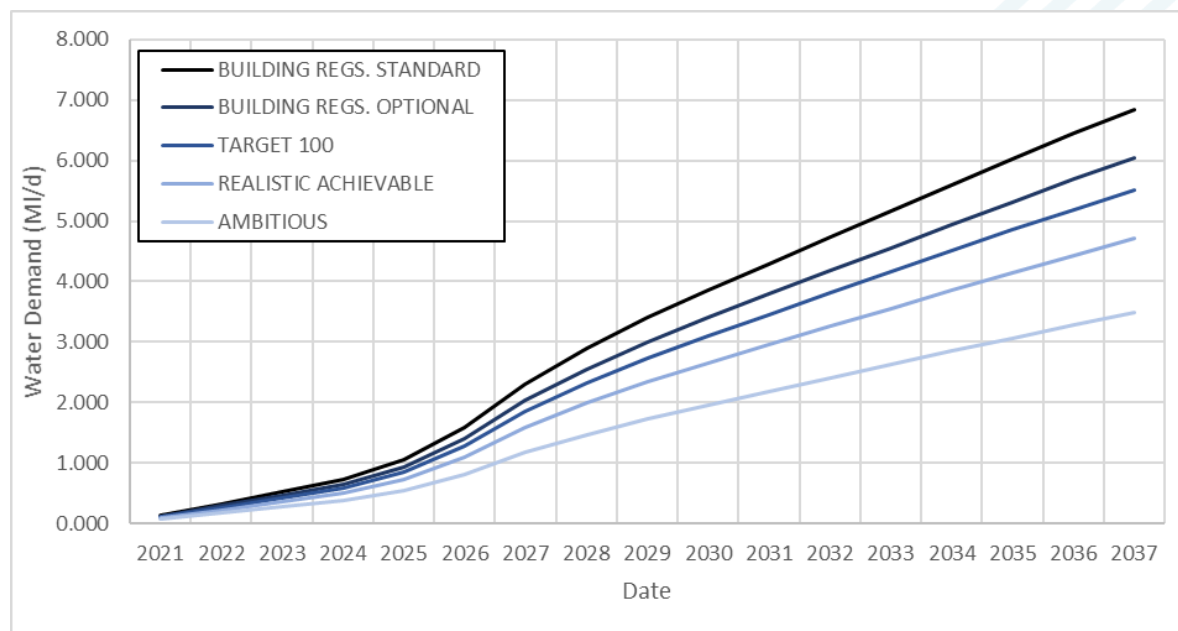


Figure 2.1 Forecast water demand from development during the plan period

A breakdown of water demand by LPA area is shown in Table 2.7 and Figure 2.2.

The most significant demand in the WRZ comes from Horsham District Council.

Table 2.7 Water demand by LPA area (MI/d)

Scenario	CBC	CDC	SDNP	HDC	WBC	Total
BUILDING REGS. STANDARD	1.353	0.514	0.151	4.821	0.008	6.847
BUILDING REGS. OPTIONAL	1.195	0.454	0.134	4.258	0.007	6.047
TARGET 100	1.089	0.414	0.122	3.882	0.006	5.514
REALISTIC ACHIEVABLE	0.931	0.354	0.104	3.319	0.005	4.714
AMBITIOUS	0.689	0.262	0.077	2.456	0.004	3.488

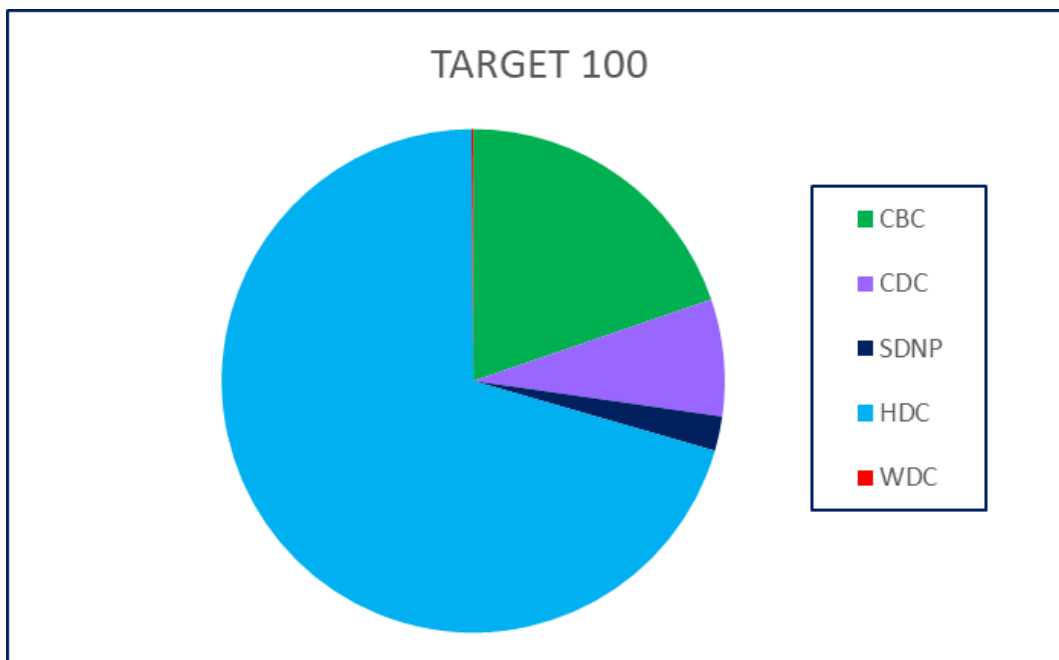


Figure 2.2 Water demand by LPA area (Target 100 scenario)

2.9 Demand Scenarios

As outlined in Part A, the following scenarios have been modelled in this work:

Building regulations

Building regulations currently state that new build housing should achieve a minimum of 125 l/p/d. A tighter target of 110l/p/d is allowed if the local authority can establish a clear need based on available evidence.

Southern Water – Target 100

Southern Water have committed in their Water Resource Management Plan to a water efficiency policy that aims to achieve a PCC of 100 l/p/d across the whole of their supply area by 2040. SW therefore advised the Councils (before neutrality was required) that a target of 100 l/p/d should be adopted in policy for new build properties, and 80l/p/d for

strategic developments where master planning and community level schemes can provide greater saving.

The Target 100 figure was proposed to be adopted within Crawley and Horsham, with this standard reflected in the emerging Local Plans of both authorities. This represented a tightening of standards from those sought through adopted Local Plans, where a figure of 110l/p/d is currently required. The 110l/p/d target is also sought in Chichester through its adopted Local Plan (Policies 12 and 40). However, in order to achieve water neutrality, more ambitious targets, particularly on larger developments will be required. Without these, the remaining water demand to be offset is considerable, requiring a larger and more costly offsetting scheme with a lower certainty of success.

Ofwat report into long term reductions in water demand

Ofwat published a study in 2018 into the long-term potential for reductions in household water demand⁴. In this report, different scenarios for future water use were created based on a range of drivers, public acceptance, policy ambition, and factors such as climate change, resulting in different levels of ambition in terms of the scope for PCC reduction in 50 years' time.

Their research showed that a demand as low as 49l/p/d was possible with high tech solutions such as waterless toilets, integration of "smart" devices, innovative tariffs and "pay-per-use" services. As this study requires the development and adoption of new technology, and a significant shift in behaviour, we consider it to be too ambitious for a study on water neutrality for application during the next twenty years. However, it provides a useful indication for what might be achieved in the future.

An ambitious but more realistic scenario was modelled where water scarcity is widely recognised as an important issue, markets in water resources and water services results in widespread competition and local providers delivering integrated services. It includes extensive use of Rwh and GwR as well as some smart devices. This scenario resulted in a PCC of 62 l/p/d.

The Ofwat report also presents a scenario based on the installation of water efficient fittings, changing behaviours (less baths, minimising running taps etc.), maximising use of eco settings on appliances such as washing machines and dishwashers, and the use of water butts in the garden. In this scenario, a water use of 86 l/p/d was achieved.

This is supported by research conducted by the Energy Saving Trust (EST) that showed that the best commercially available domestic technology could achieve 95 l/p/d, and the best commercially available

4 The long-term potential for deep reductions in household water demand, Ofwat (2018). Accessed online at: <https://www.ofwat.gov.uk/wp-content/uploads/2018/05/The-long-term-potential-for-deep-reductions-in-household-water-demand-report-by-Artesia-Consulting.pdf> on: 08/03/21

technology (including non-domestic technology⁵) could achieve 85 l/p/d.

This study will model the building regulations scenario as a baseline (summarised in Table 4.1), as well as Southern Water's Target 100 ambition. Further scenarios where water demand is cut more dramatically are also modelled including a "realistic achievable" consumption of 85 l/p/d based on current available technology (i.e., commercially available products not requiring development), and an ambitious target of 62 l/p/d based on adoption of new technology (such as smart meters) and significant behaviour change. In reality it may be that during the local plan period, the level of ambition and available technology changes and a transition occurs, for example, from the Target 100 or realistic achievable consumption towards the "ambitious" consumption.

Further information on these scenarios is contained in the Part A report.

2.10 Achieving Water Neutrality

Achieving water neutrality involves a twin track approach. First the demand for water from the new development must be reduced as far as is practicable, then this remaining demand should be offset within the region. In following this approach, the volume that requires offsetting can be reduced, reducing the cost of the overall scheme. This is noted in the Waterwise neutrality definition, and they define three steps to achieve water neutrality in their recent review:

- Reduce water demand in the new development through improvements in efficiency
- Re-use water where possible
- And finally offset the remaining water demand from new development.

Southern Water has an ambitious target in its 2019 Water Resource Management Plan (WRMP19) that aims to reduce household water consumption to 100 litres per person per day on average by 2040 throughout their supply area (not just Sussex North). Their plan includes many measures typically associated with achieving water neutrality, such as home visits and smart metering.

Section 3 of the Part A report identifies measures that are currently planned in the Sussex North WRZ as part of activities by Southern Water.

Section 4 of the same report identifies the options for demand reduction and offsetting measures that may be used for growth,

5 Water Labelling Options: Cost Benefits Analysis, Welsh Government (2020). Accessed online at:

<https://www.waterwise.org.uk/knowledge-base/est-welsh-government-water-labelling-report-2020/> on: 08/03/2021

highlighting where there is synergy between SW's actions and a water neutrality plan, and where there are risks that a benefit may be double counted. Where an action has already been factored into the WRMP, care should be taken to ensure that the benefit is not double counted as part of a neutrality plan. However, SW's WRMP accounted for a certain level of growth between 2020 and 2037, and whilst the current projections from the councils are higher, and SW must take additional measures to maintain supply-demand balance taking into account a likely reduction in abstraction from Pulborough, a significant proportion of planned growth in Sussex North WRZ is already offset in SW's plan. The contribution that could be made through Southern Water's activities is summarised in Section 3.4 below.

2.11 Southern Water

SW will have to address supply-demand balance in their next water resource management plan (WRMP24). Work on this plan is already underway, although a draft will not be ready until after the conclusion of the current study.

In order to address the supply-demand balance, WRMP24 is likely to present plans to develop new water sources, make better use of existing sources, and / or propose strategic transfers.

Large-scale water resources schemes take a considerable length of time to design and deliver and work will not take place until funding is agreed following approval of the WRMP in the Price Review (PR24). A scheme proposed in the WRMP24 is therefore unlikely to contribute to water resources until 2028 at the earliest. To ensure abstraction is not increased in the WRZ, water neutrality is likely to be needed for a period up to at least 2028.

As future water resources schemes are not certain at this stage, a precautionary approach should be taken, and it should be assumed that water neutrality is required beyond this date, up to the end of the local plan period (2037).

Southern Water have stated that they are working with the EA to mitigate the sustainability concerns raised by NE (as well as the outage at Weir Wood Reservoir). This is being done by progressing a number of short-term actions including re-zoning some customers to SES Water and working with private abstractors in the Rother catchment to provide additional deployable output at the Pulborough surface water abstraction. This is aimed at maintaining their supply-demand balance and does not contribute directly to water neutrality.

2.12 Impact of COVID-19

The Part A report stated the daily saving resulting from a household visit as 36 litres per household. Since the start of the COVID-19 pandemic, this has been observed to fall to 24 litres. Research conducted by the University of Manchester with consultants Artesia showed dramatic change in water use during the pandemic with a shift

in water use from non-household settings to household, and an increase in water-intensive practices such as washing of groceries, and more intensive personal hygiene and clothes washing. There was also a big increase in outdoor water use with people spending more time in gardens.

*"As people slowly return to their pre-coronavirus routine, it is likely that water intensive hygiene practices are likely to reduce. However, many people are expected to continue working from home post-COVID-19, which will result in long-term changes in domestic water use patterns such as taking longer showers throughout the day and the increased use of gardens"*⁶

It is not yet known what the long-term impact of COVID-19 on water demand will be, but some degree of hybrid working is likely which could increase household PCC and reduce workplace PCC. This uncertainty must be accounted for in Part C.

2.13 Education

Despite a few recent news stories about future water shortages in England, awareness of water scarcity is fairly low, and some way behind awareness of climate change and energy use.

Raising awareness of the need to save water, the reason and benefits of fitting water efficient devices and the importance of maintaining existing efficient devices where already fitted are an important part of demand reduction activities, and in maintaining that reduction over time.

Southern Water are already communicating with customers on this topic and run a schools scheme as part of the Target 100 activities. They do not regularly communicate with non-household customers in the same way, and there may be some benefit from an education / awareness programme aimed at businesses.

As noted in Part A, it is difficult to quantify the impact an education programme will have directly on PCC, and so no specific figure for demand reduction will be included within the calculations. However, we would recommend that education and awareness must form an integral part of any water neutrality plan.

6 Press release: Coronavirus lockdown caused dramatic changes in water consumption, research finds. University of Manchester (2020). Accessed online at: <https://www.manchester.ac.uk/discover/news/coronavirus-lockdown-caused-dramatic-changes-in-water-consumption/> on: 18/02/2022

3 Mitigation options

3.1 Introduction

Section 2 defined the baseline water demand from growth in Sussex North WRZ, and the demand that had already been factored into Southern Water's WRMP. This section now assesses the options available to reduce and then offset the remaining demand.

3.2 Methodology

3.2.1 Overall approach

The same methodology used in Part A was applied to Part B. A water neutrality calculator was developed as part of a research and development project at JBA. This estimates the future water use based on local authority growth forecasts and published water company data. It also estimates the volume of water that could be offset through retrofitting properties, leakage reduction, metering, and other identified measures. The calculator uses the Southern Water standard occupancy figure for Sussex North, which averages at 2.43 people per residential dwelling over the period 2021-37. This is slightly greater than the average household sizes implied by the standard occupancy and housing mix figures projected individually by CBC, CDC, HDC and SDNPA⁷ (the local authority areas where the bulk of development in Sussex North is planned). By allowing for an element of headroom beyond local authority figures, the Southern Water standard occupancy figure ensures that a suitably precautionary approach is applied in line with the Habitats Regulations.

As explained in 1.4, in order to take a precautionary approach, the WRZ boundary provided by SW, and the area that is being rezoned to SESW were used as the boundary of the study area in Part B, with statistics for the WRZ taken from the Water Resources Market Information tables for the Sussex North WRZ published in February 2020.

It is important when undertaking calculations as part of a water neutrality strategy to account for uncertainty. The expected water efficiency saving may not be realised in full, so if water neutrality is only just achieved, in theory the strategy may not be sustainable in reality. Headroom should therefore be built into any future strategy, and a percentage uncertainty presented on each measure included so that a suitable buffer can be built into the strategy.

A range of household demand scenarios was used based on the analysis in Part A and shown in Table 2.6.

7 *CBC: between 2.31 and 2.42 people per dwelling; CDC: 2.4; HDC: between 2.35 and 2.24; SDNPA: 2.3 (for SDNPA this is the average household size)

The non-household demand was estimated based on the number of employees. The British Water code of practice, "Flows and Loads 4"⁸ was used to create an equivalent PCC for employees based on a blended rate between office workers with and without a canteen (100l wastewater per day and 50l respectively), adjusted down to reflect a five-day working week. An assumption was made that approximately 75% of employees eat in a canteen^{9,10} (skewed by larger businesses being more likely to have a canteen). This gives an estimated PCC of 63 l/p/d for employees. This was applied to the Building Regulation scenarios and the Target 100 scenario. Where a more ambitious household PCC was being applied, this report assumes that a more ambitious non-household target is also applied via the BREEAM New Construction standard. In the "realistic achievable" scenario, a 40% reduction in demand is applied (a PCC of 37.9 l/p/d) and in the "ambitious" scenario the exemplar standard of a 65% reduction in demand is applied producing a PCC of just 22.1 l/p/d.¹¹

3.2.2 Available options

This section outlines measures that may be available to LPAs within the Sussex North WRZ as part of a water neutrality plan both to reduce demand from planned growth, and to offset remaining additional demand. Part A contained a number of possible mitigation options (which are summarised in Table 3.1 below). Where a mitigation option is considered to have potential to be incorporated into a water neutrality plan in Part C it is considered in the sections below. All of the figures on potential water demand reduction or offsetting are indicative at this stage and will be refined further in Part C.

8 Code of Practice – Flows and Loads 4, British Water (2014). Accessed online at:

<https://www.britishwater.co.uk/code-of-practise-flows-and-loads-4-on-sizing-criteria-treatm.aspx> on: 08/03/2021

9 Workplace report, Labour Research Department (2015). Accessed online at:

<https://www.lrdpublications.org.uk/printarticle.php?pub=WR&iss=1758&id=idp10120192> on: 08/03/2021

10 Do you have lunch at the work canteen? Statistica (2017). Accessed online at:

<https://www.statista.com/statistics/690159/work-canteen-for-lunch-united-kingdom-uk/#statisticContainer>

on: 08/03/2021

11 40% represents 3 credits in the BREEAM Wat 01 criteria, and 65% is the Exemplary level (BREEAM New Construction 2018 (UK))

Table 3.1 Mitigation options identified in Part A

Mitigation option	Summary	Considered in Part B?
Leakage reduction	SW already have a plan to reduce leakage on their network. This measure would involve funding being provided for SW to go further and faster – reducing leakage at a faster rate. It should be noted that the unit rate for leakage reduction increases as leakage reduces (i.e., it gets progressively more expensive to achieve leakage reductions).	Yes – applicable to WRZ
Metering	As with leakage reduction a plan is already in place to increase the percentage of households with water meters. This measure would involve funding being provided to extend the metering penetration to a higher percentage than planned. It could also include a faster rollout of smart meters.	Yes – applicable to WRZ
Household visits	Visits by a water company or contractor to provide advice on water saving, and to fit water efficient fittings and devices where possible. These are planned as part of the Target 100 programme, but the programme could be extended.	Yes – applicable to WRZ
Non-household visits	Similar to household visits but targeted at offices and factories.	Yes – applicable to WRZ
Application of BREEAM in commercial properties	Application of highest BREEAM standards for water efficiency for commercial buildings.	Yes – applicable to WRZ
RwH – Newbuild household	This measure will significantly reduce demand from new build houses prior to offsetting. Rainwater is collected for use in toilets and washing machines.	Yes – applicable to WRZ
RwH – retrofit household	This measure reduces demand as above, but from existing houses. It is therefore an offsetting measure rather	Yes – applicable to WRZ

Mitigation option	Summary	Considered in Part B?
	than a demand reduction measure in this case.	
RwH – retrofit commercial	Commercial buildings offer a large opportunity for RwH, particularly where buildings are large, or shared between multiple businesses.	Yes – applicable to WRZ
Education	Awareness of water scarcity is relatively low. Education is an important component of any water neutrality plan – both on the importance of saving water and the reasons for water efficient fittings.	No – not possible to quantify impact – although should be part of strategy
Wastewater re-direction	Water used in the north of the WRZ flows to Crawley WwTW as wastewater and discharges north out of the WRZ. If it were to discharge within the Sussex North WRZ, it could provide a contribution to maintaining river levels, providing more water for surface water abstraction, relieving pressure on groundwater abstraction at Pulborough.	No – extensive environmental assessment and water quality modelling required – outside the scope of this study
New water supplier from outside WRZ	Bulk transfer of water into the WRZ from an adjacent supply area or switching supply to a different WRZ.	Yes

3.3 Demand reduction

3.3.1 Outline

The first step in a water neutrality strategy is to reduce demand as far as is practicable. This can be done through water efficient fittings (flow reducers, aerated shower heads etc), setting water efficiency targets in local plan policy, requiring rainwater harvesting or greywater recycling be fitted in new build housing (also through local plan policy), and through education / information programmes. Some increase in water demand in the WRZ as a result of planned development during the local plan period (prior to mitigation) is inevitable. However, it can be minimised by making developments as water efficient as possible. Local Plan policy can require new residential developments to adopt minimum water efficiency targets, and this is essential to reduce the scale of the offsetting required to achieve neutrality.

The same water demand scenarios used in Part A have also been applied in Part B. Table 2.6 shows the impact of more stringent water efficiency targets where they go beyond the standard options contained in building regulations.

In order to achieve the water efficiency targets there are a number of measures that should be incorporated into new build housing. These were outlined in Figure 4.1 of Part A. These same measures can be retrofitted to existing housing, and many can also be applied to non-household settings such as wash facilities and canteens in office buildings.

Over time, water companies have reported an erosion of the benefits of fitting/retrofitting water efficient fittings in the UK, as they are replaced by less efficient fittings. This points to either a need for rolling programmes of retrofitting or mandatory efficiency requirements for fittings and appliances. National standards regulating the water efficiency of fittings and appliances could also be introduced to address this issue, but this would require national government intervention and therefore is considered to be beyond the scope of the Councils or Southern Water to influence. It is expected that water labelling of appliances is coming, but unlikely to be in place in time to influence water efficiency during this plan. An allowance must be made for the potential drop-off in effectiveness overtime.

3.3.2 Rainwater Harvesting

Rainwater harvesting (RwH) is the capture of water falling on buildings, roads or pathways that would normally be drained via a surface water sewer, infiltrate into the ground or evaporate. In the UK, this water cannot currently be used as a drinking water supply as there are strict guidelines on potable water, but it can be used in other systems within domestic or commercial premises.

Systems for collection of rainwater can be simple water butts attached to a drainpipe on a house, or it could be a more complex underground storage system, with pumps to supply water for use in toilet flushing and washing machines. By utilising rainwater in this way there is a reduced dependence on mains water supply for a large proportion of the water use in a domestic property.

RwH can be used to supply water uses where non-potable water is required. Part A presented evidence that if toilet flushing, laundry, garden watering and car washing utilised water from RwH, a 33% saving in water use could be achieved.

RwH is not currently being considered in the early stages of the Target 100 plan. Therefore, there may be an opportunity to offer this in both new build houses, and as a retrofit in existing properties.

The Waterwise independent review of RwH and GwR performed by consultants Ricardo, notes that integration of a RwH system is more cost effective in new build properties. It goes on to report consumer

research that shows greater enthusiasm for RWH integrated into new build properties, but little interest from developers¹².

It is particularly suited to larger developments where it can be incorporated into site landscaping or in flatted, multi-storey developments where it can be used as part of the SuDs storage and installed within the basement of the building.

If all new build homes (allocations) were installed with RWH systems, and the saving of 33% (as identified in Part A) was achieved, the total saving would be **2.00MI/d**. (Based on approx. 22,064 houses over the remaining plan period, excluding sites with extant planning permission, and a baseline demand of 110l/p/d).

The estimated cost for a new build RWH system is approximately £2,000 per house (dependent on the size / type of dwelling, number of properties served etc)^{13,14} this programme could therefore cost £38,000,000 in total, but could offset a third of the demand in the “realistic achievable” scenario.

Incorporation into housing schemes may not be feasible / viable in every case but should be considered for incorporation **as a minimum** into strategic schemes¹⁵ where a saving of approximately **0.8MI/d** could be achieved. The figures above show an upper ceiling for what could be achieved if every new house were fitted with such a system.

In a similar way to the incorporation of SuDS on development sites, the onus should be on developers to justify why they cannot incorporate a RWH or GwR scheme. Where it is not practical, the councils may wish

12 Independent review of costs and benefits of RWH and GwR, Waterwise (2020). Accessed online at:

https://waterwise.org.uk/wp-content/uploads/2020/09/Ricardo_Independent-review-of-costs-and-benefits-of-RWH-and-GWR_Appendices-A1-A2-1.pdf on: 08/03/2020

13 Independent review of costs and benefits of RWH and GwR, Waterwise (2020). Accessed online at:

https://waterwise.org.uk/wp-content/uploads/2020/09/Ricardo_Independent-review-of-costs-and-benefits-of-RWH-and-GWR_Appendices-A1-A2-1.pdf on: 08/03/2020

14 Housing Standards Review, Department for Communities and Local Government (2014). Accessed online at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on: 11/05/2021

15 HDC consider a strategic scheme to be a site with 200+ dwellings. This has been factored into the calculations for the Part B study. Other LPAs may have a different definition and will need to be considered in future calculations in Part C.

to consider imposing a larger developer contribution in order to fund a retrofit scheme elsewhere in the WRZ.

However, the plan should recognise that the capacity of RWH systems is finite, and they may run dry during prolonged dry weather, and so be less effective when they are most needed. Greywater recycling schemes outlined below would avoid this constraint.

RWH can offer the largest potential water saving in a non-household setting. Many commercial buildings have a large roof area that is ideal for the collection of rainwater. One collection system could potentially provide water for toilet flushing for multiple businesses.

The opportunity from new employment growth has not been assessed in detail here as the size of the opportunity will depend on whether employees are situated in new buildings, or whether vacant buildings are being repurposed. However, with a new non-household demand of approx. 0.5 MI/d generated by new employees in toilets, and canteens, and assuming all toilet flushing could be done by RWH, it may be possible to reduce this demand by approximately 30%, providing a saving of **0.15MI/d**.

3.3.3 Greywater Recycling

Greywater refers to water that has been “used” in the home in appliances such as washing machines, showers and hand basins. Greywater recycling (GwR) is the treatment and re-use of this water in other systems such as for toilet flushing. By their nature, GwR systems require more treatment and are more complex than RWH systems, and there are limited examples of their use in the UK.

Greywater re-use refers to systems where wastewater is taken from source and used without further treatment. An example of this is water from a bath or shower being used on plants in the garden. This sort of system is easy to install and maintain. However, as mentioned above, the lack of treatment to remove organic matter means the water cannot be stored for extended periods.

Greywater recycling refers to systems where wastewater undergoes some treatment before it is used again. These systems are complex and require a much higher level of maintenance than RWH or greywater re-use systems.

Domestic water demand can be significantly reduced by using GwR, and unlike with a RWH system where the availability of water is dependent on the weather, the source of water is usually constant (for instance if it is from bathing and showering). However, the payback period for a GwR system is usually longer, as the initial outlay is large, and the cost of water relatively low. Viability of greywater systems for domestic applications is therefore currently limited.

However, communal systems may offer more opportunities where the cost can be shared between multiple households and may be of particular use in new large developments and flatted developments where they can be incorporated from the start. GwR could also be

applied to non-household development, where the commercial ownership could be an advantage when maintenance is considered. The potential volume saved would be similar to a RWH system but has the significant advantage of added reliability in periods of dry weather.

3.4 Offsetting options

3.4.1 Outline

Once demand has been minimised by making new development as water efficient as possible, and collecting and re-using water where possible, the remaining demand must be offset. The section below outlines measures that could be taken across the WRZ. The first part of this section outlines the contribution that could be made by SW's existing WRMP where a level of growth within the WRZ has already been factored in. Once this has been defined, the sections that follow outline how the remaining demand may be offset.

3.4.2 Re-zoning

In Part A, Southern Water outlined a plan to re-zone the northern part of the WRZ to SES Water. It was thought this may have a contribution to make to achieving neutrality, however this measure is required by SW to ensure their supply-demand balance is met and will not be considered further in this report.

3.4.3 SW's WRMP

The WRMP contains a number of measures by SW to reduce water demand in the Sussex North WRZ. These include a programme of work on the network to reduce leakage on the SW network, and activities aimed at reducing household demand through improvements in water efficiency, leading to a reduction in per capita consumption. Assuming an overall supply-demand balance is maintained through re-zoning and strategic transfers, the demand reduction activities already planned to account for development in the WRZ will still be available to offset a large proportion of growth in the local plan period.

The first phase of rezoning has already taken place and a further phase is planned in June 2022 dependent on SESW carrying out enabling works on their network. Assurance will be sought separately to the Part B report that this will occur, or that the supply-demand balance will be maintained by other means. All of the calculations in this report have assumed that a supply-demand balance is maintained.

The total contribution from leakage reduction through the local plan period (to 2037) is predicted to be 3.52MI/d by 2037, and the contribution from household demand reduction is predicted to be 2.29MI/d.

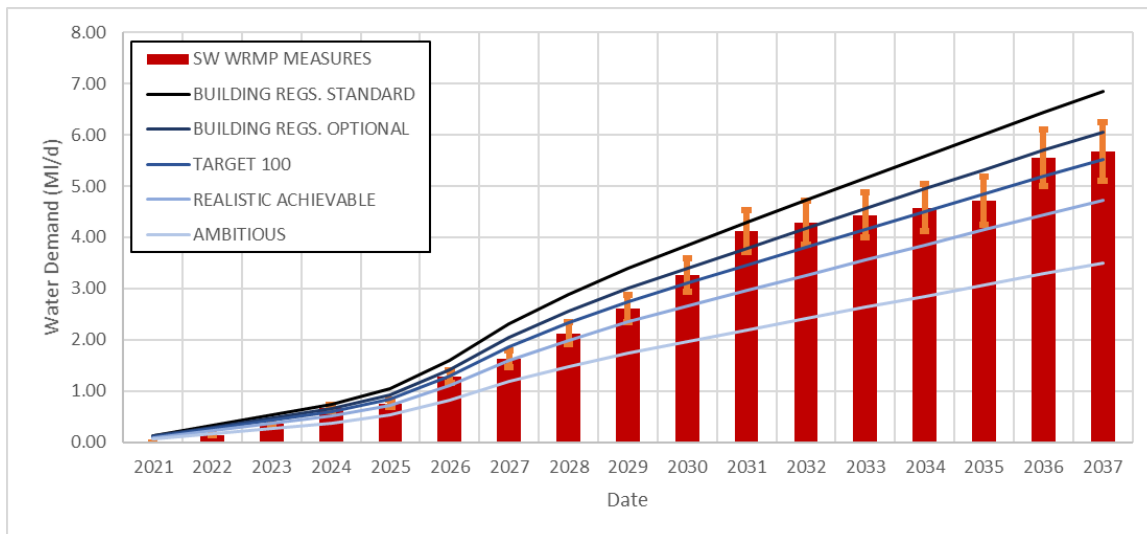


Figure 3.1 Contribution from SW WRMP measures

It can be seen from Figure 3.1 that in a “business as usual” scenario using the optional building regulations target of 110 l/p/d, further mitigation is required to offset the remaining demand from growth. In the target 100 scenario, the SW measures are close to offsetting demand for much of the plan period. In the realistic achievable scenario (PCC in new builds of 85l/p/d) in most years neutrality could be achieved.

The error bars indicate the potential of the SW measures to overachieve (-10%) or underachieve (+10%) against their targets. A precautionary approach should be taken, and the assumption adopted that the SW measures do not achieve the expected result. In all scenarios up to and including the realistic achievable scenario, further mitigation is therefore required to achieve neutrality. The ±10% allowance applied for uncertainty applied here is above and beyond the complex uncertainty analysis applied to all aspects of calculation the supply-demand balance in the WRMP. It is worth noting that SW has regulatory Performance Commitments (PCs) for leakage reduction, PCC and water saved from water efficiency visits which attract bonus payments for out-performance and penalties of under-performance, and therefore have financial incentives to exceed these commitments.

Table 3.2 Remaining water demand to offset after SW's actions

Demand scenario	Household PCC (l/p/d)	Non-household PCC (l/p/d)	Remaining Water Demand to Offset in 2037 (MI/d)
Building Regs. Standard	125	63	1.740
Building Regs. Optional (adopted 2015 Local Plan)	110	63	0.940

Target 100	100	63	0.407
Realistic achievable	85	37.9	Achieved by end of plan period – but not in every year
Ambitious	62	22.1	Neutrality achieved

3.4.4 Leakage reduction

Southern Water publish their forecast leakage reduction at the WRZ level as part of the Water Resources Market Information (WRMI) tables. The SW WRMP contains an objective to reduce leakage by 15% by 2025 and 50% by 2050, and a year-by-year forecast in their WRMI tables.

If SW were to increase their leakage reduction activities by 10% (i.e., a further 10% of water saved in addition to what is already planned in their WRMP) then this measure could contribute **0.36 MI/d** to offsetting demand by 2037. However, additional leakage reduction between now and PR24 would have to be funded through developer contributions (or another source) as it goes beyond what has been budgeted for and agreed with the regulator. SW have also noted that the unit cost of achieving leakage reductions increases the further leakage is reduced as leaks get progressively harder to find and resolve.

3.4.5 Extension of metering programme

The contribution from extending the metering programme (beyond that already planned in the SW WRMP) is difficult to calculate as the customers that do not currently have a meter are likely to have higher water demand and may be less likely to see a saving. Assuming 100% metering penetration was achieved (which SW state would not be possible), and the installation of the meter had the effect of reducing household consumption by 12-14%¹⁶ observed during the SW universal metering programme, then a contribution to neutrality of up to **0.85 MI/d** could theoretically be achieved. However, as the cost and difficulty of installing meters increases the closer to 100% the programme gets, total penetration is unlikely, costs will be high and the reduction in PCC achieved may be less. It is also likely that some of

16 WRMP Annex 6 – Options Appraisal, Southern Water (2019). Accessed online at:

<https://www.southernwater.co.uk/media/3671/wrmp19-annex6-options-appraisal.pdf> on: 08/03/2021

the savings observed were due to water efficiency messaging during the metering programme and not the metering alone.

SW have stated that further increase to metering penetration would not be possible this AMP period (2020 to 2025). By March 2025, the Sussex North domestic metering coverage will be approximately 92% which is one of the highest in the country. Opportunities to increase metering further are limited and expensive.

SW intend to roll out smart meters later in the WRMP period. This could be accelerated and incorporated into new build housing providing the benefit of more accurate monitoring water use in new housing, verifying that water efficiency targets were being met, and to increase awareness of water use in households. Smart metering of new properties is limited by the time taken to set up a competitive tender and procure meters so may not be available until later in the plan.

3.4.6 Household visits

Southern Water have reported a 36-litre per household saving on average as a result of a household visit¹⁷. This was achieved prior to the COVID-19 pandemic, and high consumption households were targeted. Since the start of the pandemic, SW have seen this figure reduce to 24 litres per household. In order to maintain a precautionary approach in this work, the lower figure of 24 litres per household will be incorporated into the calculations. This should be monitored further, and the figures adjusted in Part C if necessary.

If every household in the WRZ (reported to be 119,230 in the WRMP) received a visit and achieved the expected saving, the upper ceiling for a theoretical total water demand saving of **2.86 Ml/d** could be possible. It should be noted that it would not be possible to visit 100% of households, typically, SW have a 25% take-up when household visits are offered. Vulnerable and high consumption users are currently being targeted.

Household visits are included in the Target 100 activities and form part of the PCC reduction expected in the WRMP. Southern Water have advised that 2,500 household visits were carried out in the first year of AMP7 (2020) out of a target of 5,000 with the programme hampered by COVID-19 restrictions. For the second year of AMP 7, the plan is to carry out 11,875 household visits as well as a rollout of virtual water saving visits.

If an additional 2,000 houses per year were visited as part of an extension of the programme (between 2023 and 2037), a saving of **0.72Ml/d** could be provided by the end of the Local Plan period. The Greater Brighton Water Plan stated a cost provided by Southern Water

17 Greater Brighton Water Plan, Greater Brighton, (2020). Accessed online at: <https://greaterbrighton.com/wp-content/uploads/2020/09/Greater-Brighton-Water-Plan.pdf> on: 30/11/2021

of £70 to £100 per visit. This extension to the programme would therefore cost between £140k and £200k each year.

Once the contribution from SW's measures are considered, an extension of the household visits programme already planned by SW could offset a significant proportion of the remaining demand.

3.4.7 Non-household visits

Due to market separation in 2017, Southern Water (along with other water companies) ceased much of their activities to promote water efficiency in the non-household sector. A 2020 parliamentary briefing¹⁸ found that non-household retail competition "has not yet delivered on expectations for water efficiency improvements." There may therefore be significant opportunities in this area to reduce non-household demand.

Part A presented an estimation of the contribution that could be achievable by non-household visits. This was based on 25% of employees within LPA areas being reached with a visit and making the same percentage saving in water demand as has been observed with household visits.

Non-household demand in the Sussex North WRZ is 10.85MI/d. As the proposed re-zoning to SES Water is likely to be mostly employment land in the north of Crawley, it can be assumed that the 4MI/d could be taken from the non-household demand leaving approximately 6.85MI/d.

Re-zoning in the north of Crawley will remove much of the potential non-household contribution that could be made from CBC, but the addition of Horsham District when we take a WRZ level approach is likely to offset this so the potential contribution from non-household visits at the WRZ level is likely to be comparable to what was proposed from Crawley in Part A (**0.16MI/d**).

The contribution from Chichester, SDNP and LPAs on the edge of the WRZ such as Waverly is likely to be insignificant here. However, there may be a significant contribution to non-household demand from agriculture using mains water for farmyard activities (water for irrigation is typically abstracted privately and so is not considered here).

Demand from new school places was estimated to be 0.36MI/d by the end of the plan period. It is feasible that all of this demand could be reduced where new school buildings are being built by designing them to the highest BREEAM standards, and the remaining demand could be offset within existing schools by retrofitting water efficient devices. An education programme here could have knock-on effects where the pupils apply water saving behaviour at home.

18 House of Commons Library (2020) Water: non-household retail competition. Briefing Paper Number CBP 8925, 29 May 2020

3.4.8 Application of BREEAM

Application of the BREEAM new construction standard has been incorporated into the demand forecasts for employment land. The refurbishment and fit-out standard could be applied to commercial properties whenever a building changed hands, although in many cases this will not trigger a planning application. In the “realistic achievable” scenario a reduction of employee PCC of 25.3 l/p/d was estimated based on a 40% improvement in water efficiency from 3 BREEAM credits (Wat 01 Water consumption). If the same saving was realised when a commercial property changed hands, for a business with 100 employees where the BREEAM guidance had not previously been in place the saving would be 2,529l/d. In Part A the impact of 40 such transactions taking place was presented representing an optimistic estimate. When considering the whole WRZ, the additional commercial land from Horsham, Chichester and the SDNP is unlikely to make up for the land re-zoned in the north of Crawley. The estimate of **0.1 MI/d** that the application of BREEAM might achieve from Part A has been retained in Part B, although this unlikely to play a significant part.

3.4.9 Rainwater Harvesting and Greywater Recycling

Household

RwH has the potential to reduce water demand by a third if the RwH system was used for both toilet flushing and laundry, however the cost and disruption of retrofitting a system into existing housing (at a few thousand pounds per property) may limit the uptake for this sort of measure unless there are incentives for homeowners to come forward and financial support is available. However, the potential is significant, equating to a reduction in PCC from 134.9 (average for Sussex North) to approximately 90 l/p/d, a saving of 44.5 l/p/d.

To offset growth in the Target 100 scenario 51,300 houses would need to be retrofit, but the “realistic achievable” scenario would require 44,100 properties to be retrofit. Once SW’s WRMP measures are taken into account 5,400 houses would require retrofitting in the Target 100 scenario. In the realistic achievable scenario, the local plans would be water neutral at the end of the plan period, but mitigation may be required during the plan to ensure neutrality throughout.

Greywater Recycling is likely to produce similar results but has the benefit of reliability in periods of low rainfall.

Non-household

Rainwater Harvesting and Greywater Recycling schemes are particularly suited to largescale developments or commercial buildings where the costs of installation and maintenance can be shared, and for commercial properties, such a scheme may also be useful to a company to demonstrate their commitment to Corporate Social Responsibility.

In Part A, the Manor Royal Business Improvement District was proposed as an example of an area where a large contribution from

RwH could be made. If the re-zoning goes ahead this is likely to fall within SES Water's supply area and so could not contribute to water neutrality (although there are benefits to the region if such a scheme were implemented). Although this is the largest commercial area within the WRZ, there are other areas within the WRZ such as Horsham where largescale RwH could be implemented, for instance in the proposed development to the West of Ifield.

Specific commercial buildings or estates where communal systems can be applied should be identified as part of the development of a neutrality plan.

4 Summary and conclusions

4.1 Summary

Table 2.1 contains a summary of the measures identified above and updates the tables presented in Part A to present the feasibility of water neutrality at a water resource zone level.

Table 4.1 Offsetting options for WRZ

Mitigation option	Potential water saving (MI/d)	% of neutrality target in 110 l/p/d scenario	% of neutrality target in 100 l/p/d scenario	% of neutrality target in 85 l/p/d scenario	Opportunities	Challenges	Party best placed to deliver
Leakage reduction	0.36	38.3%	59.9%	100%	Contractors already in place – extension to existing programme	Upfront funding required if SW are to deliver beyond their existing agreed plan. Per unit cost will increase as leakage is reduced.	Southern Water
Metering	0.85 (theoretical max)	90.4%	100%	100%	Contractors already in place – extension to existing programme	Last unmetered households may be difficult to convert and may not provide the expected savings. 100% penetration would not be possible.	Southern Water

Mitigation option	Potential water saving (MI/d)	% of neutrality target in 110 l/p/d scenario	% of neutrality target in 100 l/p/d scenario	% of neutrality target in 85 l/p/d scenario	Opportunities	Challenges	Party best placed to deliver
Household visits	2.86 (max) 0.72MI/d realistic programme (2000 houses per year from 2023 to 2037)	76.6% (realistic programme)	100%	100%	Relatively cost effective Contractors already in place – extension to existing programme	This is already included in Target 100 activities – uncertain how much could contribute to neutrality. The scheme is also voluntary and therefore the impact is uncertain	Southern Water Councils (Council owned properties)
Non-household visits	0.16	17%	26.6%	100%	Potentially large gains especially at sites with large numbers of employees	SW may not be the retail supplier for all non-household customers (SW would remain as the wholesale supplier)	Partner needs to be identified Councils for Council owned assets
Water efficiency	0.36	38.3%	59.9%	100%	Measures applied in schools are		WSCC

Mitigation option	Potential water saving (MI/d)	% of neutrality target in 110 l/p/d scenario	% of neutrality target in 100 l/p/d scenario	% of neutrality target in 85 l/p/d scenario	Opportunities	Challenges	Party best placed to deliver
programme in schools					generally within the control of the council and would have the certainty of being delivered and maintained.		
Application of BREEAM in commercial properties	0.1	10.6%	16.6%	100%	Requiring BREEAM would have other environmental benefits		Councils through Local Plan policy
RwH – Newbuild household	2.1 (max) 0.8 (Strategic)	85% (Strategic sites)	100%	100%	Greater opportunity to integrate with design and include community scale systems than retrofit.	Significant cost – may not be supported by developer	Developer
RwH – retrofit household	13.24 (max)	100%	100%	100%		Significant cost for a single household and	Partner needs to be identified

Mitigation option	Potential water saving (MI/d)	% of neutrality target in 110 l/p/d scenario	% of neutrality target in 100 l/p/d scenario	% of neutrality target in 85 l/p/d scenario	Opportunities	Challenges	Party best placed to deliver
						uptake uncertain and voluntary so not likely to achieve full uptake.	
RwH – retrofit commercial	Need to identify specific buildings / estates	Unknown	Unknown	Unknown	Largescale scheme shared between businesses is more cost effective (other smaller scale schemes may be possible elsewhere in WRZ)	Persuading companies to invest in the present climate may be difficult Largest opportunity area (Manor Royal Business District) may be re-zoned to SES Water	Councils
Education	Unknown	N/A	N/A	N/A	Awareness of water scarcity is low -	Difficult to quantify benefits or demonstrate success / lacks certainty	Southern Water / Waterwise

Mitigation option	Potential water saving (MI/d)	% of neutrality target in 110 l/p/d scenario	% of neutrality target in 100 l/p/d scenario	% of neutrality target in 85 l/p/d scenario	Opportunities	Challenges	Party best placed to deliver
Wastewater re-direction	Complete	100%	100%	100%		Significant capital cost and potential environmental impact	Southern Water
New water supplier from outside WRZ	Unknown	-	-	-	Utilise water resources from neighbouring WRZs	No identifiable surpluses in neighbouring zones. May require strategic transfer from outside region.	None identified through the WRMP19 process

4.2 Impact on viability

4.2.1 Introduction

The implementation of most schemes to achieve water neutrality will require funding, either from developers, local councils, or the water companies. In some cases, this may have an impact on the viability of new housing in the water resource zone if measures are funded by or passed on to developers.

This section aims to provide some indicative CAPEX costs for different measures in order to inform separate housing viability assessments. It is based on published cost data, and where possible adjusted to take into account inflation since the cost estimate was made. It is recommended that councils undertake their own viability assessment.

The cost of a water neutrality plan should be considered in two parts; the cost of making new housing more water efficient (i.e., driving the per capita consumption below 100 l/p/d to one of the more ambitious scenarios of 85l/p/d or 62 l/p/d) and the cost of offsetting that demand for instance through demand management measures in the WRZ.

4.2.2 Demand reduction

It is for developers to determine a sustainable solution for their site in order to achieve the required water efficiency target. Evidence suggests that a PCC of 85 l/p/d is achievable with water efficient fittings and behaviour change, but in order to drive PCC below this figure it is likely that RWH or GwR may be required. The cost of installing these systems in new build housing was studied by a 2014 Government report on the cost of implementing different proposed housing standards¹⁹. The estimated costs are summarised below.

Table 4.2 Estimated cost of fitting RWH to new building housing

Dwelling type	Estimated cost*
1 Bed Apartment	£1,016
2 Bed Apartment	£1,016
2 Bed Terrace	£2,497
3 Bed Semi-detached	£3,062
4 Bed Detached	£3,062

*2014 cost adjusted to 2020 using Bank of England calculator²⁰

19 Housing Standards Review, DCLG (2014). Accessed online at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on: 16/08/2021

20 <https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator>

Greywater recycling was not considered in the 2014 report due to the “significant cost and complexity” of a GwR system at the time, so comparable costs to Table 4.2 are not available.

Waterwise commissioned a report on the costs and benefits of RWH and GwR systems²¹. Costs of different sized schemes were presented based on the reported costs contained in survey responses from suppliers. Unfortunately, these costs are averaged from a small number of responses and skewed towards commercial schemes that are different in design to most residential development being planned in the Sussex North WRZ. For example, RWH applied to a school, office complex or hotel would require only internal distribution pipework, whereas a significant, below-ground distribution network would be required to supply low to medium density housing developments. The costs in the Waterwise report cannot, therefore, be used in this study to provide a reliable cost per dwelling. The particularly low number of responses for GwR schemes reflects how new this technology is for residential developments in the UK.

The report does state the cost of a small-scale domestic system as £900 to £3,000, which is comparable to the RWH costs in Table 4.2. For large-scale schemes, the costs appear to be greater for GwR than RWH, however, the size bands used by Ricardo are different, so it is not possible to directly compare the costs.

4.2.3 Offsetting

Once demand from new build housing has been reduced as far as practicable, the cost of offsetting the rest of this demand needs to be considered.

One of the most effective methods is through household visits to provide advice on water use and fit water saving devices. In Southern Water’s pilot scheme in the Greater Brighton area, the cost of one visit was found to be £70 to £100, and the average impact was 36 litres per household per day. However, recent data suggests this figure is reduced to 24 litres per household, so this lower figure was used in the cost estimates below.

These figures have been applied to growth in the WRZ in order to estimate the number of household visits and cost to offset each new dwelling. In this analysis, just the demand from housing was considered, and the upper end of the cost range was used. The costs stated in Table 4.3 are for an average house across the WRZ, a one

21 Independent review of the costs and benefits of rainwater harvesting and grey water recycling options in the UK, Waterwise (2020). Accessed online at:

https://waterwise.org.uk/wp-content/uploads/2020/09/Ricardo_Independent-review-of-costs-and-benefits-of-RWH-and-GWR-Final-Report.pdf on: 16/08/21

bed flat would have a smaller occupancy and therefore smaller water demand than a four-bed detached house and so would require fewer household visits to offset its growth.

Table 4.3 Water demand from new housing

Demand scenario	Household PCC (l/p/d)	Additional Water Demand from one house (average occupancy of 2.43) (l/d)	Number of household visits to offset one new house	Indicative cost to offset one house
Building Regs. Standard	125	303.75	12.6	£1,259
Building Regs. Optional (adopted 2015 Local Plan)	110	267.3	11.1	£1,108
Target 100	100	243	10.1	£1,007
Realistic achievable	85	206.6	8.6	£856
Ambitious	62	150.7	6.2	£624

When figures in Table 4.2 and Table 4.3 are compared, a conclusion could be drawn that it is more cost effective to offset the demand from a new dwelling in the Target 100 scenario, than it is to first reduce demand to the level in the “realistic Achievable” scenario, and then offset that growth.

It should be remembered that in order to achieve water neutrality, demand should **first** be reduced, **before** the remaining demand is offset. The number of houses available in the wider area to be used for offsetting is finite, so every reasonable effort should be made to first reduce demand in order to minimise the number required for offsetting. Focussing on offsetting alone, although tempting to a developer, would be contrary to the definition and objective of water neutrality.

4.2.4 Metering and leakage reduction

The cost of these programmes will be explored in Part C and requires information on both the cost of installing a meter from Southern Water, and a figure for the “cost per litre saved” for leakage reduction. The cost of metering can also vary widely depending on the type of installation. As noted earlier in the report, the unit cost of leakage reduction is likely to increase as leakage is reduced as the original programme is likely to have been designed around maximum benefit for minimum cost.

4.3 Conclusions and recommendations

Part A of the water neutrality work investigated the feasibility of achieving water neutrality in Crawley and Chichester LPAs. Part B builds on this work, combining the growth forecasts of all LPAs in the water resource zone into an overall water demand. The theoretical contribution that may be achieved from each of the mitigation measures identified in Part A is then presented, alongside the latest information provided by Southern Water on their emerging plans.

New water demand during the plan period is found to be 5.71 MI/d should LPAs adopt a water efficiency target of 100 litres per person per day for new build houses in planning policy. This can be significantly reduced if a more ambitious target of 85l/p/d or 62l/p/d were adopted. This could be achieved with a combination of water efficient fittings, and / or the requirement for new build housing to incorporate rainwater harvesting and/or greywater recycling schemes where possible. The onus should be on developers to justify why this cannot be achieved. In these cases, developers could be asked to pay a significantly higher contribution to offset the water demand from their development elsewhere.

Southern Water have advised that 5.67MI/d of the demand from growth has already been accommodated within their WRMP through measures such as household visits and leakage reduction. Once a 10% buffer to account for the possibility of it not being possible for SW to deliver their entire plan is allowed for, the remaining water demand is therefore 0.601MI/d in the Target 100 scenario. In the realistic achievable scenario, water neutrality would be achieved by the end of the plan period, however there are several years within that period where demand would exceed the contribution from SW and further mitigation would be required.

This remaining demand must be offset during the plan period using a combination of measures summarised below:

- Household visits – a theoretical maximum of 2.86MI/d – a realistic programme of 2,000 visits per year would contribute 0.72MI/d and offset the remaining demand
- Extension of leakage reduction – a realistic contribution of 0.36MI/d
- Extension of metering programme – a theoretical maximum of 0.85MI/d
- Non-household visits – Part A estimate of 0.16MI/d
- Water efficiency programme in schools – 0.36MI/d
- Non-household rainwater harvesting, or greywater recycling could also provide a significant contribution but would need to be assessed based on specific opportunities

It is expected that Southern Water will address the long-term supply-demand balance, taking into account any sustainability reductions required to prevent environmental damage in the catchment. This may

include new water resources and better use of existing strategic transfers. This is likely to be included in the next WRMP but may not be delivered until 2028. Water neutrality will therefore be required at least up until this date and may be required beyond should measures planned by Southern Water not be delivered on time. The water neutrality plan therefore should assume a significant buffer beyond 2028 where additional offsetting measures may be required. A worst-case assumption was made that water neutrality will be required throughout the respective Local Plan periods to 2037/ 2038.

The next stage of this work is to produce a draft plan for how this will be delivered. This will include:

- A series of workshops to be held with stakeholders to develop the details of a water neutrality plan. These will build on the discussions to date and on stakeholder feedback to this report (see Appendix A)
- A mitigation strategy, signed up to by stakeholders, defining the measures required to reduce demand and offset growth. Each action must have an identified owner and agreed timescale.
- A technical document stating our assumptions for each mitigation measure included in the plan, their estimated indicative costs, and the evidence base to support it.
- A water budget showing the expected increase in demand year by year, and the contribution required from offsetting measures

The measures already planned by Southern Water to reduce household demand go a significant proportion of the way to achieving water neutrality during the plan period. The size of the remaining demand that must be offset and the scope and complexity of any offsetting scheme depends on the water efficiency target for new build housing. Water-use should be reduced as low as reasonably possible, as early as possible to minimise the need for offsetting later in the plan.

The carbon reduction that can be achieved through a reduction in water use should not be forgotten and could provide a significant contribution towards net zero climate targets though which sector would claim these benefits is unclear.

Parts of Crawley Borough and much of Chichester District are served from different water resource zones. Whilst water neutrality is not currently required here, the whole of the south-east is under water stress, and there is a clear benefit to reducing water use across the region. The councils should therefore consider if a uniform policy approach across their area to water efficiency is appropriate.

Appendices

A Appendix: Stakeholder feedback

This document is the first part in the preparation of a Water Neutrality Plan, and probably the first such plan in the UK. During the review process of this report, a number of queries and issues were raised by stakeholders that are best addressed during the formulation of the draft plan (Part C). These have been captured in Table A.1 below, and should be used to inform the scope of Part C.

Table A.1 Stakeholder comments

Stakeholder	Comment
Lepus (HRA consultants)	<p>“My understanding is that NE and Southern Water are currently undertaking a number of studies to provide the link between abstractions, change in water levels and changes in habitat / species distribution. It would be useful to know what work NE and Southern Water are doing to define this impact”</p> <p>NE response – “Yes this isn’t set out in a report yet – but we can pull something together for you but need to finish some of the work on the licences with the company and EA first... which we cannot discuss outside of the company and EA at this time but will do when we are able.”</p>
CBC	<p>“There is a question here of how ‘offsetting’ is defined where it involves actions that are independent of the grant of consent. If the consent is not conditional on the offsetting actions occurring, then how certain can anyone be that they will actually occur? And how is the offsetting achieved by the actions attributed to particular developments? Surely there has to be a way of tying this down more precisely in order for it to be possible to say that a given development is ‘water neutral’? Would it be sufficient for this to be agreed through a ScG or similar? Would any monitoring be required to ensure that the savings were achieved? Noting that the ‘certainty’ required by Natural England is quite a high bar.”</p>
CBC	<p>“What would be the legislation/legal status of this?” (the Water Neutrality Plan)</p>
Lepus	<p>“Before development comes forward. There needs to be a ‘hook’ in the plan which will ensure that development will</p>

Stakeholder	Comment
	<p>only come forward once mitigation has been implemented to achieve overall neutrality.”</p> <p>In terms of the HRA, case law indicates that mitigation must be effective, timely, reliable, guaranteed to be delivered and as long term as necessary. The ‘hook’ in planning policy to achieve this must reflect this requirement.</p> <p>Just a note from an HRA perspective on consideration of future reductions in other plans / policy in relation to the Dutch Ruling.</p> <p>The Dutch Nitrogen Ruling CJEU Cases C-293/17 & C-293/18</p> <p>In HRA appropriate assessment we cannot take account of the future benefits of other wider measures if the expected benefits are uncertain (para 130). This may be because:</p> <ul style="list-style-type: none"> • procedures to implement measures are not yet in place; or • scientific knowledge doesn’t allow benefits to be identified or quantified <p>But the HRA appropriate assessment can take account of all measures above where the expected benefits are certain at the time of the assessment.</p> <p>I wonder how we would quantify and ensure enforcement of some of these behavioural changes – the HRA needs to rely upon mitigation which is, beyond reasonable scientific doubt, effective, timely, reliable, guaranteed to be delivered and as long term as necessary.</p> <p>How would we demonstrate that such measures will in reality take place in the future?</p>
CBC	<p>(On timing of implementing measures) “How does this work when we are bringing forward the same developments under the existing adopted Local Plan, which was considered without this being an issue raised in the HRA? Should we be requiring mini-HRAs for all planning applications as they are doing in Wealden/Mid Sussex in</p>

Stakeholder	Comment
	relation to the air quality impacts on the Ashdown Forest? Or is the borough's adopted Local Plan enough?"
CDC	On the uncertainty on environmental impact - "Don't we have clear advice on this point at present?" NE response - "Yes if the impact is uncertain - you treat it as if it were certain as you have to prove there is not an adverse effect on integrity. "
Lepus	Given metering and household visits are relying on a behavioural change I would wonder how we would be confident in reductions. The leakage reductions (above) would be more reliable as presumably SW would sign up to a more ambitious target over a certain time period.
CBC	Responsibility for these measures is spread across various stakeholders and is outside the planning process to a large extent, so question arises as to how the resulting savings are attributed to Crawley and to the Local Plan period.
SW	"Have you considered the long term effects of Covid-19 which will likely result in more people working from home in future?"
NE	Regarding water efficient fittings - "These have a shelf life and can be removed by home owners so needs evidence from water sector on how much this happens... and that needs to be taken account of - also need evidence that it doesn't happen quickly - as it only needs to be secure until the new Water supply is implemented."
NE	On the potential carbon saving: "Absolutely especially when you combine it with water heating so short showers instead of baths - big energy saving per household and big carbon saving. It is important who takes this carbon offsetting as it could be double or even triple counted... so need to be clear who is claiming the carbon."
NE	"For school there is loads that can be done to save water that saves them money and the fixture and fittings here will not be ripped out so are certain"
NE	On the employment PCC - "Does this take account of works with showers for workers cycling to work? Presume this is already in the office data? As obviously we want to join this up with sustainable transport strategies... etc..."
NE	"How much mitigation will rainwater harvesting offer in dry weather - will this offer the reductions in weather conditions in which the groundwater is used. it is worth noting a reduction needs to be made for this to be precautionary..."

Stakeholder	Comment
CBC	On the number of residential properties to be retrofit: "Possibly for Part C(?) but is this where we would rely on the council-owned stock for retrofit? Are there 21,600 council owned properties across Sussex North, or would this to an extent rely on the retrofit of private homes?"
SW	Occupancy should be considered when setting up an offsetting programme, i.e., the contribution from a four-bed house should be greater than a one bed flat
CBC	"Do we need a paragraph to justify us applying a borough wide policy approach in the local plan? The mitigation measures would of course be justified in much of Crawley which is supplied by SW, but with areas supplied by SES and also SE Water, is there justification for applying the policy approach in this area outside of SW supply? (my feeling is that it would be justified as the entire south east is subject to water stress, and it is important that the local plan applies a consistent approach across the borough)."

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