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Review of the position statement for Thornham

Final technical note for Havant Borough Council and Chichester District Council

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Table of contents

1 Introduction

Havant Borough Council (HBC) and Chichester District Council (CDC) are in the process of developing new local plans, which must be supported by wastewater treatment infrastructure, provided by Southern Water (SWS). Each Council must formulate and publish an Infrastructure Delivery Plan (IDP) which outlines the infrastructure requirements of the planned housing. These plans are dependent upon the information provided by SWS. This is predominantly with reference to the capacity of wastewater treatment works (WwTW) and their capacity to support new developments without flooding, causing environmental harm or water quality issues. Although SWS employ professionals to undertake technical reviews with reference to capacity and stormwater discharges, HBC and CDC deem it necessary to carry out an additional independent review to increase the public's confidence in conclusions arrived at through the planning process for future development within the Thornham WwTW catchment.

Ricardo has been commissioned to undertake a review of the position statement for Thornham which considers the available technical documentation to provide an assessment of the approach to wastewater treatment within the area. This report outlines the results of the assessment of the documentation provided to us.

As part of this technical note the following documents were reviewed:

- Amec Foster Wheeler's ***Chichester District Water Quality Assessment***[1] (August 2018);
- Wood's ***Integrated Water Management Study addendum*** on behalf of the Partnership for South Hampshire[2] (July 2020);
- CDC and HBC's ***Statement of Common Ground***[3] *(February 2021)*;
- CDC, Environment Agency (EA) and SWS's ***Thornham WwTW Position Statement***[4] **(***November 2021***);**
- CDC's ***Waste Water Treatment and Remaining Headroom***[5] (January 2023);
- CDC's ***Headroom Monitoring for Thornham WWTW***[6] (November 2023 update); and
- CDC, EA and SWS, ***Statement of Common Ground*** (November 2021).

1.1 Assumptions and limitations

Our assessment has been based on the following assumptions and limitations:

- Our review of the technical documents is a comparative assessment, with a focus on variations in methodologies and results.
- We have assumed that third parties have applied the methodologies and data sources as stated in each of the associated report listed above i.e. there has been no detailed analysis or cross checking to confirm integrity of the primary data in the reports.
- Where possible, as part of this review, we have checked and compared the calculations included in the environmental and headroom assessment reports by following the methodologies provided by each assessor. It is noted that in some instances, we have not replicated the calculations as we did not hold sufficient information and data to allow us to make a quantitative assessment.
- Our comments reflect the outcome of our comparisons of the different approaches stated in documents highlighted above as produced by third parties, therefore our outputs aim to provide

[1] Amec Foster Wheeler, Chichester District Council Water Quality Assessment. Doc ref. ID 39151rr014i8, August 2018.
[2] https://www.push.gov.uk/wp-content/uploads/2020/10/Wood-Technical-Note-July-2020.pdf
[3] CDC & HBC (2021). Statement of Common Ground, February 2021.
[4] CDC, SWS & EA, A Statement on managing new housing development in the Thornham WwTW catchment, November 2021
[5] CDC (2023) Waste Water Treatment and Remaining Headroom, January 2023 update
https://www.chichester.gov.uk/thelocalplanclimatechange (accessed on 15/09/2023)
[6] CDC (2023) Headroom Monitoring for Thornham WWTW, January 2023 update
https://www.chichester.gov.uk/thelocalplanclimatechange (accessed on 20/11/2023)

support to the decision-making process in conjunction with other sources of information (as laid out in the summary).
- This report does not address the issue of nutrients loading (e.g., nitrates) in the treated effluent and the resulting implications for Nutrient Neutrality. Nitrate loading associated with the housing growth in the Thornham catchment is briefly discussed in Section 2.3.
- We have not considered impacts of climate change in this note as it represents the current situation when written, impacts of climate change should be considered in future planning.

2 Review of technical documentations for Thornham WwTW

2.1 Overview of documents reviewed and key assessments

2.1.1 CDC Water Quality Assessment (Aug 18)

The CDC Water Quality Assessment report was prepared by Amec Foster Wheeler in 2018 to support the Council Local Plan outlining how sustainable growth will be achieved taking into account both population growth with associated housing needs, as well as increased transport, power and infrastructure growth. The Water Quality Assessment report describes the studies and modelling works undertaken to inform on the potential impact to receiving water bodies associated with increased discharge volumes from nine separate WwTWs within the Council area.

Our Key Assessment: a review of the methodology used for assessing the estimated remaining headroom at WwTW (dry weather flow (DWF) calculations) including research of other methods and evidence for alternatives that could provide a more robust output.

2.1.2 Integrated Water Management Study (IWMS) for the Partnership for South Hampshire (PfSH) – Technical Note update (Jul 20)

The potential impact and additional nutrient loading associated with projected housing developments in the Solent area were also assessed in the IWMS report prepared on behalf of the PfSH as detailed in the 2020 Addendum technical note.

Our Key Assessment: Primarily a review of the 2020 Technical Note Update given it includes the most up to date calculations for the report on DWF and nutrient loading and expands the study area to include Thornham WwTW which was not present in the 2018 IWMS report.

2.1.3 CDC and HBC Statement of Common Ground (Feb 21)

The Statement of Common Ground briefly outlines CDC and HBC's combined position and also mentions some uncertainties around the environmental impact and wastewater capacity assessments for Thornham WwTW undertaken up to February 2021, including the Water Quality Assessment, and the 2018 PfSH IWMS along with the IWMS 2020 Technical Note Update.

The main concerns raised by the CDC and HBC include the need for WwTW capacity upgrades by 2025, as well as the discrepancies in how the DWF and headroom are calculated using different water consumption rate (i.e., per dwelling or per person).

Note: This document forms part of the starting point for this technical note.

2.1.4 Joint Thornham WwTW Position Statement (Nov 21)

In November 2021 a joint position statement on managing new housing development in the Thornham WwTW catchment was signed by CDC, SWS and the EA. This joint position statement is built on existing policies and technical reports, including both the Water Quality Assessment report and the Statement of Common Ground both discussed above. It provides DWF headroom estimates (as of January 2021) along with calculation method and assumptions.

Note: This document forms part of the starting point for this technical note.

2.1.5 Wastewater treatment and remaining Headroom calculations as at 1st Jan 2023)

This document estimates headroom remaining above the Q80 DWF for the WwTW within the Chichester Local Plan Area, which includes Thornham WwTW, as of 1st January 2023. The remaining headroom is calculated by comparing current EA permits to average DWF Q80 data for the 5-year period 2018-22, using an average of 500l/d wastewater per household. This calculation does not take account of additional housing permissions but is based on actual flows, so will include flows from any housing already built. The DWF headroom is updated when SWS publish new DWF data each year and is published as part of the evidence base for the Chichester Local Plan. The document gives an explanation of the use of the Q80 for estimating headroom and notes that reaching the Q80 does not equate to a breach in permit.

Our Key Assessment: a review of the Jan 2023 WwTW and Headroom Calculations for assessing the estimated remaining DWF headroom at Thornham WwTW. Assessment of other methods and evidence to estimate the water usage rates against recent actual data from SWS and PW.

2.1.6 Headroom Monitoring for Thornham WwTW (Nov 2023)

The annual estimates of headroom remaining within the Q80 DWF are supplemented by monthly monitoring of extant planning permissions within the Thornham catchment, based on data from CDC and Hampshire County Council. The tables, which are published close to the start of each month, set out extant permissions in the catchment and indicate how much of the headroom identified in the annual headroom statements would still be available IF all developments with extant planning permission in the catchment were constructed. This information is relevant to implementation of the Thornham Position Statement which requires sufficient headroom to serve new development taking account of both the latest DWF based headroom information AND the needs of extant planning permissions yet to be completed, or alternatively that no net increase in flows to Thornham WWTW will result from the development.

Our Key Assessment: review of the ongoing DWF headroom monitoring considering the latest available planning permissions data.

2.1.7 Statement of Common Ground between Chichester District Council, Environment Agency and Southern Water – Waste Water Treatment in the Chichester Plan Area 24th November 2021

This statement sets out common ground between the parties about the issues relating to wastewater. Thornham WwTW is identified as environmentally constrained. The document summarises ways that capacity could potentially be freed up without requiring an increase in permits at environmentally constrained works – with more detail to come through Southern Water's 5 yearly business planning processes and the longer-term Drainage and Wastewater Management Plan. An updated statement is currently being finalised to support submission of the Chichester Local Plan.

2.2 Thornham WwTW headroom calculations

2.2.1 Environmental Permit

Thornham WwTW operates under a Permit issued by the EA and is subject to environmental permit constraints. **Table 2-1** provides a summary of permit constraints cited in the documents under review.

Table 2-1 Thornham WwTW environmental permit constraints[7]

DWF	Nitrate	Biochemical oxygen demand (BOD)
6,565 m^3/d	10.0 mg-N/l	64 mg/l

2.2.2 Current DWF

The DWF represents the average daily flow to a WwTW during a period with no rainfall. It is a good measure of effluent coming from residential and commercial properties, as it contains the greatest concentration of organic matter and pollutants that require treating before returning to the environment. It is noted that the overall flow may vary between seasons as a result of changing sewer infiltrations rates and population numbers. Furthermore, it is also one of the thresholds for treated effluent from a WwTW set by the EA to avoid potential adverse impacts on the environment.

Estimating the DWF headroom for a WwTW is the industry standard method typically used to provide evidence for Local Plans that there is sufficient wastewater treatment capacity for a given catchment population growth. For an established WwTW, understanding the current DWF is a key consideration to understanding the available headroom. A comparison of DWF values stated in the reports reviewed are presented in **Table 2-2**. It should be noted that this only reviews the DWFs where assumptions and methodological approach behind the estimate are clear. It also noted that two Monitoring Certification Scheme (MCERTS) standards are used to check the validity of the total daily volume (TDV) of treated effluent data that forms the basis of the DWF provided by SWS. Further information on these standards and wider quality assurance procedures are included in the Monitoring discharges to water technical guidance[8]. Ricardo has not replicated the calculations used by the Water Utilities as this is outside of the scope of this report.

Table 2-2 Comparison of current DWF values

Document *note 1*	Data Source *note 1*	Year / methodology *note 2*	Current average Q^{80} DWF *note 2*	Indication of remaining headroom *note 3*
CDC Waste Water Treatment and Remaining Headroom (Jan 23)	SWS	2018 - 2022 5-year average 20%ile recorded flow (Q80)	5852 m^3/d	713 m^3/d
CDC, SWS & EA's Thornham WwTW Position Statement (Nov 2021)	SWS	2016 - 2020 5-year average 20%ile recorded flow (Q80)	6090 m^3/d	475 m^3/d
CDC Water Quality Assessment (Aug 2018)	SWS	2011 - 2017 7-year average 20%ile recorded flow (Q80)	6174 m^3/d	391 m^3/d
		2013 - 2015 3-year average 20%ile recorded flow (Q80)	6197 m^3/d	368 m^3/d

note 1: *All reports were undertaken by CDC or jointly with CDC and use 20%ile DWF provided by SWS.*

note 2: *All DWFs are calculated using the same methodology in line with EA Guidance[9] i.e. using the nonparametric 80% exceeded flow (Q80) methodology for current DWF where recorded daily values exist.*

[7] CDC (2023) Waste Water Treatment and Remaining Headroom, January 2023 update https://www.chichester.gov.uk/thelocalplanclimatechange (accessed on 15/09/2023)
[8] Monitoring discharges to water: guidance on selecting a monitoring approach - GOV.UK (www.gov.uk), accessed November 2023.
[9] **Error! Hyperlink reference not valid.**

note 3: *The indicated headroom in the table above is derived from the difference between current average Q80 DWF and the current EA DWF permit value (i.e. the indicative average remaining DWF headroom within the Q80). There can be large fluctuations in the measured DWF from year to year. The highest indicative headroom is 713 m^3/d and is based on an average DWF from 5 years of data using the most **recent** data (other calculations use shorter periods and / or older data). Therefore, this highest indicative headroom of 713 m^3/d could be expected to be more representative than those using older data or shorter periods. It is noted that the difference between estimated remaining headroom, as presented in **Table 2-2**, are largely due to the difference in the Q_{80} flow values used in each report. The Q_{80} flows can be observed steadily decreasing between the older datasets and the latest available data, and this decrease is consistent with demand management, measures such as the ongoing "Target 100 initiative". This may have offset impacts on treated effluent flows resulting from additional development over the same time period.*

2.2.3 Calculation Methods

The average wastewater of 500l per household per day is used to estimate remaining capacity on the advice of the EA[10] and in line with SWS's guidance[11] on calculating DWF Headroom for Local Plans. This water usage rate is based on an assumption of 150l/d per person with an average 2.4 household occupancy and an allowance for a 40% infiltration rate. This method for calculating DWF Headroom applies a flat water consumption rate per dwelling rather than a per-capita consumption and occupancy rates noting that the loadings for Sewage Treatment Systems recommended in the British Water code of practice for domestic dwellings is 150 litres per person per day (also referenced in the Water Quality Assessment report)[12].

This is higher than SWS's estimated average use per day based on charges for the year April 2022 to March 2023 (see **Table 2-4**)[13] and is considered to be a more precautionary assumption. It should be noted that the average number of people per household in the UK was 2.36 in 2022[14] and that both SWS and Portsmouth Water have a "Target 100 initiative" which aims to reduce per capita consumption to 100 l/person/d (company- wide average) by 2040.

Table 2-3 below presents remaining headroom in units of number of households (the estimated remaining dwelling capacity) of Thornham WwTW from the various documents reviewed.

Table 2-3 Estimated remaining dwelling capacity of Thornham WwTW

Document	Estimated remaining dwelling capacity	Methodology	Year
CDC Waste Water Treatment and Remaining Headroom (Jan 23)	1426	Based on 713 m^3/d (see Table 2-2) and 500 l/d per dwelling	As @ 01/2023
CDC, SWS & EA's Thornham WwTW Position Statement (Nov 2021)	950	Based on 475 m^3/d (see Table 2-2) and 500 l/d per dwelling	As @ 1 Jan 2021
CDC Water Quality Assessment (Aug 2018)	1063	Specifics not provided in report	As @ 31 Dec 2017

[10] CDC (2023) Waste Water Treatment and Remaining Headroom, January 2023
[11] SWS (2013). Estimation of dry weather flow Headroom at Wastewater Treatment Works for Local Planning Authorities
[12] British Water (2015). Flows and Loads – 4 Sizing Criteria, Treatment Capacity for Sewage Treatment Systems, British Water. BW COP:18.11/14
[13] SWS website accessed October 2023 https://www.southernwater.co.uk/account/average-water-use-and-cost
[14] Office for National Statistics (ONS) Families and households in the UK: 2022 Section 3 (accessed October 2023) https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2022

Table 2-4 SWS's estimated average water use per day based on charges for the year April 2022 to March 2023[15]

Number of people in property	*1*	*2*	*3*	*4*	*5*	*6*
Estimated use (litres per property per day)	*178*	*274*	*370*	*438*	*493*	*548*
Estimated use (litres per person per day)	*178*	*137*	*123*	*110*	*99*	*91*

2.2.4 Future growth projections

As part of our review, Ricardo focused on the approach and calculations undertaken for the predicted household growth and the headroom calculations assessment. **Table 2-5** presents the housing projections for the Thornham WwTW catchment provided in the reports along with the estimate of the associated DWF increase and assumptions. It is noted that some of the housing projection figures included in **Table 2-5** are now outdated and are only included to fully outline the results of the previous DWF headroom estimates.

Table 2-5 Housing projections for Thornham WwTW catchment

Document	Source	Housing projections *note 1*	Associated DWF increase *note 2*	Methodological assumptions
CDC & HBC Housing Projections to 2039	HBC Email confirmation[16]	2360 (1638 CDC; 722 HBC)	1181 m^3/d	DWF estimated using 500 l/d per household
CDC, SWS & EA's Thornham WwTW Position Statement	CDC, HBC and SWS (2021)	1085 2185 with Southleigh	543 m^3/d 1093 m^3/d (with Southleigh	DWF estimated using 500 l/d per household
Wood's Integrated Water Management Study Technical Note	LPAs in the PfSH area projections of housing growth for 2018-2036	2715	717 m^3/d	DWF estimated using 110 l/person/day and occupancy per household of 2.4 ***note 3***
CDC Water Quality Assessment	CDC projections of household increases to 2036[17] (2017)	1000 - 1500	880 m^3/d	Full assumptions behind DWF estimate are not apparent.

note 1: *The housing projections range from 1085 to 2715 and as of 1 April 2021, there were planning permissions for 575 of the 1085 projections given in the Joint Position Statement (2021).*

note 2: *The associated estimated DWF increase ranges from 543 m^3/d to 1181 m^3/d. The remaining indicative headroom based on the most recent recorded flow data was 713 m^3/d (see* **Table 2-3***). This suggests that most of the housing projections could not be accommodated within the existing headroom at Thornham WwTW although it is noted that, with the exception of the January 2023 data, all other housing projections are now no longer up to date. However, our review has also highlighted much variability in the methodology for calculating DWF which is dependent on occupancy rate and consumption assumptions. Using the latest housing projections of 2360 units, the national average 2.4 occupancy rate and the range of water usage rates above, it can be observed there is a significant variation in the overall DWF increase estimates. A 110 l/p/d (264 l/d per household) water usage rate results in a DWF increase of 680 m^3/d, while the more precautionary 500 l/d per household rate results*

[15] It is noted that these estimate average water use per day values are based on water supply charges for the SWS water, which does not include the Thornham catchment that falls within the Portsmouth Water area. However, they are considered appropriate to be used as proxies for the purpose of this report.
[16] Allgrove, M. (2024). Havant Borough Council, email received Wed 31/01/2024 16:40.
[17] These housing projections do not include potential housing growth within the HBC area.

in an increase of 1181 m³/d. The overall water usage rates used in the various assessments and the latest recent actuals, are further discussed in Section 2.2.4.1 below.

The Wood assumptions are in line with average occupancy rate the SWS's current and Target 100 initiative (see note under **Table 2-3***) but assumes no infiltration and not consistent with SWS's guidance on calculating DWF Headroom for Local Plans (CDC's Wastewater treatment and remaining Headroom calculations).*

***note 3:** Parameters in Wood's 2020 Addendum were updated including projected population growth, occupancy rate, water consumption and nitrogen loading (2.5 to 2.4 for occupancy, and 120 l/p/d to 110 l/p/d) to account for advice from Natural England, and the assumption of increased water efficiency in the newest developments. It is noted that as of 2017-2018 the average water consumption per capita was 129 l/p/d, although this includes older developments as well as unmetered properties.*

2.2.4.1 Water usage rates comparison and projected DWF growth

Comparing the three DWF headroom estimates listed in **Table 2-5** as presented in Section 2.2.2, it can be observed that each headroom value has been calculated using different water usage rates. These water usage values are all based on the guidance documents that were available at the time of writing (2017 to 2023), resulting in different assumptions being included in each of the headroom estimates. For example, in both the 2017 and 2020 reports the water usage rates are calculated as a function of household occupancy (average 2.4 and 2.5 people per home) and water consumption rate per person (110l/p/d and 120l/p/d, equivalent to 264l/d to 300l/d per household). However, the most recent DWF estimates[18] are based on the SWS[19] guidance for local plans, which suggests using a flat rate of 500l/d per household.

If we use the latest publicly available SWS average water usage rates per day presented in **Table 2-4**[20], it can be observed that for an average occupancy rate of 2.4 people per household, the resulting estimate water usage rate is 312.4l/d per dwelling or 130l/d per person with a 2.4 household occupancy (excluding infiltration). It should be noted that for the purpose of this study, the water usage values in **Table 2-4** are considered being equivalent to water discharged by the property (i.e., ignoring infiltration and water lost to gardening, car washing etc.). The SWS guidance for Baseline Risk and Vulnerability Assessment (BRAVA) for DWF Compliance[21] assumes that 92.5% of the total water supply is returned to as wastewater to the sewer system. If the estimate water usage above is corrected by 0.925 it would result a per capita consumption of 120.25l/d per person or 289l/d per dwelling. Communication from Portsmouth Water[22] indicates that for their draft Water Resources Management Plan (WRMP) 2024, the average occupancy rate was 2.42 (2022-23) people per property and the estimated water use was 152.5 l/p/d (or 369.5 l/d per property). This is slightly higher but still in line with the Southern Water data referenced in **Table 2-4** which may be used as a proxy. It is noted the recent actuals also include older and/or unmetered properties, and the likely usage rates for new development will be lower. The SWS draft WRMP[23] suggests an average occupancy rate of 2.33 people per household, however for the purpose of this report we have kept the national average rate as it's closer to the one used by Portsmouth Water.

In order to estimate the DWF growth, the water usage value above should be corrected to take into account sewer infiltration. The current government DWF guidance[24] suggests using an infiltration rate of 50%, which would increase the recent actual rate of 312l/d per household to 469l/d per household, or from 289 l/d per household to 433 l/d per household if using the 0.925 correction factor. Comparing

[18] CDC (2023) Waste Water Treatment and Remaining Headroom, January 2023 update https://www.chichester.gov.uk/thelocalplanclimatechange (accessed on 15/09/2023)
[19] SWS (2013). Estimation of dry weather flow Headroom at Wastewater Treatment Works for Local Planning Authorities
[20] As noted in Section 2.2.2 we are assuming these values can be used as proxies for the Thornham catchment.
[21] SWS (2021). Drainage and Wastewater Management Plans (DWMPs) Summary of the methodology for the Baseline Risk and Vulnerability Assessment (BRAVA) on: Wastewater Treatment Works Dry Weather Flow Compliance. March 2021.Southern Water Services.
[22] Allgrove, M. (2023). Havant Borough Council, email correspondence received Wed 20/12/2023 15:45
[23] SW (2022). Draft Water Resources Management Plan 2024. Accessed December 2023 (6177_dWRMP_Sections_1_3_v1.7.indd (southernwater.co.uk))
[24] Calculating dry weather flow (DWF) at waste water treatment works - GOV.UK (www.gov.uk)

the new value of 469/d per dwelling (or 433 l/d per dwelling) to the water usage rates used in the various headroom estimates, it can be observed that the values included in both the 2017 and 2020 reports fall short of it, and should be considered as the least precautionary values. Whereas the 500l/d per household rate (which also accounts for 40% infiltration) included in the current SWS DWF guidance is only slightly higher than the 469l/d per household capacity calculated above.

The predicted DWF growth based on the latest available housing projections of **2360 units** and a capacity of **469l/d per household**, is equal to **1106 m^3/d**, or **1023 m^3/d** if using the 0.925 correction. It should be noted however the value above is precautionary as it doesn't account for either the more efficient water usage in newly built properties, lower infiltration rates of newly built sewers or the for the Target 100 initiatives which may further reduce the daily water consumption. A revised DWF growth estimate is provided in the **Table 2-6** below.

Table 2-6 Revised housing projections for Thornham WwTW catchment

Document	Source	Housing projections	Associated DWF increase	Methodological assumptions
CDC & HBC Housing Projections to 2039	HBC email confirmation[25]	2360 (1638 CDC; 722 HBC)	1106 m^3/d (1023 m^3/d)	DWF estimated using 469 l/d per household (433 l/d per household)

Whilst it can be argued that 500l/d is a slightly more precautionary approach to calculating DWF headroom than the 469l/d it may also be less representative of future water usage rates throughout the Thornham WwTW catchment.

2.3 Nitrate Loading

Nitrate loading from housing growth associated with the Thornham WwTW catchment was assessed in two reports as show in **Table 2-7** below which provides a summary of the predicted increase in Total Oxidised Nitrogen (TON) loading from projected Thornham WwTW growth to 2036 provided in these two reports.

Table 2-7 Summary of predicted increase in Total Oxidised Nitrogen (TON) loading from projected growth to 2036

Document	Increase in TON (kg/yr, 2036)	Percentage increase in TON (2036)
Wood's Integrated Water Management Study addendum (2020)	2354.6 kg/yr	7.4%
CDC Water Quality Assessment (2018)	2007.5 kg/yr	8.3%

note: *The predicted increase in TON loadings and effluent TON concentrations are dependent on assumptions and methodologies associated with projected growth and DWFs which are highly variable (as discussed in previous sections). However, the CDC Water Quality Assessment (2018) stated that the current loading assessment for Thornham WwTW was 86 N kg/d which represents only 3% of the total nitrate loading reaching the receiving waters (EA data[26]). It also states that the EA evidence indicates the 8.3% increase is not a significant contributor (8.3% of 3%) of nitrate to the receiving watercourse (WFD waterbody of Chichester Harbour). It is noted these loading estimates are based on data included in the 2018 Water Quality Assessment report and as such might not be fully representative of the current conditions.*

2.4 Summary

Following our review of the technical reports and headroom estimates discussed in the sections above, we note that due to the various methodologies used in the headroom assessments, the net DWF increase and the remaining headroom vary between the reports that were reviewed as part of this study.

[25] Allgrove, M. (2024). Havant Borough Council, email received Wed 31/01/2024 16:40.
[26] Amec Foster Wheeler, Chichester District Council Water Quality Assessment. Doc ref. ID 39151rr014i8, August 2018.

These differences are dependent on underlying assumptions such as occupancy rate, water consumption and future development plans. It is be expected that use of more recent data and latest guidance on methods would be more representative. For example, the approach taken in the latest 2023 'Wastewater and remaining Headroom Calculations' is based on the most recent available average DWF data along with EA and SWS's current guidance on DWF headroom calculations and therefore, could be considered to best represent the current conditions at the Thornham WwTW compared to the older datasets and guidance. However, there can be large fluctuations in the measured DWF from year to year and therefore, as new DWF becomes available, the position can be continually reviewed. Furthermore, some concerns were raised during the review of the water consumption rates per-capita, including values included in the current guidance.

The comparison of the water consumption rates in each of the reports reviewed as part of this study has shown that the per-capita values used in the DWF headroom calculations are either significantly lower or higher than the actual water usage data from 2022/23. This is due to either including water efficiency assumptions in the overall assessment, or due to the existing guidance suggesting the use of a flat-rate value that is higher than observed water usage. Ultimately, the decision on whether using the most precautionary 500l/d per dwelling value will lie with the Councils. Our assessment however has highlighted that the existing DWF headroom assessment is utilising water consumption values that may not be fully representative of typical water use in the catchment or could be too low and not provide any level of buffer. Although more recent studies yield higher estimates of available DWF headroom it is uncertain whether this could accommodate growth to 2039 due to the variability in household projections, occupancy rate and consumption values.

As part of our assessment, we have derived a water usage rate value based on the publicly available rates from SWS (2022-2023) and the latest government guidance for estimating DWF. This results in an overall rate of 469l/d per household, and an estimate of DWF growth of 1106 m^3/d by 2039 (or 433 l/d per household and DWF growth of 1023 m^3/d by 2039 if the 0.925 correction is factored in). Whilst based on the latest available data, the values above are also precautionary as they do not take into account factors such as the ongoing SWS and PW Target 100 initiatives to reduce water consumptions or the fact that new constructions will have higher water use efficiency rates and sewerage design leading to lower infiltration rates. It is also noted that the increase in percentage of modern sewerage systems resultant from new developments will be evidenced in lower flows being received at the WWTW which will feed into future calculations. Given the above, Havant and Chichester Councils may consider using either capacity rates of 469/d or 433 l/d per household as they're likely to be the most representative of the latest catchment conditions and average water use, while still retaining a buffer to account for potential fluctuations. A summary of the various water usage rates and their associated risks and benefits are included in Table 2-8 below.

Table 2-8 Summary of risks and benefits of the various water usage rates

Key parameter	Data Source	Rate (l/d)	Risks	Benefits	Consider for use?
Water consumption rates	CDC Water Quality Assessment (2018)	120l/d per person (2.5 people per dwelling)	Below the recent actual usage rates.	Possibly in line with more water-efficient new properties and water use reduction measures.	No – does not allow for any buffer.
	IWMS Technical Note (2020)	110l/d per person (2.4 people per dwelling)	Below the recent actual usage rates.	Possibly in line with more water-efficient new properties and water use reduction measures.	No – does not allow for any buffer.
	Wastewater treatment and remaining Headroom calculations (2023)	500l/d per dwelling	Overestimating the water usage rates for new properties.	precautionary estimate – allowing for a significant buffer.	Yes - although possibly too precautionary

	Calculations based on SWS recent actuals	469l/d per dwelling*	Overestimating the water usage rates for new properties.	Based on the most recent water usage data from SWS.	Yes – but would require regular updates (i.e., recent actuals water usage values, effects of infiltration reduction plans etc.).
		433 l/d per dwelling**			

* Using 100% supply returned to sewer
**Using 92.5% supply returned to sewer

We also note that other relevant factors including those associated with development should also be considered such as:

- no surface water from new development will be discharged to the public foul or combined sewer system;
- applicants should demonstrate that techniques such as Sustainable Drainage Systems (SuDS) have been used to minimise the flow to the treatment works;
- applicants are encouraged to include water efficiency measures to achieve SWS's Target 100;
- development in this catchment also needs to be nutrient neutral in line with Natural England guidance.

Each new proposed development should be considered on a case-by-case basis considering location, property size and property type and updated with the most recent data and information e.g. DWF data and recent actual data. Guidance and Legislation may also change and should always be considered.

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