

Technical Note

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Introduction

Development of the Habitats Regulations Assessment (HRA) to support the Horsham Local Plan (2019-2036) is currently underway. As part of the HRA screening assessment, Natural England raised concerns about the Hardham groundwater abstraction (a key part of the Southern Water supply strategy for Horsham during certain conditions) and the effect they think it has on water levels/flows in the Arun Valley Special Area of Conservation (SAC) and Ramsar site. As such, they have advised Horsham District Council that they should implement the requirement to target water neutrality in order for sufficient water to be available to the district.

A water neutrality assessment has been undertaken to identify the requirements and supporting measures that would need to be implemented in order to achieve different levels of water efficiency working towards neutrality. This technical note provides an overview of the methodology and results of the water neutrality assessment.

Water Resource Planning

Water companies undertake medium to long term planning of water resources in order to demonstrate that there is a long-term plan for delivering sustainable water supply within its operational area to meet existing and future demand. This is reported via a statutory Water Resource Management Plan (WRMP) produced every five years to coincide with each of the water companies' five-yearly asset management (or business) plans.

WRMPs set out how demand for water from growth within a water company's supply area can be met, taking into account the need for the environment to be protected. During development of WRMPs, water companies liaise with the Local Planning Authorities in their supply area to understand and account for growth planned within the Local Plans. As part of the statutory process, WRMPs must be approved by both the Environment Agency and Natural England (as well as other regulators) and hence the outcomes of the plans can be used directly to inform whether growth levels being assessed within a WCS can be supplied with a sustainable source of water supply.

Water companies manage available water resources within key zones, called Water Resource Zones (WRZ). These zones share the same raw resources for supply and are interconnected by supply pipes, treatment works and pumping stations. As such the customers within these zones share the same available 'surplus of supply' of water when there is more available water than demand; but also share the same risk of supply when demand for water is greater than the available supply (i.e. deficit of supply). Water companies undertake resource modelling to calculate if there is likely to be a surplus of available water or a deficit in each WRZ by the end of their WRMP plan period, once additional demand from growth and other factors such as climate change are taken into account.

Planned Water Availability

Horsham District lies within the North Sussex WRZ, which is within the Central sub-regional Southern Water supply area. It is identified within the Southern Water WRMP (2019) that water supply within the North Sussex WRZ is supplied from a number of sources, including:

- 35% groundwater;
- 51% river;
- 8% reservoir; and

- 6% inter-company transfer.

Southern Water’s assessment of available water in their baseline predictions (without any measures) identifies that the Central area, which includes the North Sussex WRZ, does not have sufficient water for the whole of the planning period (to 2030) to meet its customers’ need.

Southern Water has therefore identified a number of schemes that will benefit the WRZ. This strategy ensures that Southern Water maintains a headroom surplus throughout the planning period. The key measures identified within the Southern Water WRMP for the central area, which includes the North Sussex WRZ, are outlined in Table 1 below.

Table 1: Southern Water WRMP Preferred Schemes for the Central area which includes the North Sussex WRZ

Period	Preferred Schemes
2020 - 2025 (all WRZs in the Central area)	<p>Demand management</p> <ul style="list-style-type: none"> • Target 100 water efficiency activity¹ • Leakage reduction (15% reduction by 2025; 50% by 2050) • Extension of Universal Metering Programme Period <p>Resource development</p> <ul style="list-style-type: none"> • Catchment management and infrastructure solutions to address rising nitrates and increase resilience at the Long Furlong B source, and for pesticides at the River Arun, Weir Wood reservoir, and Pulborough surface water sources • Improve the existing infrastructure to bring the West Chiltington source back into service • Apply for a licence variation at the Pulborough groundwater source • Apply for Drought Permits or Orders in severe or extreme droughts for the Pulborough surface and groundwater sources, Weir Wood reservoir, East Worthing and North Arundel sources
2025-2030 (all WRZs in the Central area)	<p>Demand management</p> <ul style="list-style-type: none"> • Target 100 water efficiency activity • Leakage reduction (15% reduction by 2025; 50% by 2050) <p>Resource development</p> <ul style="list-style-type: none"> • Improve treatment and/or rehabilitate a borehole at Petersfield • Implement catchment management and infrastructure solutions against nitrates at the North Falmer A and B sources • Apply for a Drought Permit / Order in extreme droughts for the East Worthing source
2027 (all WRZs in the Central area)	<p>Resource development</p> <ul style="list-style-type: none"> • Indirect potable water reuse scheme from Littlehampton Wastewater Treatments Works • Aquifer storage and recovery scheme north of Worthing • A potential desalination plant at Shoreham • Improvements to the existing mains between Shoreham and Brighton • Apply for a Drought Permit / Order for the East Worthing and Pulborough surface water sources in an extreme drought event.

The key factor driving the strategy for the Central area is the potential for significant, but as yet unconfirmed sustainability reductions (licence changes). These sustainability reductions will be confirmed by the Environment Agency following the conclusion of the investigations the company is proposing to undertake early in the AMP7 period (by 2022-23). If licence changes are confirmed, then significant new infrastructure will be required to provide new water resources to offset the water that is effectively “lost”.

In order to ensure water efficiency in the future, Southern Water have included proposals for leakage reduction and demand management measures for the Central area, along with the development of a shared new non direct potable water reuse resource with South East Water, together with up to two desalination plants, a storage reservoir, and other measures. It is hoped that by reducing the long-term

¹ This is an initiative to target a usage of 100 litres per person per day in properties within the Southern Water supply area

demand for water, the supply of water can be controlled to aid in ensuring that water is available in the future.

Recent correspondence from Natural England to Southern Water in December 2019 identified that an adverse effect on the integrity of the Arun Valley SAC, SPA and Ramsar features could not be excluded with certainty following an evidence review of the Hardham groundwater abstraction². Natural England state that *'this abstraction supplies Horsham and has clear implications for plans and projects in this area. The Environment Agency and Natural England are working with Southern Water to try to identify a long term more sustainable water supply. In the meantime, whilst the adverse effect remains or is uncertain, development in Horsham must be certain not to add to this adverse effect. We therefore advise that water quantity is screened in for appropriate assessment in the HRA. We advise that your authority consults studies such as the Gatwick Sub Regional water cycle study regarding this issue. For example the study cites the requirement to demonstrate water neutrality in order for sufficient water to be available to the district'*.

Water Neutrality

Water neutrality is a concept whereby the total demand for potable mains water supply within a planning area after development has taken place is the same (or less) than it was before development took place. If this can be achieved, the overall balance for water demand is 'neutral', and there is considered to be no net increase in demand as a result of development. In order to achieve this, new development needs to be subject to planning policy which aims to ensure that where possible, houses and businesses are built to high standards of water efficiency through the use of water efficient fixtures and fittings, and in some cases rainwater harvesting and greywater recycling.

It is theoretically possible that neutrality can be achieved within a new development area, through the complete management of the water cycle within that development area. In addition to water demand being limited to a minimum, it requires:

- all wastewater to be treated and re-used for potable consumption rather than discharged to the environment;
- maximisation of rainwater harvesting (in some cases complete capture of rainfall falling within the development) for use in the home; and
- abstraction of local groundwater or river flow storage for treatment and potable supply.

Achieving 'total' water neutrality within a development remains an aspirational concept due to the requirement for specific catchment conditions to supply raw water for treatment and significant capital expenditure. It also requires specialist operational input to maintain the systems such as blackwater re-use on a community scale.

For the majority of new development, in order for the water neutrality concept to work, the additional demand created by new development needs to be offset in part by reducing the demand from existing population and employment. Therefore, a 'planning area' needs to be considered where measures are taken to reduce existing or current water demand from the current housing and employment stock. The planning area in this case is considered to be the Horsham District Council administrative area as a whole.

Methodology

Metering Assumptions

Installing water meters within existing residential properties is an important element of the Southern Water WRMP to manage their customers' demand for water. The existing level of metering within the North Sussex WRZ is already high at 88% which limits the potential for further metering to contribute to neutrality. Southern Water's future target for meter penetration on domestic water supplies is 92% by 2025.

² Correspondence in relation to the Horsham Local plan Regulation 18 Consultation and Habitats Regulations Screening Assessment (Natural England, 30 March 2020, Ref: 308448).

Demand in new homes

Likely increases in demand in the study area have been calculated using three different water demand projections based on different rates of water use for new homes that could be implemented through proposed and potential future policy.

The projections were derived as follows:

- Average metered consumption – New homes in the district would use 133.24 l/h/d;
- Local plan requirements – New homes would conform to (and not use more than) the proposed Local Plan requirement where “*New residential development to limit water use to achieve a water efficiency of 100 litres/person/day, all strategic development is to achieve 80 litres/person/day; and all to incorporate measures which promote the conservation of water and / or grey water recycling*”;
- Best case re-use – New homes would include both greywater recycling and rainwater harvesting reducing water use to a minimum of 62 l/h/d.

Using these projections, the increase in demand for water has been calculated for the proposed housing growth of 20,757 homes over the plan period (2020 – 2036) and a target of 111,700m² of employment space. For the housing growth it was assumed that 8,425 homes would be delivered on sites identified as strategic development with the remainder to be delivered on non-strategic development sites. The projections are shown in Figure 1.

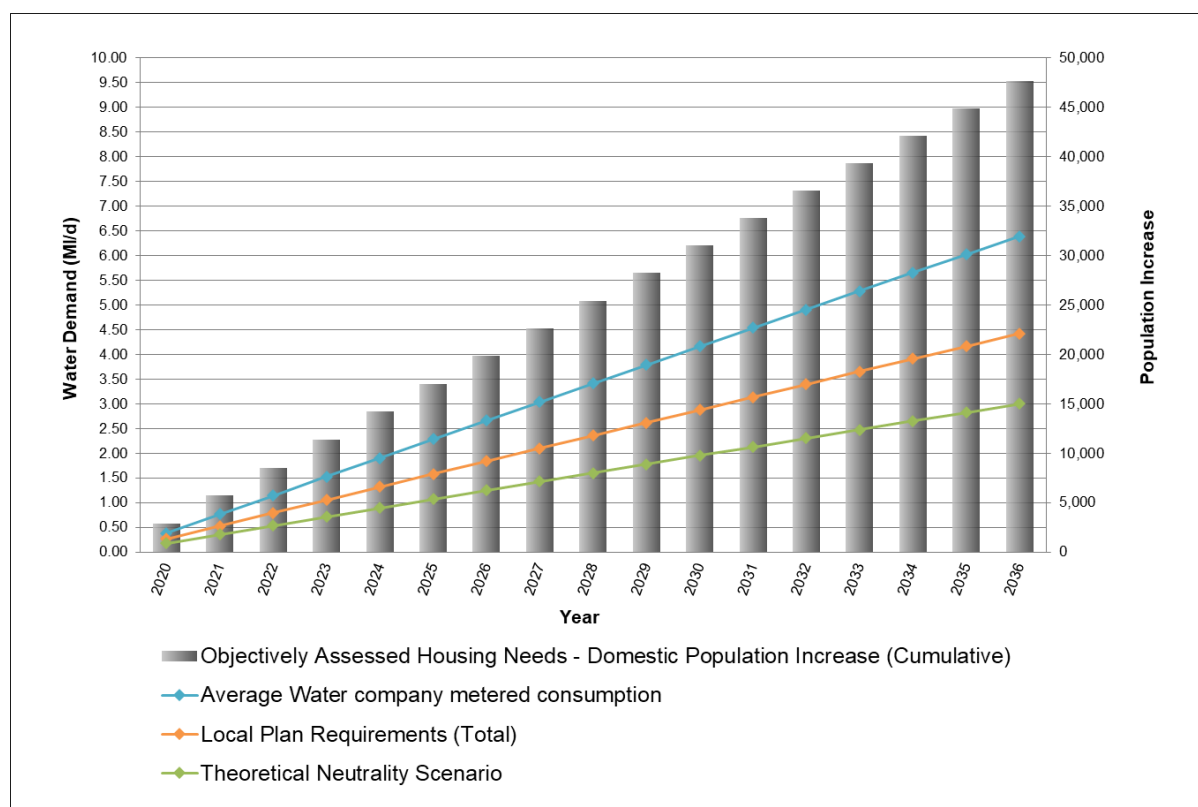


Figure 1: Range of water demands across the plan period in the study area depending on efficiency levels of new homes

Water Neutrality Scenarios

In order to reduce water consumption and manage demand for the limited water resources within the study area, a number of measures and devices are available³. Generally, these measures fall into two categories due to cost and space constraints, as those that should be installed in new developments and those which could be retrofitted. Waterwise in conjunction with the Environment Agency, DEFRA,

³ Water Efficiency in the South East of England, Environment Agency, April 2007.

OFWAT and the Department of Communities and Local Government published a best practice guide to water efficiency and retrofitting in 2009. This guide provides case studies and advice on how water companies, local authorities and housing providers can manage retrofitting strategies under different scenarios⁴. These have been used to develop a number of 'scenarios' which have been used to demonstrate the different levels of water neutrality that could be achieved with the implementation of different measures.

1. *High Scenario (Theoretical neutrality)*

This scenario has been developed as a context to demonstrate what is required to achieve the full aspiration of water neutrality. In reality, achieving 100% meter penetration across the study area is unlikely, due to a proportion of existing properties which either have complicated plumbing or whose water is supplied by bulk (i.e. flats), making it difficult for meter installation.

The key assumptions for this scenario are that water neutrality is achieved; however, it is considered as aspirational only as it is unlikely to be feasible based on:

- Existing research into financial viability of such high levels of water efficiency measures in new homes; and
- Uptake of retrofitting water efficiency measures required (65.5%) is considered to exceed the maximum achievable in the study area.

It would require:

- Meter installation into all existing residential properties (100% meter penetration);
- A significant funding pool and a specific joint partnership 'delivery plan' to deliver the extremely high percentage of retrofitting measures required;
- Strong local policy within the Local Plan on restriction of water use in new homes which is currently unprecedented in the UK; and
- All new development to include water recycling facilities across the study area which is currently limited to small scale development in the UK.

2. *Medium Scenario*

The key assumptions for this scenario are that the water neutrality percentage achieved is at least 50% of the total neutrality target and would require funding and partnership working, and adoption of draft local policy.

It would require:

- a. Meter installation as per Southern Water's WRMP by 2025 (92% meter penetration within their supply area);
- b. Uptake of retrofitting water efficiency measures to be considerably high (50%) in the study area; and
- c. A significant funding pool and a specific joint partnership 'delivery plan' to deliver the high percentage of retrofitting measures required.

3. *Low Scenario*

The key assumptions for this scenario are that the water neutrality percentage achieved is low but would require small scale level of funding and partnership working, and adoption of draft local policy.

It would require:

⁴ Water Efficiency Retrofitting: A Best Practice Guide. Waterwise 2009. Available at: <http://www.waterwise.org.uk/resources.php/30/water-efficiency-retrofitting-a-best-practice-guide>

- a. Meter installation as per Southern Water’s WRMP by 2025 (92% meter penetration within their supply area);
- b. Uptake of retrofitting water efficiency measures to be fairly high (20%); and
- c. A relatively small funding pool and a partnership working not moving too far beyond ‘business as usual’ for stakeholders.

It is considered that it is technically and politically straightforward to obtain this level with a funded joint partnership approach and with new developers contributing water efficient homes with a relative low capital expenditure.

Results

To achieve total water neutrality, the demand post growth must be the same as, or less than existing demand. Based on estimates of population size, current demand in the Borough was calculated to be 19.35 MI/d.

For each neutrality scenario, total demand was calculated at three separate stages for housing as follows:

- Stage 1 – total demand post growth without any assumed water efficiency retrofitting of existing housing stock for the differing levels of water efficiency in new homes;
- Stage 2 – total demand post growth with effect of metering applied to the existing housing stock for the differing levels of water efficiency in new homes; and,
- Stage 3 – total demand post growth (additional household and non-household use) with metering and water efficient retrofitting applied to existing homes for the differing levels of water efficiency in new homes.

The results are provided in Table 2 below. If neutrality is achieved, the result is displayed as **green**, otherwise the result is displayed as **red**. The percentage of total neutrality achieved per scenario is also provided.

Table 2: Results of the Water Neutrality Scenario Assessment

Neutrality Scenario	New Homes demand projections	New homes consumption rate (l/h/d)	% of existing properties to be retrofitted	Demand from Growth (MI/d)	Total demand post growth* (MI/d)	Total demand after metering (MI/d)	Total demand after metering & retrofitting (MI/d)	% Neutrality Achieved
Baseline	Baseline Projection: Average Southern Water metered consumption	133	0	6.39	25.75	25.66	25.66	0%
	Local Plan requirements		0	4.42	23.77	23.69	23.69	32%
		80 - Strategic development						
Low	Local Plan requirements + 20% retrofit		20	4.42	23.77	23.69	22.86	45%
		100 – Non-strategic development						
Medium	Local Plan requirements + 50% retrofit		50	4.42	23.77	23.69	21.61	65%
High	Theoretical neutrality + 65.5% retrofit	62	65.5	3.00	22.35	22.10	19.37	100%

* prior to demand management for existing housing stock

The results show that total neutrality is only achieved by applying the High Scenario, requiring new homes to use water at a rate of 62 l/h/d with retrofitting a minimum of 65.5% of the existing housing stock with water efficiency fittings equivalent to the Southern Water 'Target 100' standard. The Medium Scenario would give a minimum of 65% neutrality which would require new homes to be designed to use water at a rate of 80 l/h/d for strategic development or 100 l/h/d for non-strategic development (as required by the proposed Local Plan policy) and retrofitting 50% of the existing housing stock with water efficiency fittings equivalent to the Southern Water 'Target 100' standard, which would be difficult to achieve. In the situation where only new homes are designed to use water at a rate required by the proposed Local Plan policy, i.e. without any retrofitting of the existing housing stock with water efficiency fittings, a water neutrality of 32% could be achieved.

Delivery Requirements

To achieve any level of neutrality, a series of policies, partnership approaches and funding sources would need to be developed. For example, the Low Scenario is considered to require a funding pool and a specific joint partnership 'delivery plan' to deliver the required percentage of retrofitting measures, as well as the implementation of the draft Local Plan policy restriction of water use in new homes. It would require:

- New housing development to adhere to the requirements of the proposed Horsham Local Plan Policy 38, being designed to limit water use to 80 l/h/d on strategic development sites or 100 l/h/d on non-strategic development sites (more stringent than the optional Building Regulations requirements);
- Uptake of retrofitting water efficiency measures to be relatively high (20%) in the District; and
- A considerable funding pool and a specific joint partnership 'delivery plan' to deliver the relatively high percentage of retrofitting measures required.

Policy

Horsham District Council is already proposing a requirement in the Local Plan (2019 – 2036) (Policy 38) that new homes delivered on strategic developments incorporate water efficiency measures and/or water recycling in order to limit water use to 80 l/h/d or 100 l/h/d on non-strategic developments; therefore, this policy element of the delivery requirements is already in place. It is recommended that the Council consider ways to support developer implementation of this policy via information sources on their website. Measures can include (but not necessarily limited to) garden water butts, low flush toilets, low volume baths, aerated taps, water efficient appliances and water recycling (greywater and/or rainwater).

Partnership Approaches

Housing association partners should be targeted with a programme of retrofitting water efficient devices, to showcase the policy and promote the benefits. This should be a collaborative scheme between Horsham District Council, Southern Water and Waterwise. In addition, rainwater harvesting and/or greywater recycling schemes could be implemented into larger council owned and maintained buildings, such as schools or community centres. Rainwater harvesting could be introduced to public toilets.

The retrofitting scheme should then be extended to non-Council owned properties, via the promotion and education programme.

A programme of water audits should be carried out in existing domestic and non-domestic buildings, again showcased by council owned properties, to establish water usage and to make recommendations for improving water efficiency measures. The water audits should be followed up by retrofitting water efficient measures in these buildings, as discussed above. In private non-domestic buildings water audits and retrofitting should be funded by the asset owner, the cost of this could be offset by the financial savings resulting from the implementation of water efficient measures.

In order to ensure the uptake of retrofitting water efficient devices for non-council properties, the council should implement an awareness and education campaign, which could include the following:

- working with Southern Water to help with its water efficiency initiative ('Target 100'), which has seen leaflets distributed directly to customers and at events across the region each year;

- a media campaign, with adverts/articles in local papers and features on a local news programme;
- a media campaign could be supplemented by promotional material, ranging from those that directly affect water use e.g. free cistern displacement devices, to products which will raise awareness e.g. fridge magnets with a water saving message;
- encouraging developers to provide new residents with ‘welcome packs’, explaining the importance of water efficiency and the steps that they can take to reduce water use;
- working with retailers to promote water efficient products;
- carrying out educational visits to schools and colleges, to raise awareness of water efficiency amongst children and young adults;
- working with neighbourhood trusts, community groups and local interest groups to raise awareness of water efficiency; and,
- carrying out home visits to householders to explain the benefits of saving water, this may not be possible for the general population of the Borough, but rather should be used to support a targeted scheme aimed at a specific residential group.

Relationships

The recommendations above are targeted at Horsham District Council and Southern Water as these are the major stakeholders, although the Environment Agency and other statutory consultees can also influence future development to ensure the water neutrality target is achieved. It is therefore suggested that responsibility for implementing water efficiency policies be shared as detailed in Table 3.

Table 3: Responsibility for implementing water efficiency

Responsibility	Responsible stakeholder
Ensure planning applications are compliant with Local Plan Policy 38	Horsham District Council
Fitting water efficient devices in accordance with policy	Developers
Provide guidance and if necessary, enforce the installation of water efficient devices through the planning application process	Horsham District Council
Ensure continuing increases in the level of water meter penetration	Southern Water
Continue with ‘Target 100’ campaign	Southern Water
Retrofit devices within council owned housing stock	Horsham District Council
Retrofit devices within privately owned housing stock (via section 106 agreements)	Developers
Promote water audits and set targets for the number of businesses that have water audits carried out. Allocate a specific individual or team to be responsible for promoting and undertaking water audits and ensuring the targets are met. The same team or individual could also act as a community liaison for households (council and privately owned) and businesses where water efficient devices are to be retrofitted, to ensure the occupants of the affected properties understand the need and mechanisms for water efficiency.	Horsham District Council
Educate and raise awareness of water efficiency	Horsham District Council and Southern Water

A major aim of the education and awareness programmes would be to change peoples’ attitude to water use and water saving and to make the general population understand that it is everybody’s responsibility to reduce water use. Studies have shown that the water efficiencies in existing housing stock achieved by behavioural changes, such as turning off the tap while brushing teeth or reducing shower time, can be as important as the installation of water efficient devices.

Conclusion

The assessment of water neutrality has been undertaken to demonstrate whether moving towards neutrality within the Horsham district is feasible and what the technological implications might be to get as close to neutrality as possible. The results have shown a range of theoretical scenarios which achieve differing levels of progress towards water neutrality but which all include significant challenges. In order to achieve 100% water neutrality within the district a significant funding pool and associated 'delivery plan' would be required, along with more stringent local policy requirements within the Local Plan which would require developers to incorporate reuse technologies within all new homes, regardless of the size of the development.