West Oxfordshire District Council

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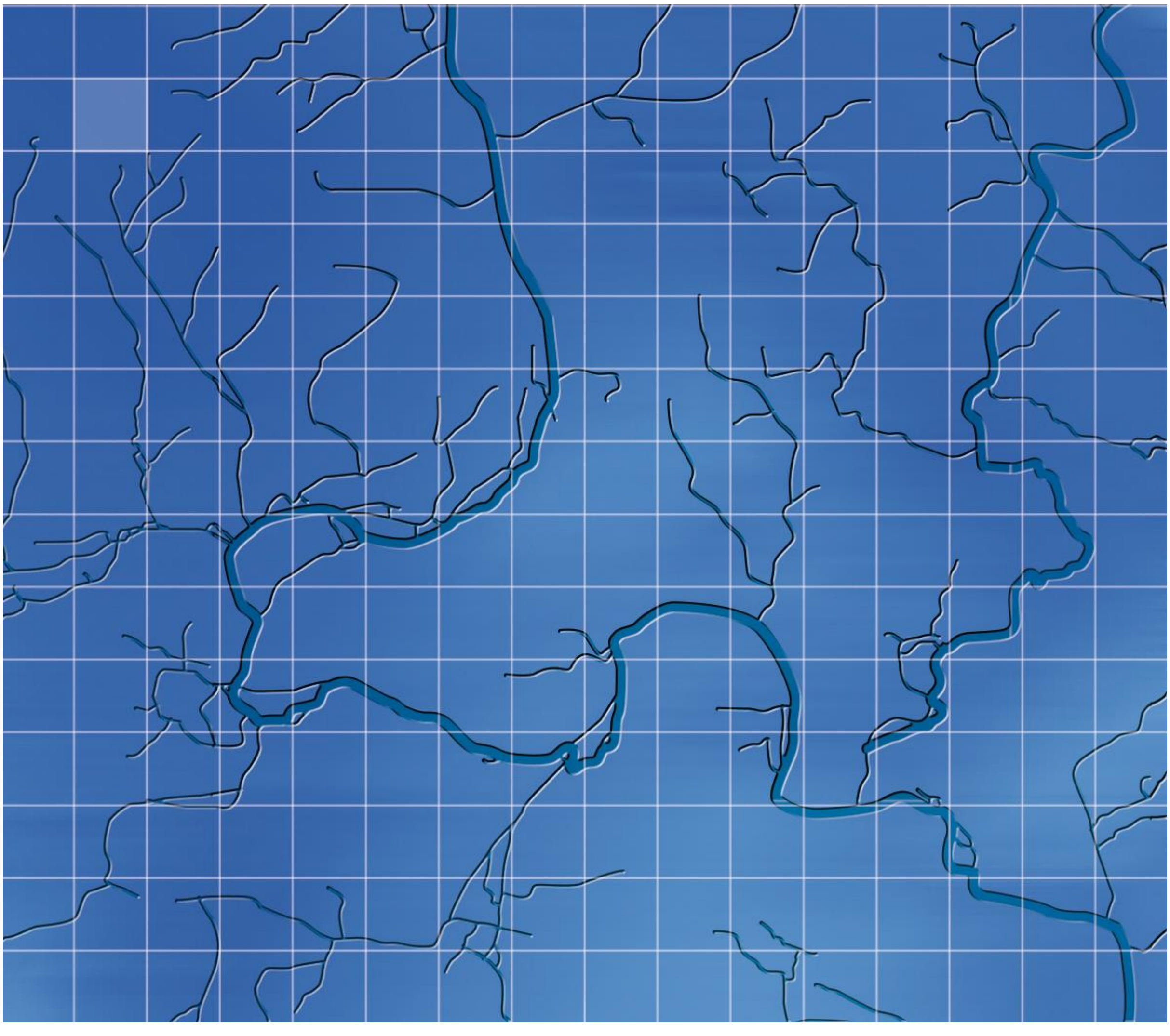
West Oxfordshire District Council Water Cycle Study Detailed Report



WHS

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For and on behalf of Wallingford HydroSolutions Ltd.

CERTIFIED ISO 9001 · ISO 14001 UKAS MANAGEMENT SYSTEMS 001

The WHS Quality & Environmental Management system is certified as meeting the requirements of ISO 9001:2015 and ISO 14001:2015 providing environmental consultancy (including monitoring and surveying), the development of hydrological software and associated training.

WHS

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Contents

Glossary

90th Percentile (90th%ile)	The 90th percentile is a value that's greater than 90% of the numbers in a set. It is a useful statistic for measuring performance data and identifying anomalies.
95th Percentile (95th%ile)	The 95th percentile is a value that's greater than 95% of the numbers in a set. It is a useful statistic for measuring performance data and identifying anomalies.
Abstraction licence	Authorisation granted by the Environment Agency to allow the removal of water from a source.
Ammonia	Ammonia is an inorganic chemical compound of nitrogen and hydrogen with the formula NH_3. It is used as a fertilizer, cleaning product and in the production of plastics. Sewage is also a source of ammonia.
Assessment Point (AP)	A significant point on a river, often where two major rivers join or at a gauging station.
Asset Management Period (AMP)	The AMP sets the framework for how water companies manage their assets, deliver services to customers, and invest in infrastructure over a five-year period. The AMP is regulated by Ofwat, the Water Services Regulation Authority in England and Wales. AMP 7 ran from 2020-2025, AMP8 runs from 2025-2030.
Biochemical Oxygen Demand (BOD)	BOD is a measure of how much oxygen is used to break down organic matter in water. It is an important indicator of water quality and organic pollution. A high BOD indicates that there is more organic pollution in the water. BOD is used to measure the level of organic pollution in wastewater before it's released to a watercourse.
Combined Sewer Overflows (CSOs)	Many parts of England have a combined sewage system with clean rainwater and wastewater conveyed in the same pipe. During heavy rainfall the capacity of these pipes can be exceeded, which means possible backing up of the system and inundation of Water Recycling Centres (WRCs) downstream. CSOs were developed as overflow valves to reduce the risk of sewage backing up during heavy rainfall. They are a necessary part of the sewer system but where they regularly spill it can indicate underlying issues with the sewer system's condition and capacity.
Compliance Assessment Report (CAR)	A written report compiled by Environment Agency officers when assessing compliance with an environmental permit. The CAR is used to record the findings of the EA's site inspections, audits and monitoring activities. It also includes reviews of monitoring and other data/reports.
Deployable Output (DO)	The reliable output of an active source, or group of sources, or of a bulk supply of water, which is constrained by: environment; licence, if applicable; pumping plant and/or well/aquifer properties; raw water mains and/or aquifers; transfer and/or output main; treatment; water quality.
Discharge Permit	An environmental permit granted by the Environment Agency to discharge liquid effluent or waste water to a surface water or the groundwater body.

District Metering Area (DMA)	A DMA is a discrete area of the water distribution network that can be isolated by closing valves so that the quantities of water entering and leaving the area can be metered. The volume of water into and out of the DMA is measured by a district meter. The purpose of a DMA is to divide each WRZ into manageable sections to detect and determine the location of burst mains, calculate the level of leakage in each DMA and compare DMAs so that activities can be targeted to where they will have the greatest impact in reducing leakage.
Drainage and Wastewater Plan (DWMP)	Strategic plans where wastewater companies take a company-wide approach to managing their wastewater and drainage assets. DWMPs look at current and future capacity, pressures, and risks to their networks such as climate change and population growth over a 25-year period.
Drought Permit	An authorisation granted by the Environment Agency under drought conditions, which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Dry Weather Flow (DWF)	DWF is the average daily flow to a WRC during a period without rain. The EA sets limits on the quality and quantity of treated effluent from a WRC so that the WRC do not cause an unacceptable impact on the environment. The flow that may be discharged in dry weather is one of these limits.
Dry Year Annual Average (DYAA)	The annual average value of water demand, deployable output or some other quantity over the course of a dry year.
Dry Year Critical Period (DYCP)	The water demand, deployable output or some other quantity during the time in a dry year when demand is greatest, often termed the peak week. Also commonly known as the summer peak period.
Environment Agency (EA)	The Environment Agency (EA) is a non-departmental public body, established in 1996 and sponsored by the UK government's Department for Environment, Food and Rural Affairs (DEFRA). Their responsibilities include water quality and resources, fisheries, inland river, estuary and harbour navigations, conservation and ecology, regulating major industry and waste, treatment of contaminated land and managing the risk of flooding from main rivers, reservoirs, estuaries and the sea.
Environmental Impact Assessment (EIA)	EIA is a tool used to assess the significant effects of a project or development proposal on the environment.
Flood Zone 1	Areas situated in Flood Zone 1 have a low probability of flooding, with less than a 0.1% probability of river or sea flooding.
Flood Zone 2	Areas situated in Flood Zone 2 have a medium probability of flooding and have an annual probability of river flooding between 1.0% and 0.1% or an annual probability of sea flooding between 0.5% and 0.1%.
Flood Zone 3a	Areas situated in Flood zone 3a have a high probability of flooding, with a 1% or greater annual probability of river flooding or a 0.5% or greater annual probability of sea flooding.
Flood Zone 3b	The functional floodplain. This is where water from rivers or the sea has to flow or be stored in times of flood. Local authorities should identify areas of functional floodplain in their Strategic Flood Risk Assessment.

Flow to Full Treatment (FFT)	A measure of how much wastewater a treatment works must be able to treat at any time. All WRCs are built to be able to deal with a certain amount of wastewater, calculated depending on the area they serve, and many have a requirement in their environmental permit about the FFT level they must work to.
Good Ecological Potential (GEP)	GEP is the ecological quality that can be achieved in the affected water bodies without a significant adverse impact on the benefits provided by the uses or a significant adverse impact on the wider environment.
Groundwater Infiltration	Groundwater infiltration occurs when groundwater finds its way into the underground water and sewerage system. Small leaks, openings, defective joints and cracks are the main causes for infiltration.
Habitat Regulations Assessment (HRA)	A HRA is a process that determines whether development plans could negatively impact local plans on a recognised protected European site.
Hands off flow (HoF)	A condition attached to an abstraction license which states that if flow (in the river) falls below the level specified on the license, the abstractor will be required to reduce or stop the abstraction.
Headroom	The difference between the measured DWF and the consented DWF is termed headroom.
Household (HH) Consumption	Water consumed by household customers.
Leakage	Water that leaks from water mains and customer supplies pipes.
Load Standstill	An improvement in the quality of effluent, so that extra pollution load will not result in a deterioration in the water quality of the watercourse.
Monte Carlo Simulation	A Monte Carlo simulation is a way to model the probability of different outcomes in a process that cannot easily be predicted due to the intervention of random variables. It involves repeatedly generating random input values within a defined probability distribution to model a complex system and analysing the range of possible outcomes.
Natural Flood Management (NFM)	NFM involves working with nature to reduce the risk of flooding for communities. It uses various techniques to restore or mimic the natural functions of rivers, floodplains and the wider catchment.
Non-Household (NHH) Consumption	Water consumed by businesses.
Olfactometry	Olfactometry is the process of measuring the concentration and intensity of odour. Olfactometry is often used for monitoring wastewater infrastructure, where controlling odorous emissions is important for environmental and health reasons.
Olfactometry	Olfactometry is the process of measuring the concentration and intensity of odour. Olfactometry is often used for monitoring wastewater infrastructure, where controlling odorous emissions is important for environmental and health reasons.
Orthophosphate	Orthophosphate is a phosphorus compound. It is commonly used for water treatment.
Price Review (PR)	The price determination process undertaken by Ofwat every five years. Each water and sewerage undertaker submits a business plan

	covering the five-year period for which Ofwat will determine cost and revenue allowances.
Sewage Pumping Stations (SPS)	SPS typically move sewage from lower to higher elevations. The stations pump raw sewage and wastewater into pipes transporting the waste to a WRC or other disposal site.
Sewage Treatment Works (STW)-	Sewage treatment works are plants designed to treat and clean sewage and wastewater before it is released into the environment. Treatment typically consists of three phases termed primary, secondary and tertiary water treatment.
Simulation of Catchments (SIMCAT)	SIMCAT is the EA's stochastic water quality river model. It is a crucial tool for setting and reviewing discharge permits at a catchment scale and to quantify the source apportionment of both point and diffuse pollutant load within the receiving watercourse. Driven by summary statistics of flow and quality, SIMCAT uses Monte Carlo simulation to predict in-river summary statistics for direct comparison with environmental quality standards.
Site of Specific Scientific Interest (SSSI)	A SSSI is a formal conservation designation. Usually, it describes an area that's of particular interest to science due to the rare species of fauna or flora it contains (Biological SSSI) - or important geological or physiological features that may lie in its boundaries (Geological SSSI).
Smarter Business Visit (SBV)	A location-based business programme that helps customers to fit water-saving devices, identify and potentially fix leaking toilets and fit free urinal controls if practical.
Source Protection Zones (SPZs)	SPZs are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.
Special Area of Conservation (SAC)	A site designated as being of special conservation value under the European Habitats Directive. It protects one or more special habitats and/or species – terrestrial or marine.
Storm Overflow Assessment Framework (SOAF)	The SOAF written by the Environment Agency sets out how sewer systems comply with current statutory requirements. The framework shows that any overflow reported to exceed the spill frequency thresholds set out in this document should be investigated.
Strategic Overview of Long-term Assets and Resources (SOLAR)-	SOLAR is what Thames Water use to feed into their strategic upgrades plan, rather than waiting on approval of a site prior to undertaking modelling to understand what upgrades may be required.
Sustainable Drainage Systems (SuDS)	SuDS mimic nature and typically manage rainfall close to where it falls. SuDS can be designed to transport (convey) surface water and slow runoff down (attenuate) before it enters watercourses. They provide areas to store water in natural contours and can be used to allow water to soak (infiltrate) into the ground or evaporated from surface water and lost or transpired from vegetation (known as evapotranspiration).
Technically Achievable Limits (TALs)	Technically Achievable Limits (TALs) define the lowest numeric concentration of a given pollutant that conventional wastewater treatment technologies can reliably achieve. In the UK, TALs are central to environmental permits and nutrient neutrality regulations.

Total Phosphorous	Total phosphorus (TP) is the sum of all phosphorus in a sample, including dissolved and particulate forms. I' is a key measurement used to assess water quality and wastewater treatment. Sewage, fertilizer and urban runoff are key sources.
Urban Creep	Urban creep is the increasing density of development, due to extension, paving over of gardens and other permeable areas, which increases the impermeability of developed areas and causes rates and volumes of runoff to rise.
Water Available for Use (WAFU)	The overall amount of water that is available to use. This takes account of the total deployable output minus water lost through planned and unplanned events, sustainability reductions, climate change, water transferred out of a supply area to other companies (exports) and water received from other companies (imports).
Water Framework Directive (WFD)	The Water Framework Directive (WFD) 2000/60/EC is an EU directive to establish a framework for the protection of all water bodies. The WFD set a programme and timetable for Member States to set up River Basin Management Plans by 2009, which are then periodically updated every 5-years.
Water Resource Management Plan (WRMP)	WRMPs set out how water companies intend to achieve a secure supply of water for their customers and a protected and enhanced environment. Water companies in England or Wales, must prepare and maintain a WRMP every 5-years to align with the AMP.
Water Resource Zone (WRZ)	The largest possible zone in which all resources, including external transfers, can be shared and hence, the zone in which all customers will experience the same risk of supply failure from a resource shortfall.
Water Services Regulation Authority (Ofwat)	The Water Services Regulation Authority, or Ofwat, is the body responsible for economic regulation of the privatised water and sewerage industry in England.
Water Trading	An agreement with an existing licence holder to give part or all of their water abstraction right permanently or temporarily.
Water Treatment Works (WTW)	A facility which treats and cleans water to a specific standard.
Windfall Development	Development not specifically allocated in a development plan.

1 Introduction

1.1 Scope of Assessment

Wallingford HydroSolutions (WHS) has been commissioned by West Oxfordshire District Council to undertake a detailed water cycle study in relation to their local plan 2043[1]. This follows on from recommendations made in the Water Cycle Study Scoping Report completed by WHS for the district in July 2025.

This detailed study undertakes headroom assessments and water quality modelling for 13 sewage treatment works (STWs) selected by WHS. These were selected based on the conclusions of the scoping study and the latest development allocations proposed in the local plan. In undertaking these assessments, the study considers how development proposed in the local plan period could affect water quality. This allows for steps to be put in place by Thames Water, the EA and the council to enable development to proceed sustainably without compromising the environment.

1.2 Background

This detailed study is required to build on the findings and evidence gaps identified by the Water Cycle Scoping Study (July 2025) and to consider the latest development allocations being brought forward in the local plan 2043. New homes and businesses are proposed in the local plan and will require the provision of clean water, safe disposal of wastewater and protection from flooding.

The safe disposal of wastewater is the focus of this detailed study. Development has the potential to increase the volume of flow to the sewer network and downstream STWs. The allocation of development in certain locations may result in the capacity of existing available infrastructure being exceeded, a situation that could potentially cause service failures, adverse impacts to the environment and high costs for the upgrade of assets. Sustainable planning for water is therefore essential. It is important that there is engagement between the council and Thames Water as the sewerage undertaker, so that Thames Water is aware of planned development. Once aware, it is Thames Water's responsibility to ensure that it upgrades its infrastructure so that developments can progress without presenting a risk to the environment.

Key to understanding the potential impacts of development on the sewer network, STWs and the downstream water environment is the sewage treatment process. Wastewater first enters the sewer network via a series of drains, pipes and main sewer lines. The main sewer lines take the wastewater to a STW. At the STW, wastewater is passed through several cleaning and filtering processes which aim to return it safely into receiving waterbodies. Screening is the first step, where large solids are removed from the wastewater. This is followed by primary treatment, which largely involves removing finer solids from wastewater using sedimentation tanks.

Wastewater after primary treatment still contains organic solid matter. It is at the secondary treatment stage where the majority of this matter is removed through processes including biological treatment and disinfection. Secondary treatment looks to achieve a certain level of effluent quality for discharge into the receiving waterbody. Note, in some cases, a further treatment phase known as tertiary treatment is applied which uses more advanced treatment systems. This can be required when discharging to protected water bodies or to make water suitable for re-use.

[1] West Oxfordshire District Council (2025) *Local Plan 2043 - https://www.westoxon.gov.uk/planning-and-building/planning-policy/local-plan-2043/*

The EA is responsible for regulating sewage discharge releases via a system of Environmental Permits which set out the required effluent quality for a range of metrics to protect the environment. Sewerage undertakers like Thames Water must ensure compliance against the permits set.

Future development is likely to lead to increased wastewater flows arriving at STWs. Where there is insufficient capacity or headroom to treat these flows, it can lead to a greater volume of untreated sewage being discharged into receiving watercourses than permitted. This presents a water quality risk and could lead to negative impacts on indicators used to assess a watercourse's health under the Water Framework Directive[2] (WFD).

The WFD seeks to protect and enhance surface waters including watercourses. It assigns each watercourse an overall, ecological and chemical status based on a range of indicators. Under the WFD a watercourse should not deteriorate from its current WFD status, either as an overall watercourse or for each of the individual indicators assessed. Paragraph 180e of the National Planning Policy Framework (NPPF) further requires that planning policies and decisions should contribute to and enhance the natural and local environment by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of water pollution. Development should, wherever possible, help to improve local environmental conditions such as water quality, taking into account relevant information such as river basin management plans, which implement the WFD at the river basin scale.

This study helps meet these requirements by elucidating the potential impacts of future development on headroom, water quality and WFD status. This supports the EA and Thames Water in planning for the future and carrying out their responsibilities effectively. It also helps the local plan meet its aim to protect and enhance the environment.

1.3 Water Cycle Study Detailed Report Objectives

Water cycle studies are voluntary studies that consider how strategic plans and development proposals will affect the water environment. The study's objectives include the following:

- Engage with stakeholders including the EA, Thames Water and neighbouring authorities.
- Determine the quantum of development expected within 13 key STW catchments to 2043, with consideration given to development allocations proposed in the emerging local plan, sites in the adopted local plan, undeveloped sites with planning permission and windfall development. All of which have been provided by West Oxfordshire District Council.
- Undertake a headroom assessment for each of the 13 STWs to determine projected changes in flows against permitted levels, identifying where there may be capacity concerns.
- Outline recommendations for future development and actions for regulators to manage projected changes in headroom.
- Undertake water quality modelling considering the current technology at each STW to assess the impact of development on ammonia, biochemical oxygen demand (BOD), orthophosphate and total phosphorous in the receiving watercourses drained to by the 13 STWs.
- Undertake water quality modelling incorporating the Technically Achievable Limits (TAL) agreed with the EA at each STW to determine whether potential impacts on water body WFD status and deteriorations in water quality can be avoided when applying TAL.

[2] European Commission (2000) *Water Framework Directive (WFD)* https://environment.ec.europa.eu/topics/water/water-framework-directive_en

- Determine potential impacts on water body WFD status and identify where there is a 10% deterioration in water quality for all scenarios tested.
- Undertake water quality modelling, incorporating proposed Asset Management Period 8 (AMP8) schemes at each STW to determine likely post-development conditions.
- Outline recommendations for future development and actions for regulators, to manage projected changes in water quality.

2 Method Statement

The water cycle study has been completed using national EA guidance on water cycle studies[3]. It has also been guided by liaison with key stakeholders including West Oxfordshire District Council, the EA, Thames Water and neighbouring authorities. The EA, Thames Water and neighbouring authorities have been contacted to acquire the datasets required to progress the study and to gain a clear understanding of the water environment and water infrastructure for the district.

The scope of this detailed study has been informed by the recommendations made in the West Oxfordshire District's Scoping Water Cycle Study completed in July 2025 and the development allocations being brought forward in the district's emerging local plan.

2.1 Headroom Assessment

The EA is responsible for regulating sewage discharge releases via a system of Environmental Permits. Environmental permits can relate to treated sewage from STWs and untreated sewage from combined sewer overflows (CSOs) on the sewer network. Permits for treated sewage are used alongside water quality limits as a means of controlling the pollutant load discharged from STWs to a receiving watercourse. Sewage flow rates must be monitored for all STWs where the permitted discharge rate is greater than 50 m^3/day in dry weather.

Permitted discharges from STWs in the majority of cases are based on a statistic known as the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for STW design as a means of estimating the 'base flow' in sewerage modelling and for determining the flow at which discharges to storm tanks will be permitted (Flow to Full Treatment, FFT).

When setting a permitted DWF the EA typically use the Q80 flow (the flow exceeded for 80% of the time) provided they are confident that it will not lead to a significant water quality deterioration. However, the Q90 flow (the flow exceeded for 90% of the time) is monitored by the sewerage undertaker and the EA for compliance purposes. This is because, being a lower flow, it gives greater certainty of an exceedance of the permitted DWF. As it is important to understand how growth will affect measurements of DWF, the Q80 and Q90 are both used in the headroom assessments. For the water quality modelling, only the Q80 flow is used. This ensures that a worst-case approach is taken when assessing impacts on the environment and improves the clarity of the water quality results presented.

Environmental Permits also consent for maximum concentrations of pollutants, in most cases suspended solids, BOD, ammonia, orthophosphate and total phosphorous. These look to ensure that the receiving watercourse is not prevented from meeting its environmental objectives, with specific regard to its WFD status.

Increased domestic population and/or employment activity can lead to increased wastewater flows arriving at a STW. Where there is insufficient headroom at the works to treat these flows, this could lead to breaches in permitted flows leading to a greater volume of treated sewage being discharged into receiving watercourses, presenting a water quality risk. A lack of headroom at an STW can also lead to the capacity of the sewer network upstream being exceeded more regularly, in turn contributing to a greater number of untreated sewer discharges via CSOs.

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[3] Environment Agency (2021) *Guidance- Water Cycle Studies* https://www.gov.uk/guidance/water-cycle-studies

To overcome these issues, a STW can upgrade its treatment systems to improve effluent quality allowing for a higher DWF to be permitted by the EA. This will allow more flow to be discharged from an STW freeing up capacity. However, in cases where the STW is already performing close or above technically achievable limits this can be a challenge and may not be possible. In these cases, an upgrade to the capacity of the works and its upstream drainage network may be required.

Alongside the scoping study, baseline headroom assessments were carried out at 23 STWs across the district. These showed five sites exceeding their permitted DWF on a regular basis (Q90 > DWF), four sites close to exceeding their permitted DWF (Q80 > DWF > Q90) and fourteen sites with headroom capacity (Q80 < DWF).

To better determine future headroom and inform a further water quality modelling assessment recommended as part of the scoping study, the headroom assessments will need to be updated to take account of future growth.

In view of this, the latest site allocations have been reviewed to determine which STW they are likely to drain to. This has identified a total of 13 STWs requiring reassessment including Bampton, Bledington, Burford, Carterton, Cassington, Charlbury, Chipping Norton, Church Hanborough, Enstone, Middle Barton, Standlake, Tackley and Witney STWs. The location of these STWs and their associated catchment areas are shown in Figure 1.

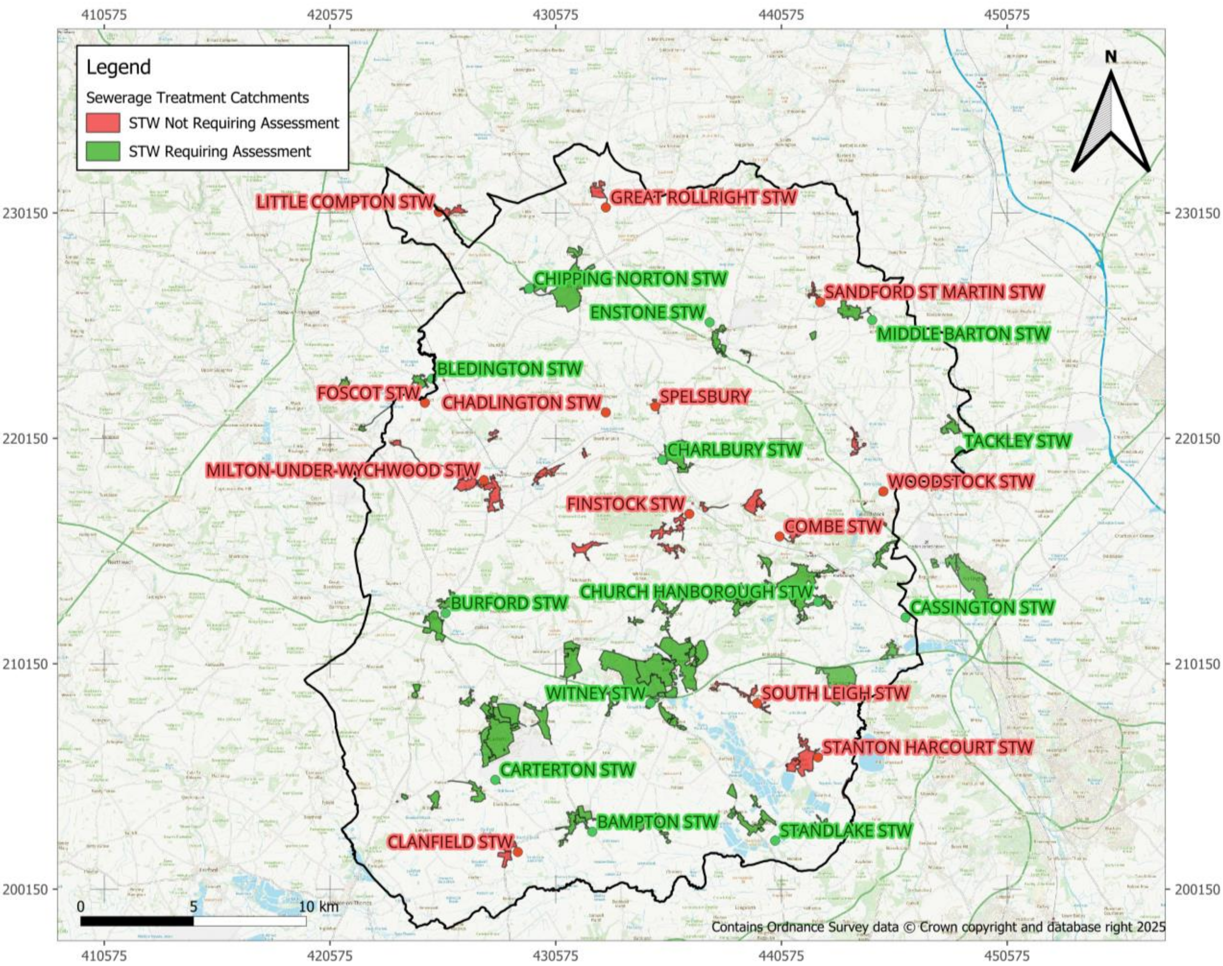

Figure 1- Locations of STWs scoped in and out of the detailed study

An assessment of whether the 13 STWs have headroom to manage the future development was carried out using the following data sources:

- Measured daily flow data supplied by Thames Water for the years 2019-2024, used to estimate Q80 and Q90 flows.
- STW catchment extent data provided by Thames Water.
- Development allocations in the local plan, adopted local plans, undeveloped sites with planning permission and estimates of windfall development provided by West Oxfordshire District Council. This included information on the number of residential dwellings and area of employment land expected across the plan period.
- Development figures from neighbouring authorities, where part of a STW catchment falls within another authority's area. This effects the Bledington STW and Cassington STW.
    - Cotswold District Council estimated nine additional dwellings in the Bledington STW catchment by 2043, comprising four allocated dwellings and five windfall dwellings.
    - Cherwell District Council provided details of emerging (2042) and adopted Local Plan allocations, together with undeveloped sites with planning permission. None of these sites are located within the Cassington STW catchment.
- The current discharge permits in place at each STW supplied by the EA, to extract the permitted DWF. These were cross checked with the EA before undertaking the assessments.

Using the data sources above, the first step was to set a baseline DWF using the measured flow data provided by Thames Water in February 2026. It was first decided that flows recorded over the last 5-years (2020-2024) should be used, Section 3.2 provides justification for this approach. Two scenarios were then assessed at each STW, scenario one uses the 80th percentile annual exceedance flow values for the last five years (2020-2024) as the baseline DWF. Scenario 2 uses the 90th percentile annual exceedance flow values for the last five years (2020-2024) as the baseline DWF.

The next step was to determine which development allocations would drain to each STW using the STW catchments also provided by Thames Water. For each STW, the future DWF was calculated by estimating the expected increase in flows from future development across the plan period. This considered household consumption and consumption from employment land. Household consumption was calculated using the equation below.

$$\textit{Household Consumption} = \textit{Dwellings} \times \textit{Occupancy Rate} \times \textit{Per Capita Consumption}$$

For residential dwellings an occupancy rate of 2.370 people per dwelling (p/dw) was adopted, this is based on the projected *final plan* occupancy rate for the Swindon and Oxfordshire (SWOX) water resource zone (between 2026-2043) used in Thames Water's latest water resource management plan (WRMP). A per-capita consumption of 121.02 litres per day (l/p/d) was adopted, again this is based on the projected *final plan* rate for the SWOX water resource zone used in Thames Water's latest WRMP.

It is more difficult to estimate water use associated with employment site allocations because there are a range of employment uses that could come forward on the earmarked sites, each of which may result in different wastewater flows. Nonetheless a reasonable estimate may be obtained using the formula below:

$$\textit{Employment Consumption} = \textit{Employees} \times \textit{Per Capita Consumption}$$

The components of this formula and associated assumptions are as follows:

- Employees– West Oxfordshire District Council have provided the potential number of jobs to be created in certain regions of the district, these have then been allocated to the relevant STW catchments.
- Per capita consumption - A per-capita consumption rate of 50 l/p/d was used for employment land based on estimates made by South Staffs Water for office buildings which is expected to make up the majority of the employment land in the local plan. No equivalent rate is provided in Thames Water's WRMP. This consumption rate is higher than benchmark figures stated by Waterwise of 15 l/p/d[4] and is considered precautionary.

It was assumed that 100% of water used is returned to sewer. In reality this is unlikely to be the case but again guarantees that a precautionary approach is taken when assessing the capacity of the STWs. When assessing capacity, the permitted DWF at the STWs were used as a substitute for actual designed hydraulic capacity for each WRC being assessed. It should be noted that whilst the permitted flows will relate well to the actual designed hydraulic capacity of a STW in some cases, in other cases they may not.

2.2 Water Quality Modelling

To assess the potential water quality impacts from future development in the district, in combination with the impacts arising from development in neighbouring authorities, the EA's SIMCAT model for the River Thames has been used. SIMCAT (Simulation of Catchments) is the EA's water quality river modelling software and is a crucial tool for setting and reviewing discharge permits at a catchment scale and to quantify the source apportionment of both point and diffuse pollutant load within the receiving watercourse.

In this context, water quality impacts to receiving watercourses at the 13 STWs have been measured against overall WFD status and the WFD status for individual elements. For this study, these elements include Biochemical Oxygen Demand (BOD), ammonia, orthophosphate and total phosphorous.

The aims of the WFD[5] are to enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystem. In this regard, the water quality modelling undertaken is used to assess the following criteria:

- Could the development cause a greater than 10% deterioration in water quality?
- Could the development cause a deterioration in WFD status for any element assessed?
- Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) when considering technically achievable limits (TAL)?

To achieve this, the first task was to review and run the Thames model to confirm it was fit for purpose. The model was run using SIMCATv15.7 and the default flows already in the model. The results from the model were collated for the 13 STWs and four parameters required for this study (BOD, ammonia, orthophosphate and total phosphorous). SIMCAT compares its modelled results to observed results recorded for flow and water quality at monitoring stations. The level of agreement between the modelled and observed results was used as a 'fit for purpose' test.

Once the Thames model was confirmed as fit for purpose, the technically achievable limits (TALs) proposed by the EA were reviewed. The EA advised that the permit values shown below are achievable using TALs, and that these values should be used for modelling all STW potential capacity

[4] Waterwise (2025) *THE WATERWISE GUIDE FOR OFFICES* https://waterwise.org.uk/app/uploads/2025/02/The-Waterwise-Guide-for-Offices.pdf

[5] European Commission, *Water Framework Directive (2000)*, http://ec.europa.eu/environment/water/water-framework/index_en.html

irrespective of the existing treatment technology and size of the works. It is important to note that TALs are not theoretical maximums, but rather the levels that can be consistently achieved in practice using standard wastewater treatment processes.

- Ammonia (95%-ile): 1mg/l
- BOD (95%-ile): 5mg/l
- Phosphorous (mean): 0.25mg/l

To review the appropriateness of the TALs involved comparing the existing effluent quality values at each STW (contained in the SIMCAT data files provided by the EA) to the TAL values.

Following this the model was run for a new baseline considering the averaged 2020-2024 Q80 values provided by Thames Water. As mentioned, only the Q80 is assessed as this ensures that a worst-case approach is taken when assessing impacts on the environment and improves the clarity of the water quality results presented. This baseline run assumed current wastewater treatment technology.

The model was subsequently run for a post-development scenario which considered increased flows due to development in West Oxfordshire district and neighbouring authorities to 2043. The model was run considering current technology and then with TALs applied.

The results for ammonia, BOD, orthophosphate and total phosphorous for the baseline runs were compared to the post-development results. The results were reviewed considering the environmental quality standards for ammonia and BOD listed in Table 1, these relate to the 90th percentile. Note, for total phosphorous there are no universal environmental quality standards, instead the watercourse specific values for orthophosphate have been used; these are listed in Table 2 and relate to the mean value. The standards are used to determine the impacts on WFD status and individual WFD elements.

Table 1- Environmental Quality Standards for Ammonia and BOD

Element	High	Good	Moderate	Poor
Ammonia (90th Percentile, mg/l)	0.30	0.60	1.10	2.50
BOD (90th Percentile, mg/l)	4.00	5.00	6.50	9.00
Orthophosphate (Mean, mg/l)	0.036-0.044	0.068-0.082	0.173-0.198	1.002-1.060

Table 2- Reach specific standards for Orthophosphate

STW name	High status (mg/l)	Good status (mg/l)	Moderate status (mg/l)	Poor status (mg/l)
Bampton STW	0.044	0.082	0.198	1.060
Bledington STW	0.037	0.069	0.174	1.006
Burford STW	0.036	0.068	0.173	1.002
Carterton STW	0.042	0.078	0.191	1.043
Cassington STW	0.043	0.080	0.194	1.052
Charlbury STW	0.042	0.078	0.191	1.045
Chipping Norton STW	0.037	0.069	0.174	1.006
Church Hanborough STW	0.042	0.078	0.191	1.045

STW name	High status (mg/l)	Good status (mg/l)	Moderate status (mg/l)	Poor status (mg/l)
Enstone STW	0.044	0.082	0.198	1.060
Middle Barton STW	0.041	0.077	0.189	1.040
Standlake STW	0.041	0.076	0.187	1.036
Tackley STW	0.040	0.075	0.185	1.030
Witney STW	0.041	0.076	0.187	1.035

The three criteria were subsequently assessed based on this information. Table 3 summarises the standards for passing or failing each criterion. The water quality results are provided in Section 5.

Table 3- Environmental Quality Standards for Ammonia and BOD

Score	Criteria
Green	No Infrastructure upgrade required to achieve.
Amber	Infrastructure upgrade required, but achievable using TALs or by addressing other factors preventing criteria being met.
Red	Cannot be achieved using TAL. Environmental capacity could be a constraint on growth.

It is understood that the SIMCAT model provided, and the scenarios tested above, do not account for the impacts of AMP8 schemes planned for the period 2025–2030. It is important that these schemes are incorporated when establishing baseline conditions that will need to be protected in the coming years and estimating best case post-development conditions (without the application of TALs). In addition, assessing the potential impacts of future development on water quality with these schemes in place, is likely to provide a more realistic representation of future regulatory controls.

To update the SIMCAT model to account for AMP8 schemes the EA's price review 2024 (PR24) Water Industry National Environment Programme (WINEP)[6] was reviewed. The programme details proposed changes during AMP8 to permit limits. The WINEP lists existing (AMP7) and proposed (AMP8) limits for Ammonia, BOD and Total Phosphorous, which have been further verified with the EA. The existing and proposed limits were compared against the mean (for Total Phosphorous) and 95th percentile values (for Ammonia and BOD) contained in the EA's supplied SIMCAT model. The model values were updated where the proposed limit represents a betterment upon the existing effluent quality. The model was subsequently run for a baseline and post-development scenario with the AMP8 limits providing betterment incorporated.

[6] Environment Agency (2025) *PR24 Water Industry National Environment Programme* https://environment.data.gov.uk/dataset/39b11ea0-3cfa-4cbb-b3a1-b5950019f169

3 Headroom Assessment

3.1 Introduction

Increased domestic population and/or employment activity can lead to increased wastewater flows arriving at a STW. Where there is insufficient headroom at the works to treat these flows, this could lead to breaches in flows permitted leading to a greater volume of treated sewage being discharged into receiving watercourses, presenting a water quality risk. A lack of headroom at a STW can also lead to the capacity of the sewer network upstream being exceeded more regularly, in turn contributing to a greater number of untreated sewer discharges via CSOs. To assess the headroom available at each of the 13 STWs in this study, the methodology in section 2.1 was applied.

3.2 Review of Dry Weather Flow (DWF) Data

For the baseline headroom assessment which reviewed capacity at 22 STWs serving West Oxfordshire, DWF data supplied by Thames Water for the two most recent years 2023 and 2024 was used. For this detailed assessment, further DWF data has been obtained from Thames Water for a wider period from 2019 to 2024 and a comparison undertaken to ensure that the 2023 and 2024 data provide a representative baseline to use in the future headroom assessment and subsequent water quality modelling. Table 4 shows the recorded 80th (Q80) and 90th (Q90) percentile flow values.

Table 4- 80th and 90th percentile annual exceedance flow values (2019-2024)

STWs	Q80					
	2019	2020	2021	2022	2023	2024
Bampton STW	740.7	910.5	902.7	747.9	1015.9	1080.0
Bledington STW	157.1	179.5	195.3	145.3	183.0	231.3
Burford STW	363.0	299.9	354.0	363.3	377.7	395.1
Carterton STW	4947.1	3242.2	3734.2	3432.4	3972.1	4002.0
Cassington STW	2686.9	2879.4	3087.5	2460.5	3021.8	3701.9
Charlbury STW	393.7	498.9	474.9	432.6	445.7	385.4
Chipping Norton STW	1717.7	2036.9	2112.6	1853.2	1786.2	2024.7
Church Hanborough STW	1516.0	1727.2	1856.1	1464.5	2118.7	2210.4
Enstone STW	304.5	311.0	324.4	280.8	435.7	556.9
Middle Barton STW	260.3	308.7	265.2	213.9	297.8	337.1
Standlake STW	604.5	612.0	720.4	626.8	734.5	765.4
Tackley STW	149.2	186.2	230.1	207.1	253.0	516.0
Witney STW	9142.3	10367.6	11563.1	9281.4	11588.8	14626.8
STWs	**Q90**					
	2019	**2020**	**2021**	**2022**	**2023**	**2024**
Bampton STW	696.4	832.3	830.7	704.7	968.1	963
Bledington STW	144.8	160.8	175.3	130.8	162.9	191.7
Burford STW	345.9	276.5	332.8	346.4	363.9	358.2
Carterton STW	4706.6	3034.3	3502.9	3160.7	3731.1	3771
Cassington STW	2519.2	2739.3	2871.7	2304.1	2869.7	3496.8
Charlbury STW	372.4	478.4	453.7	407.5	410.2	360.8
Chipping Norton STW	1626.8	1920.8	1973.7	1758.2	1698.3	1798.7
Church Hanborough STW	1426.8	815.6	1692.6	1380.2	1941.9	2008.0
Enstone STW	236.9	266.0	276.4	247.5	386.2	444.6
Middle Barton STW	231.0	271.4	248.0	196.9	258.5	275.4
Standlake STW	No Data	595.9	674.2	550.7	697.4	678.2
Tackley STW	142.0	174.6	219.7	194.9	233.5	462.6
Witney STW	9621.3	9676.9	10398.4	8413.5	8802.1	12377.4

Figure 2 shows the trends in the Q80 values between 2019 and 2024. The year 2023 was notably wet across Southern England, while 2024 was among the wettest years on record. For 10 of the 13 STWs, the highest Q80 value occurred in 2024, and for 7 of the 13 STWs, 2023 recorded the second-highest Q80 value. A similar trend is seen for the Q90 flow values. These elevated flows indicate that the average Q80 for 2023–2024 is substantially higher than the longer-term average across the study period. As these years were exceptionally wet, their inclusion may result in an underestimation of the available headroom at many sites.

To provide a representative assessment, the average Q80 and Q90 values for the period 2020–2024 has been adopted as the five-year average. The year 2019 was excluded because it is both the oldest year in the dataset, and because it generally exhibited the lowest flows across the majority of STWs. Therefore, it is considered to be less representative of present-day conditions and its inclusion could lead to an overestimation of available headroom.

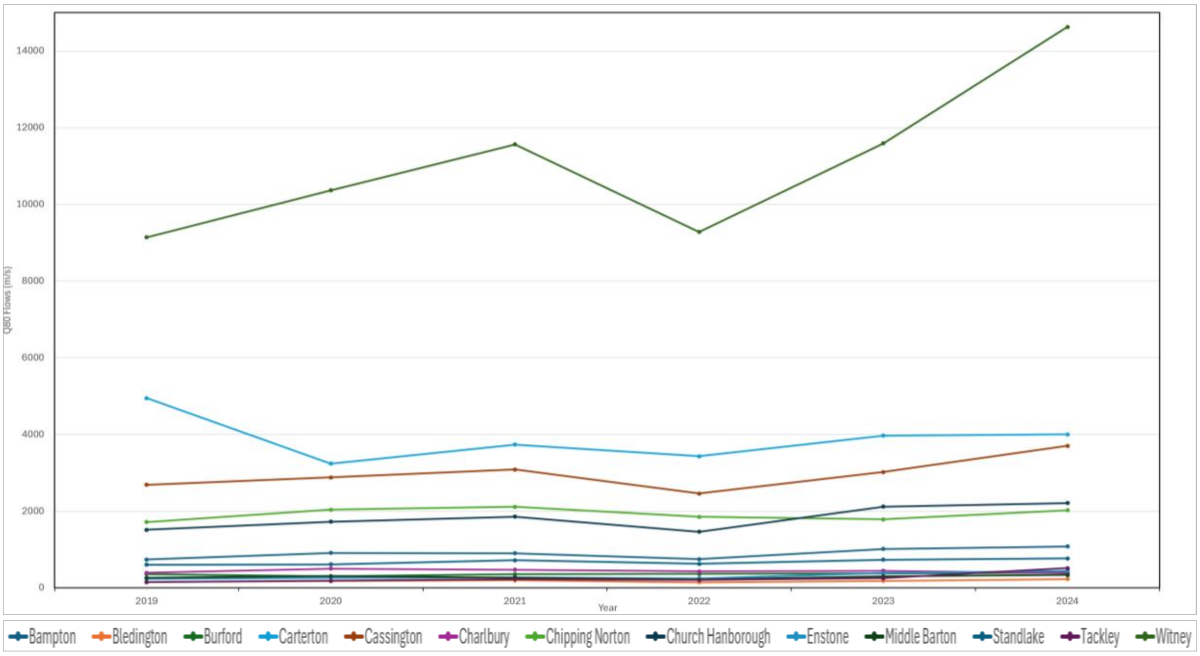

Figure 2- Trends in 80th percentile annual exceedance flow values (2019-2024)

Table 5 provides a comparison between the average flows for 2023-2024 and the adopted longer-term average flows between 2020-2024. For the majority of the STWs the average flows recorded in 2023 and 2024 are higher, with the largest differences at Witney STW (14.1% higher), Enstone STW (30.0% higher) and Tackley STW (38.1% higher). At three of the sites, the 2023-2024 average is slightly lower, this includes Chipping Norton STW (3.0% lower), Charlbury STW (7.2% lower), and Standlake STW (7.6% lower).

Table 5- Comparison between adopted flows (average 2023/24) with longer term flows (average 2019-24)

Sewage Treatment Works	Average Q80 (2020-2024)	Average Q80 (2023-2024)	Average Q90 (2020-2024)	Average Q90 (2023-2024)
Bampton STW	931.4	1048.0	859.8	965.6
Bledington STW	186.9	207.2	164.3	177.3
Burford STW	358.0	386.4	335.6	361.1
Carterton STW	3676.6	3987.0	3440.0	3751.0
Cassington STW	3030.2	3361.9	2856.3	3183.2
Charlbury STW	447.5	415.5	422.1	385.5
Chipping Norton STW	1962.7	1905.5	1829.9	1748.5
Church Hanborough STW	1875.4	2164.5	1567.7	1974.9
Enstone STW	381.8	496.3	324.1	415.4
Middle Barton STW	284.6	317.5	250.0	267.0
Standlake STW	691.8	639.3	639.3	687.8
Tackley STW	278.5	384.5	257.1	348.1
Witney STW	11485.5	13107.8	9933.7	10589.7

3.3 Results

3.3.1 Bampton STW

Bampton STW is located in the south of the district with a total catchment area of 1.3 km^2. It discharges to the Shill Brook at NGR: 432309, 202747 with a permitted DWF of 853 m^3/day.

Two preferred spatial option sites are expected to drain to Bampton STW, this is the East of Bampton (R) and North of Aston (M) sites allocated for 150 and 40 dwellings respectively. There are also several extant development permissions within the STW catchment, which combined total 64 dwellings.

The headroom assessment at the Bampton STW shows that the baseline Q80 and Q90 flows exceed the permitted DWF, being 9.2% and 0.8% higher respectively. Additional development draining to the STW would cause a significant increase in flows (see Figure 3). By the end of the plan period the projected Q80 and Q90 flows are 21.5% and 13.1% higher than the permitted DWF respectively.

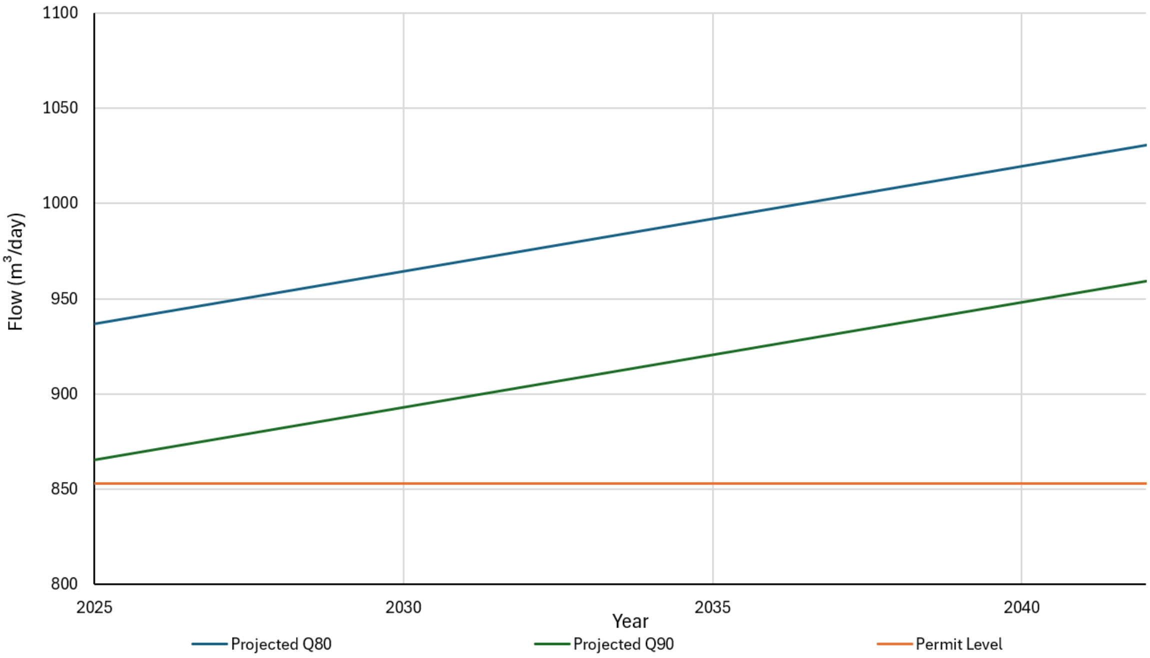

Figure 3 – Bampton STW DWF Headroom Forecast

Bampton STW is currently operating above its permitted DWF capacity under both the Q80 and Q90 flow scenarios and this exceedance is set to increase with future growth.

Importantly, future upgrades are currently scheduled as part of Thames Water's AMP8 capital delivery program (2025–2030). These infrastructure changes aim to expand processing capacity and enhance environmental compliance to mitigate ongoing capacity concerns. Site upgrades are planned to increase the plant's FFT from 23 litres per second to 36 litres per second to cope with local population growth. In addition, upgrades are earmarked to improve overall effluent quality.

By increasing the treatment works' capacity to store and treat sewage, the volume and frequency of discharges to the receiving environment should be reduced. This is expected to lower the Q80 and Q90 flows, thereby improving headroom.

However, the existing Q80 and Q90 flows already exceed the permitted DWF and there is set to be a significant increase in flows to the works as a result of future development. In this regard, Thames Water may need to seek a permit variation to increase the authorised DWF. This may require further upgrades to the treatment works to improve effluent quality and maintain (or improve) pollutant loads. Any permit variation should be progressed well in advance of planned development.

3.3.2 Bledington STW

Bledington STW is located approximately 100 m outside of the district boundary to the northwest. However, a small part of its 0.5 km^2 catchment area is located within the West Oxfordshire District. The STW discharges to the River Evenlode at approximately NGR: 425080, 222827 with a permitted DWF of 249 m^3/day.

One preferred spatial option site drains to Bledington STW, this is Kingham Station (R) where 70 dwellings are proposed. There are also several extant development permissions within the STW catchment, totalling to 17 dwellings.

The headroom assessment at Bledington STW shows that the baseline Q80 and Q90 flows are 24.9% and 34.0% lower than the permitted DWF flows respectively. When only considering the development in West Oxfordshire district, the additional development proposed within the catchment reduces the available headroom, however the Q80 and Q90 flows remain 14.9% and 24.0% below the permitted DWF, respectively (see Figure 4).

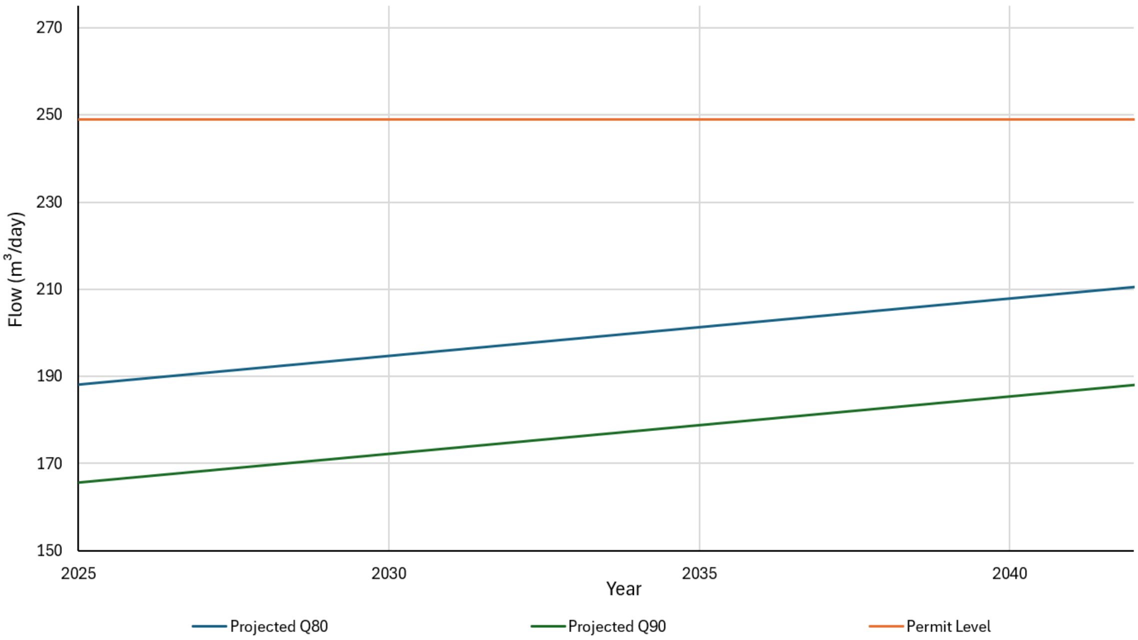

Figure 4 – Bledington STW DWF Headroom Assessment Forecast (West Oxfordshire District Council Only)

When also considering future development proposed by Cotswolds District Council, there is still a significant amount of headroom at the works (see Figure 5). By the end of the plan period the Q80 and Q90 flow are 13.9% and 23.0% below the permitted DWF respectively.

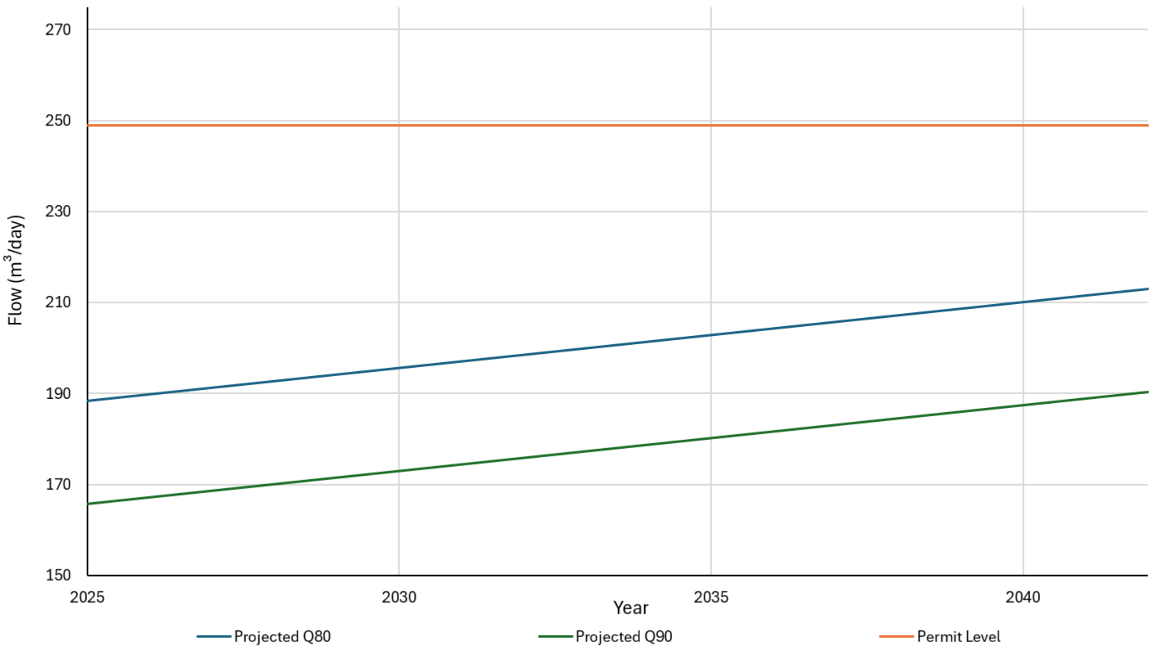

Figure 5 – Bledington STW DWF Headroom Assessment Forecast (Cotswolds District Council Included)

The assessment indicates that the permitted DWF will not be exceeded during the plan period as a result of future development. No infrastructure upgrades are schedule at the STW, however a Phosphorus permit limit of 1 mg/l is proposed for AMP8. This should improve effluent quality helping reduce water quality pressures on the receiving waterbody.

3.3.3 Burford STW

Burford STW is located in the west of the district with a total catchment area of 1.0 km^2. It discharges into the River Windrush at approximately NGR: 425641, 212267 with a permitted DWF of 467 m^3/day.

One preferred spatial option site drains to Burford STW, this is the South of Sheep Street (N) site where 70 dwellings are proposed. There are also several extant development permissions within the STW catchment, totalling 160 dwellings.

The headroom assessment at the Burford STW shows that the baseline Q80 and Q90 flows are below the permitted DWF, being 23.3% and 28.1% lower respectively. Additional development draining to the STW would cause a significant increase in flows (see Figure 6), however importantly the projected Q80 and Q90 flows remain below the permitted DWF, being 3.3% and 8.1% lower respectively.

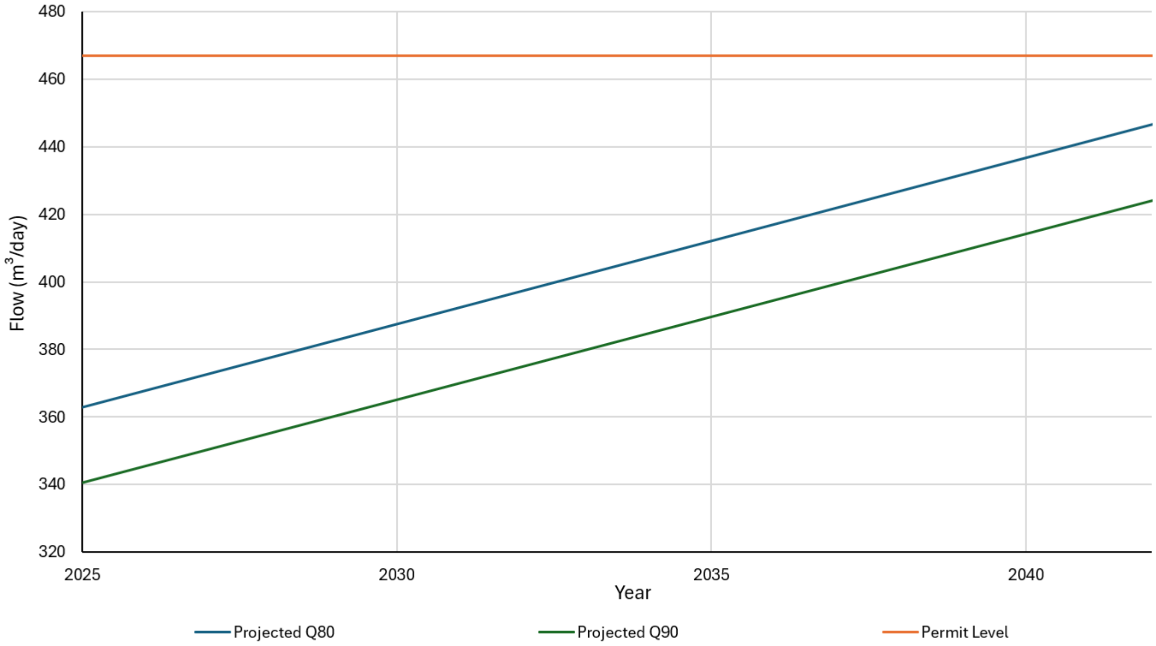

Figure 6 – Burford STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will not be exceeded during the plan period as a result of future development. Thames Water does not currently have any plans to upgrade Burford STW.

3.3.4 Carterton STW

Carterton STW is located in the southwest of the district with a total catchment area of 3.7 km^2. It discharges to the Shill Brook at approximately NGR: 428009, 204862 with a permitted DWF of 3884 m^3/day.

Two preferred spatial option sites drain to Carterton STW, these are the North of Carterton (E) and West of Carterton (I) sites where 750 dwellings and 800 dwellings are proposed respectively. There are also several extant development permissions within the STW catchment, totalling 518 dwellings. An additional 347 dwellings are also expected to drain to Carterton STW from the REEMA North and Central site which is an adopted allocation from the local plan 2041.

The headroom assessment at the Carterton STW shows that the baseline Q80 and Q90 flows are below the permitted DWF, being 5.3% and 11.4% lower respectively. Additional development draining to the STW would cause a significant increase in flows (see Figure 7), with the projected Q80 and Q90 flows forecast to exceed the permitted DWF, being 17.1% and 11.0% higher respectively.

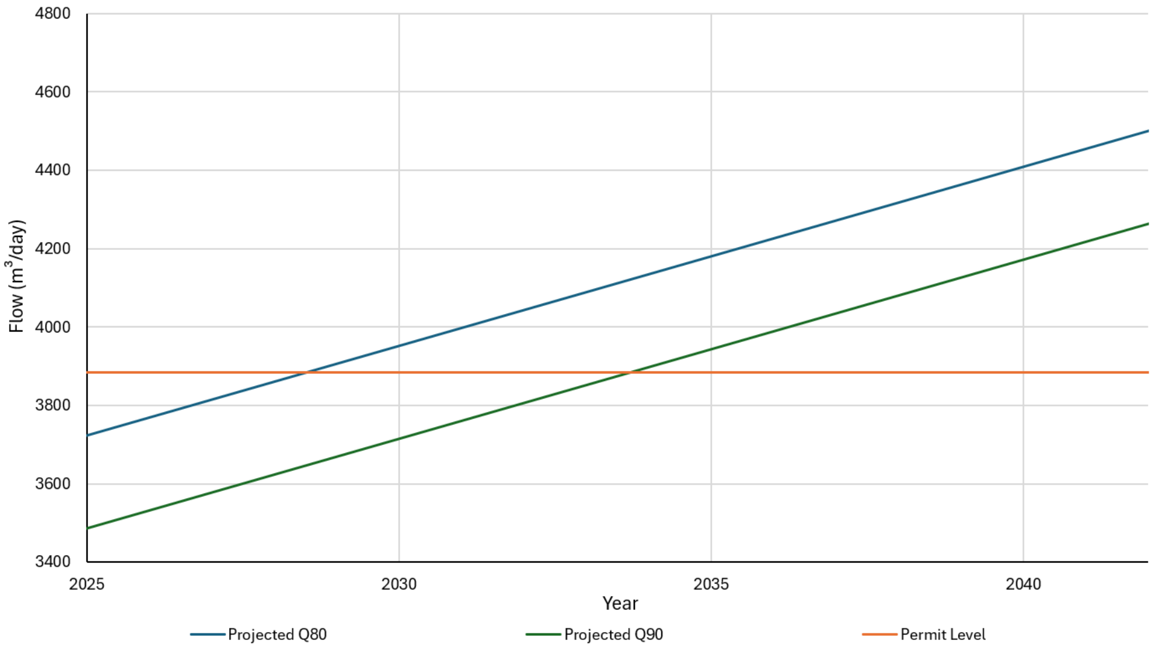

Figure 7 – Carterton STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will be exceeded in both the Q80 and Q90 flow scenarios as a result of future development.

A formal upgrade to the Carterton STW is planned by Thames Water. The scheme aims to increase treatment capacity and reduce the reliance on untreated storm discharges during wet weather. This project is currently planned for completion in 2028. In tandem with the treatment works upgrade, Thames Water is investigating the impact of groundwater infiltration on the local sewer network to manage capacity for future housing developments.

Increasing the treatment works' capacity to store and treat sewage should reduce the volume and frequency of discharges to the receiving environment. In addition, measures to reduce infiltration throughout the catchment should lessen its contribution to influent flows. Collectively, these measures are expected to reduce Q80 and Q90 flows from the STW, thereby improving headroom.

However, as there is set to be a significant increase in flows to the works as a result of future development, Thames Water may also need to seek a permit variation to increase the authorised DWF. This may require further upgrades to the treatment works to improve effluent quality and maintain (or improve) pollutant loads. Any permit variation should be progressed well in advance of planned development.

3.3.5 Cassington STW

Cassington STW is located in the west of the district with a total catchment area of 3.5km^2. The site discharges to the River Thames at NGR: 446430, 210010 with a permitted DWF of 4000 m^3/day.

No preferred options sites are set to drain to Cassington STW. However three adopted local plan allocation sites are expected to, these are Salt Cross Garden Village, West Eynsham SDA and Horizon Technology Park, in total these will provide 2613 dwellings and 1073 jobs. There are also several small extant development permissions within the STW catchment, totalling 12 dwellings.

The headroom assessment at the Cassington STW shows that the baseline Q80 and Q90 flows are below the permitted DWF being 24.2% and 28.6% lower respectively. Additional development draining to the STW would cause a significant increase in flows (see Figure 8), however importantly the projected Q80 and Q90 flows remain below the permitted DWF, being 2.8% and 7.1% lower respectively.

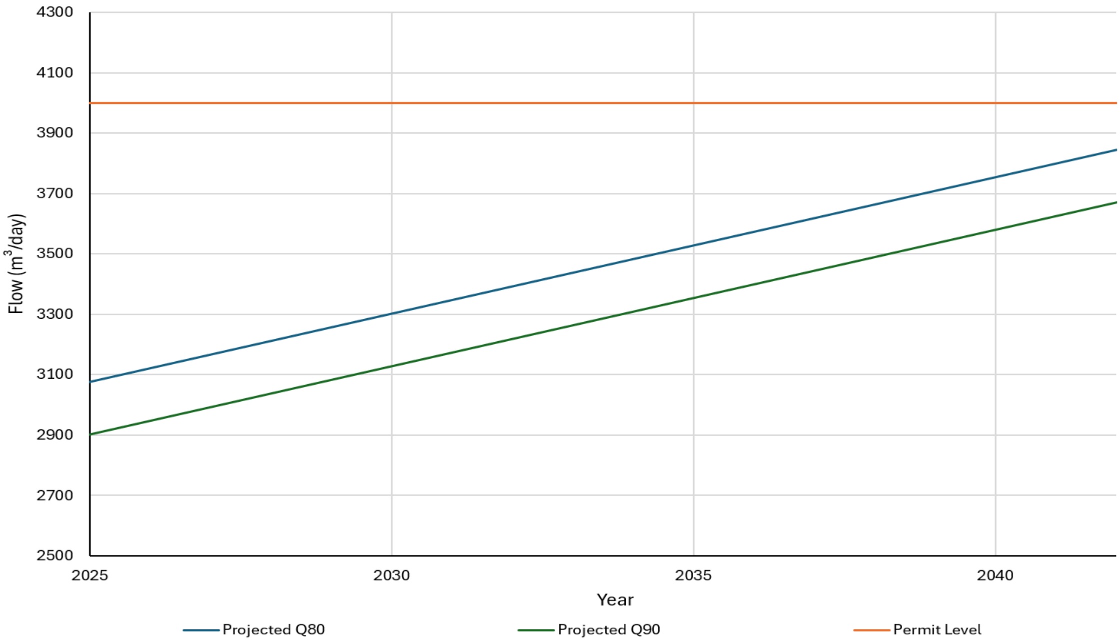

Figure 8 – Cassington STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will not be exceeded during the plan period as a result of future development.

Future upgrades at the Cassington STW are also planned, these focus on boosting hydraulic capacity and improving effluent water quality. Some of these improvements seek to protect Wolvercote Mill Stream, a sensitive designated bathing water. The primary capacity upgrades at the Cassington STW are scheduled for completion in 2028.

3.3.6 Charlbury STW

Charlbury STW is located in central West Oxfordshire with a total catchment area of 1.0 km^2. It discharges to the River Evenlode at approximately NGR: 435298, 219174 with a permitted DWF of 727 m^3/day.

Two preferred spatial option sites drain to Charlbury STW, these are the Jeffersons Piece (O) and Land South of Hydac (P) sites, both of which are earmarked for 40 dwellings each. There are also a handful of extant development permissions within the STW catchment, totalling 4 dwellings.

The headroom assessment at the Charlbury STW shows that the baseline Q80 and Q90 flows are below the permitted DWF being 38.4% and 41.9% lower respectively. Additional development draining to the STW would cause a moderate increase in flows (see Figure 9), however importantly the projected Q80 and Q90 flows remain below the permitted DWF, being 31.6% and 35.1% lower respectively.

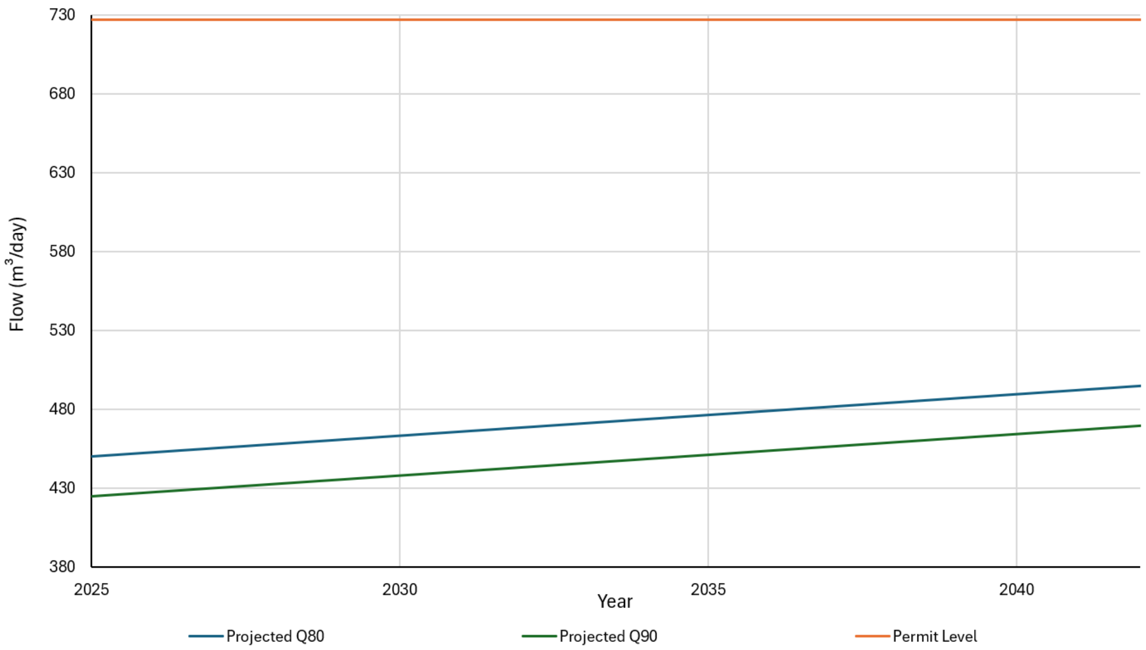

Figure 9 – Charlbury STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will not be exceeded during the plan period as a result of future development.

An upgrade is also planned for Charlbury STW. This will improve its ability to treat the volumes of incoming sewage, reducing the need for untreated discharges in wet weather. The scheme is due to complete in 2028. Furthermore, a Phosphorus permit limit of 2 mg/l is proposed for AMP8. This should improve effluent quality helping reduce water quality pressures on the receiving waterbody.

3.3.7 Chipping Norton STW

Chipping Norton STW is located in the northwest of the district with a total catchment area of 2.2km^2. It discharges to the Blue Brook at NGR: 429390, 226650 with a permitted DWF of 2000 m^3/day.

One preferred spatial option site drains to Chipping Norton STW, this is the East of Chipping Norton (J) site where 750 dwellings are proposed. There are also several extant development permissions within the STW catchment, totalling 127 dwellings.

The headroom assessment at the Chipping Norton STW shows that the baseline Q80 and Q90 flows are below the permitted DWF being 1.9% and 8.5% lower respectively. Additional development draining to the STW would cause a significant increase in flows (see Figure 10), with the projected Q80 and Q90 flows forecast to exceed the permitted DWF, being 16.0% and 9.3% higher respectively.

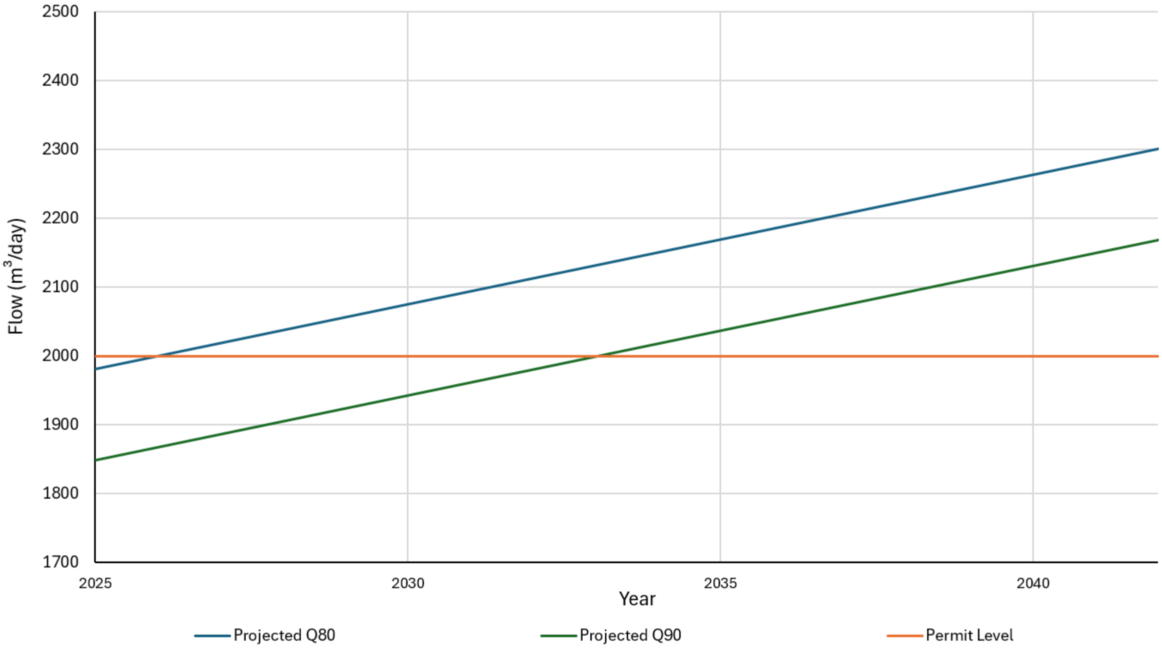

Figure 10 – Chipping Norton STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will be exceeded in both the Q80 and Q90 flow scenarios as a result of future development.

Importantly, Chipping Norton STW is set to undergo a significant upgrade at a cost of more than £5 million. This will improve its ability to treat the volumes of incoming sewage reducing the need for untreated discharges in wet weather. However, Thames Water are not yet in a position to confirm the exact timing of this work.

Increasing the treatment works' capacity to store and treat sewage should reduce the volume and frequency of discharges to the receiving environment. It is also known that during AMP8 (2025-2030), the Phosphorus permit limit will be tightened to 0.25 mg/l with a stretch target of 0.20 mg/l beyond the current TAL. Together these measures should reduce Q80 and Q90 flows and improve effluent quality helping reduce water quality pressures on the receiving waterbody.

However, as there is set to be a significant increase in flows to the works as a result of future development, Thames Water may also need to seek a permit variation to increase the authorised DWF. This may require further upgrades to the treatment works to improve effluent quality and maintain (or improve) pollutant loads. Any permit variation should be progressed well in advance of planned development.

3.3.8 Church Hanborough STW

Church Hanborough STW is located in the east of the district with a total catchment area of 3.5 km^2. It discharges to an unnamed tributary of the River Evenlode at approximately NGR: 442234, 212935 with a permitted DWF of 1455 m^3/day.

One preferred spatial option site drains to Church Hanborough STW, this is Land Southwest of Hanborough Station (K) where 300 dwellings are proposed. There are also several extant development permissions within the STW catchment, totalling 261 dwellings.

The headroom assessment at the Church Hanborough STW shows that the baseline Q80 and Q90 flows exceed the permitted DWF, being 28.9% and 7.7% higher respectively. Additional development draining to the STW would cause a moderate increase in flows (see Figure 11). By the end of the plan period, the projected Q80 and Q90 flows are 42.7% and 21.5% higher than the permitted DWF respectively.

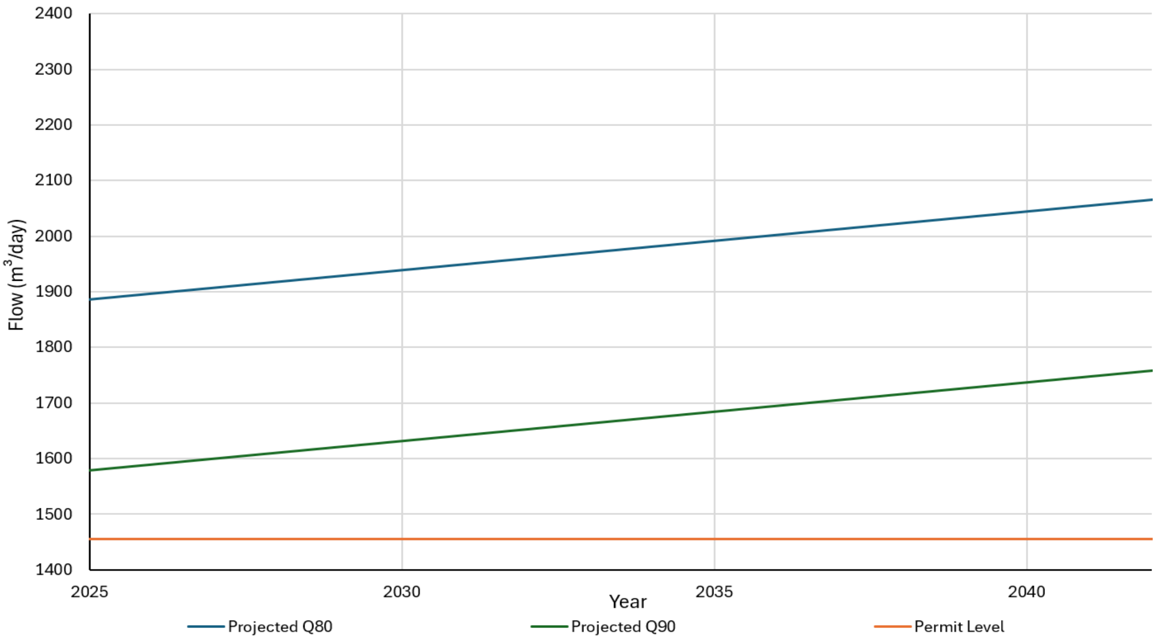

Figure 11 – Church Hanborough STW DWF Headroom Forecast

Church Hanborough STW is currently operating above its permitted DWF capacity under both the Q80 and Q90 flow scenarios and this exceedance is set to increase with future growth.

Upgrades at the Church Hanborough STW are planned, these include compliance and capacity improvements to address permit breaches and accommodate future development.

By increasing the treatment works' capacity to store and treat sewage, the volume and frequency of discharges to the receiving environment should be reduced. This is expected to lower the Q80 and Q90 flows, thereby improving headroom. Linked to this a Phosphorus permit limit of 0.25 mg/l is proposed for AMP8 which aligns for the TAL for this parameter. This should safeguard the effluent quality in terms of phosphorous helping reduce water quality pressures on the downstream receiving waterbody.

However, the existing Q80 and Q90 flows already exceed the permitted DWF and there is set to be a significant increase in flows to the works as a result of future development. In this regard, Thames Water may need to seek a permit variation to increase the authorised DWF. This may require further upgrades to the treatment works to improve effluent quality and maintain (or improve) pollutant loads. Any permit variation should be progressed well in advance of planned development.

3.3.9 Enstone STW

Enstone STW is located in the north of the district with a total catchment area of 0.5 km^2. It discharges to the Heythrop Stream at NGR: 437476, 225359 with a permitted DWF of 450 m^3/day.

One preferred spatial option site drains to Enstone STW, this is an employment allocation, Enstone Airport (V) which is planned to support 840 jobs. There are also a handful of extant development permissions within the STW catchment, totalling 6 dwellings.

The headroom assessment at the Enstone STW shows that the baseline Q80 and Q90 flows are below the permitted DWF, being 15.2% and 28.0% lower respectively. Additional development draining to the STW would cause a moderate increase in flows (see Figure 12), however importantly the projected Q80 and Q90 flows remain below the permitted DWF, being 5.4% and 18.3% lower respectively.

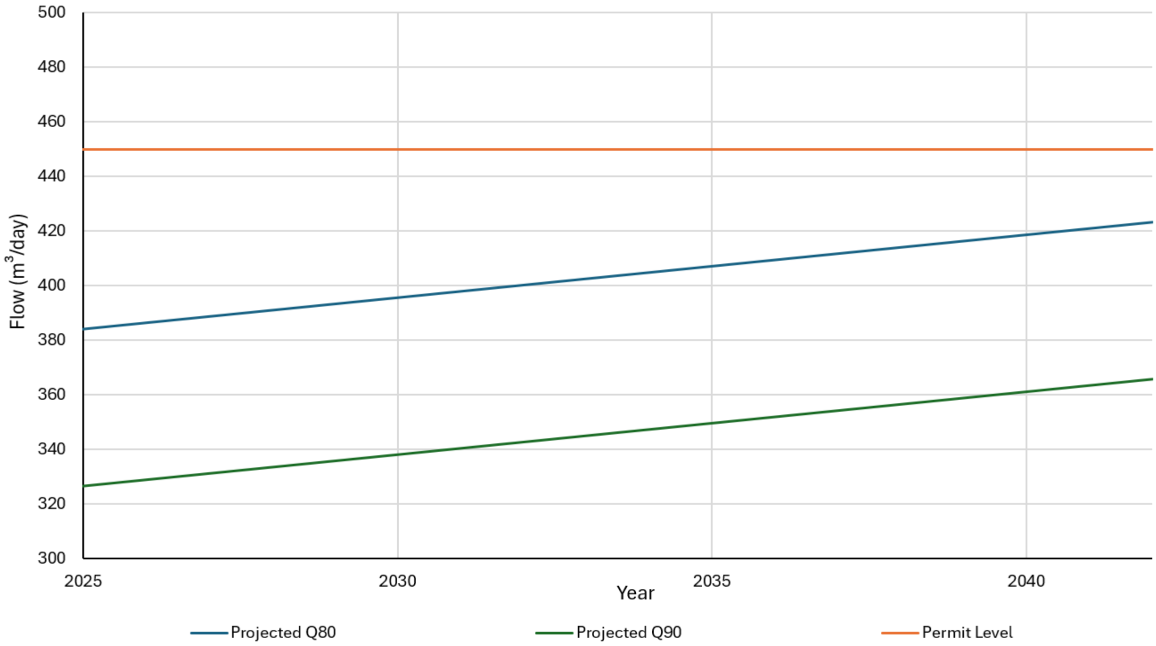

Figure 12 – Enstone STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will not be exceeded during the plan period as a result of future development. The STW underwent a site performance review recently. Following this assessment, Thames Water determined that no immediate capacity or operational upgrades were necessary to ensure compliance.

3.3.10 Middle Barton STW

Middle Barton STW is located in the northeast of the district with a total catchment area of 0.6 km^2. The site discharges to the River Dorn at NGR: 444730, 225409 with a permitted DWF of 396 m^3/day.

One preferred spatial option site drains to Middle Barton STW, this is the Middle Barton (S) site where 80 dwellings are proposed. There are also a handful of extant development permissions within the STW catchment, totalling 5 dwellings.

The headroom assessment at the Middle Barton STW shows that the baseline Q80 and Q90 flows are below the permitted DWF, being 28.1% and 36.9% lower respectively. Additional development draining to the STW would cause a moderate increase in flows (see Figure 13), however importantly the projected Q80 and Q90 flows remain below the permitted DWF, being 20.5% and 29.2% lower respectively.

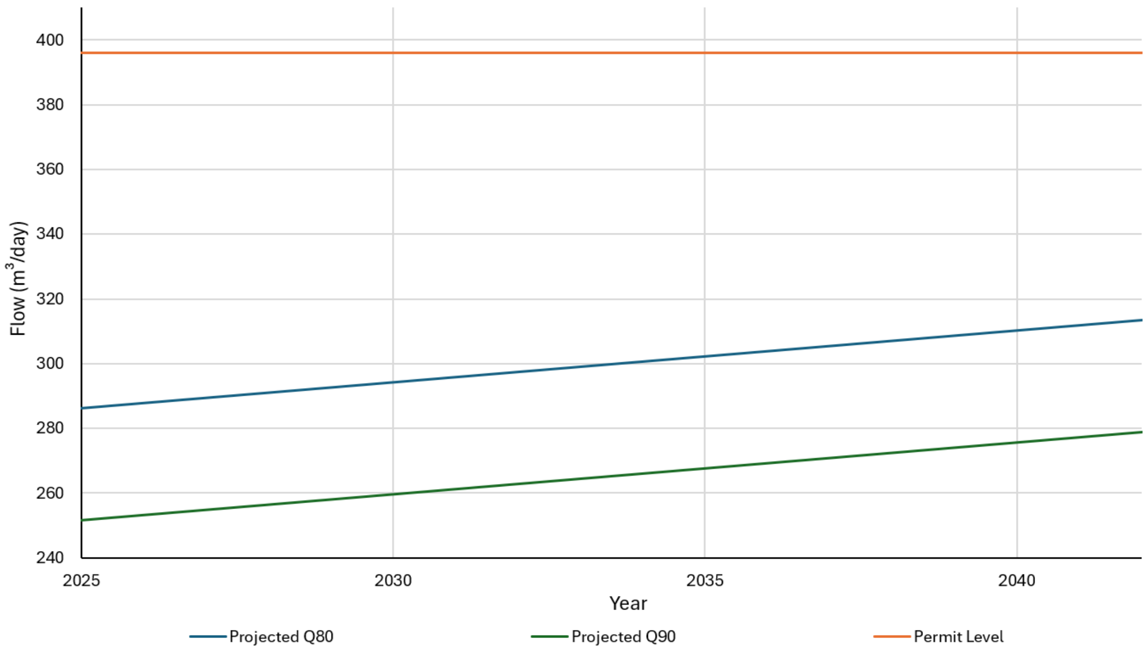

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Figure 13 – Middle Barton STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will not be exceeded during the plan period as a result of future development.

Middle Barton STW was upgraded in Spring 2025. This involved increasing the capacity of its storm tanks. This upgrade should reduce the need for untreated sewage discharges during storm conditions but is not expected to directly increase headroom at the site during dry weather flows. However, Thames Water are also planning to improve the STW's ability to treat volumes of incoming sewage. This should improve the general performance of the works and is due to be completed in 2029.

3.3.11 Standlake STW

Standlake STW is located in the southeast of the district with a total catchment area of 1.2 km^2. It discharges to the River Windrush at approximately NGR: 440361, 202283 with a permitted DWF of 500 m^3/day.

One preferred spatial option site drains to Standlake STW, this is the Downs (T) site where 200 dwellings are proposed. There are also several extant development permissions within the STW catchment, totalling 24 dwellings. Additionally, one Adopted Local Plan 2041 site, Cotswolds Farm (241 employees) will drain to Standlake STW.

The headroom assessment at the Standlake STW shows that the baseline Q80 and Q90 flows exceed the permitted DWF, being 38.4% and 27.9% higher respectively. Additional development draining to the STW would cause a moderate increase in flows (see Figure 14). By the end of the plan period, the projected Q80 and Q90 flows are 54.8% and 44.3% higher than the permitted DWF respectively.

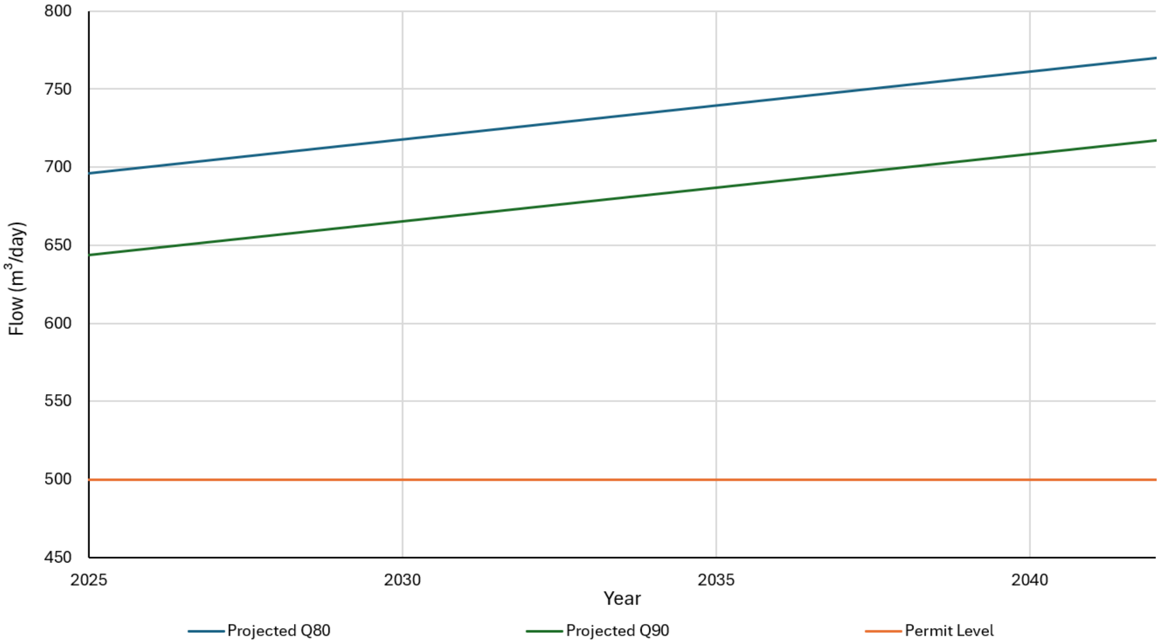

Figure 14 – Standlake STW DWF Headroom Forecast

Standlake STW is currently operating above its permitted DWF capacity under both the Q80 and Q90 flow scenarios and this exceedance is set to increase with future growth.

Thames Water has no immediate, large-scale capacity construction planned for the Standlake STW. Upgrades locally focus on groundwater infiltration management.

These measures are expected to reduce the volume of infiltration entering the sewer network and, consequently, the influent volume reaching the STW. However, given the existing capacity constraints and the projected increase in flows from new development, Thames Water may need to increase the treatment capacity of the works and seek amendments to the DWF permit to accommodate future flows. Any applications for permit amendments should be progressed well in advance of planned development coming forward within the catchment.

3.3.12 Tackley STW

Tackley STW is located in the northeast of the district with a total catchment area of 0.3 km^2. It discharges to the River Cherwell at approximately NGR: 448475, 219541 with a permitted DWF of 209 m^3/day.

One preferred spatial option site drains to Tackley STW, this is the Rousham Road (U) site where 70 dwellings are proposed. There is also an extant development permission for one dwelling.

The headroom assessment at the Tackley STW shows that the baseline Q80 and Q90 flows exceed the permitted DWF being 33.2% and 23.0% higher respectively. Additional development draining to the STW would cause a moderate increase in flows (see Figure 15). By the end of the plan period, the projected Q80 and Q90 flows are 35.6% and 23.0% higher than the permitted DWF respectively.

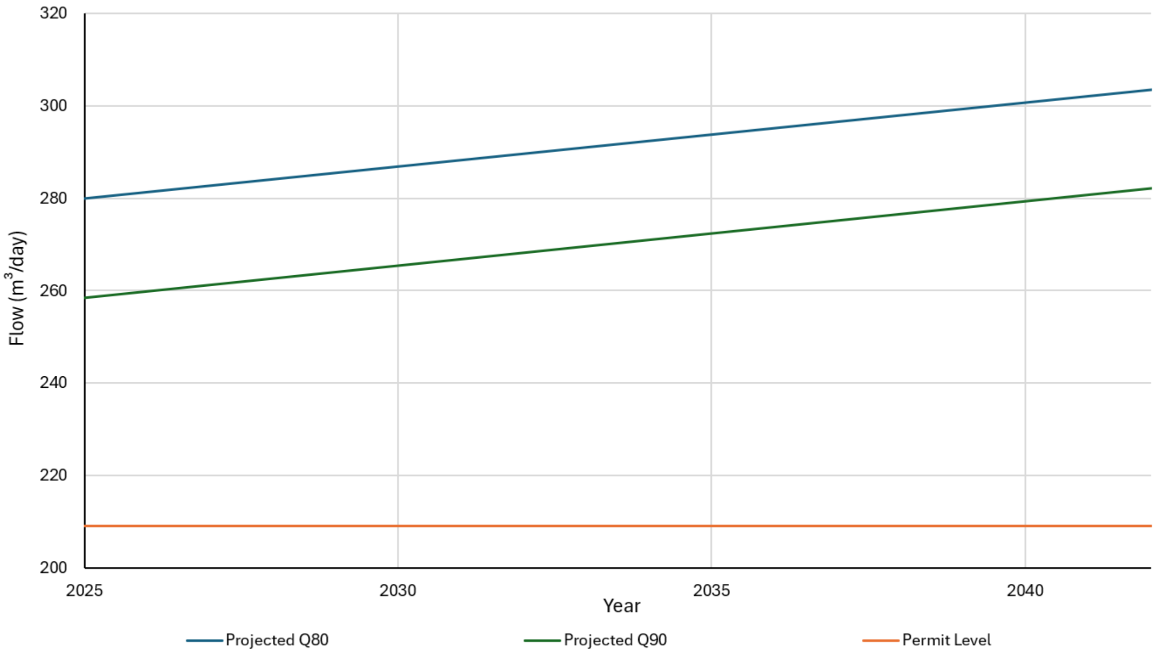

Figure 15 – Tackley STW DWF Headroom Forecast

Whilst the development proposed in the catchment is limited, Tackley STW is currently operating above its permitted DWF capacity under both the Q80 and Q90 flow scenarios and this exceedance is set to increase with future growth.

While local authorities and the EA have recorded historical permit breaches there are no upgrades planned for the works.

In view of this and the existing capacity constraints upgrades to the STW are likely required and Thames Water may need to seek amendments to the DWF permit to accommodate future flows. Any applications for permit amendments should be progressed well in advance of planned development coming forward within the catchment.

3.3.13 Witney STW

Witney STW is located in the centre of the district with a total catchment area of 10.3 km^2. It discharges to Colwell Brook at NGR: 434749, 208538 with a permitted DWF of 11,883 m^3/day.

A total of nine preferred spatial option sites drain to Witney STW, these are summarised in Table 6.

Table 6 – Preferred Spatial Option Sites Draining to Witney STW

<table>
<tr><th>Site Name</th><th>Dwelling Numbers</th><th>Job Numbers</th></tr>
<tr><td>Land North of Burford Road, Witney (A)</td><td>700</td><td></td></tr>
<tr><td>Land South of Witney (C)</td><td>700</td><td></td></tr>
<tr><td>Land West of Witney (D)</td><td>700</td><td></td></tr>
<tr><td>North East of Carterton (F)</td><td>2000</td><td></td></tr>
<tr><td>East of Brize Norton (H)</td><td>2000</td><td></td></tr>
<tr><td>Land South of Ducklington (Q)</td><td>40</td><td></td></tr>
<tr><td>Welch Way, Witney (W)</td><td>75</td><td></td></tr>
<tr><td>Land West of Downs Road (B)</td><td>-</td><td rowspan="2">1830</td></tr>
<tr><td>Land at New Close Lane and Windrush Park Road (G)</td><td>-</td></tr>
</table>

There are also two adopted local plan 2041 sites that drain to Witney STW, these are North Witney SDA (1250 dwellings) and Woodford Way, Car Park (50 dwellings). Additionally, there are also several extant development permissions draining to Witney STW, totalling 1817 dwellings.

The headroom assessment at the Witney STW shows that the baseline Q80 and Q90 flows are below the permitted DWF being 3.3% and 16.4% lower respectively. Additional development draining to the STW would cause a significant increase in flows (see Figure 16), with the projected Q80 and Q90 flows forecast to exceed the permitted DWF, being 21.3% and 8.3% higher respectively.

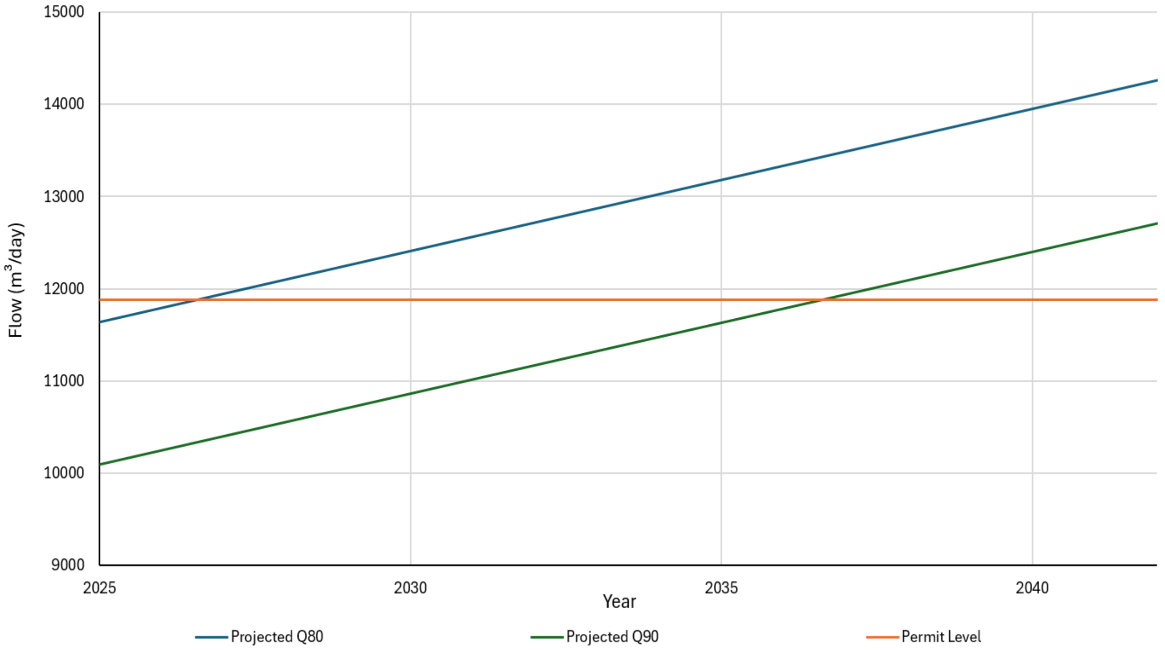

Figure 16 – Witney STW DWF Headroom Forecast

The assessment indicates that the permitted DWF will be exceeded in both the Q80 and Q90 flow scenarios as a result of future development.

Importantly, Witney STW has recently been upgraded at a cost of more than £16 million. This work has provided a major increase in treatment capacity from 240 to 399 litres per second. This work was completed in 2026 and is not anticipated to have had an impact on the sample period assessed for this study. The impact of groundwater on the sewer network in the catchment area is also being investigated.

The increase in the treatment works' capacity to store and treat sewage should reduce the volume and frequency of discharges to the receiving environment. In addition, future measures to reduce groundwater infiltration should lessen its contribution to influent flows. Collectively, these measures are expected to reduce Q80 and Q90 flows from the STW, thereby improving headroom.

However, as there is set to be a significant increase in flows to the works as a result of future development, Thames Water may also need to seek a permit variation to increase the authorised DWF. This may require further upgrades to the treatment works to improve effluent quality and maintain (or improve) pollutant loads. Any permit variation should be progressed well in advance of planned development.

3.4 Summary

Table 7 and Table 8 provide a summary of the headroom assessments when considering the Q80 flow and Q90 flow respectively.

At 6 of the 13 STWs (Bledington, Burford, Cassington, Charlbury, Enstone and Middle Barton STWs) the Q80 flow will not exceed the current permitted DWF by the end of the plan period. Significant infrastructure upgrades are planned for Cassington STW, and Charlbury and Middle Barton STW also are scheduled to receive some infrastructure improvements. While no infrastructure upgrades are proposed at Bledington STW, its phosphorus permit will be tightened. No infrastructure upgrades or permit changes are currently proposed for Enstone STW or Burford STW.

At 4 of 13 STWs (Bampton, Carterton, Chipping Norton and Witney STWs) the current permitted DWF will be exceeded by the end of the plan period, albeit by less than 25% (highlighted in amber).

In terms of upgrades, a major capacity upgrade has recently been completed at Witney STW and treatment capacity is set to be increased at Bampton STW, Carterton STW and Chipping Norton STW. The majority of these upgrades should take place at the start of the plan period.

At 3 of the 13 STWs (Church Hanborough, Standlake and Tackley STWs) the current DWF permits will be exceeded by more than 25% by the end of the plan period (highlighted in red). For the Standlake STW the exceedance remains more than 25% when considering the Q90 flow.

Whilst upgrades are planned at the Church Hanborough STW the timing of these remain unclear and at Standlake STW and Tackley STW no upgrades in treatment capacity are proposed.

Table 7 – Summary of Headroom Assessment for Q80 Flow (m^3/day)

STW Name	Q80 (5-yr average 20-24)	Projected Q80 (All Authorities)	Permitted DWF	Headroom Available Projected (%)
Bampton	931	1036	853	-21.5
Bledington	187	214	249	13.9
Burford	358	451	467	3.3
Carterton	3677	4547	3884	-17.1
Cassington	3030	3890	4000	2.8
Charlbury	447	497	727	31.6
Chipping Norton	1963	2320	2000	-16.0
Church Hanborough	1875	2076	1455	-42.7
Enstone	382	425	450	5.4
Middle Barton	285	315	396	20.5
Standlake	692	774	500	-54.8
Tackley	278	305	209	-35.6
Witney	11486	14418	11883	-21.3

Table 8 - Summary of Headroom Assessment for Q90 Flow (m³/day)

STW Name	Q90 (5-yr average 20-24)	Projected Q90 (All Authorities)	Permitted DWF	Headroom Available Projected (%)
Bampton	860	964	853	-13.1
Bledington	164	192	249	23.0
Burford	336	429	467	8.1
Carterton	3440	4310	3884	-11.0
Cassington	2856	3716	4000	7.1
Charlbury	422	472	727	35.1
Chipping Norton	1830	2187	2000	-9.3
Church Hanborough	1568	1768	1455	-21.5
Enstone	324	368	450	18.3
Middle Barton	250	280	396	29.2
Standlake	639	722	500	-44.3
Tackley	257	283	209	-23.0
Witney	9934	12865	11883	-8.3

It should be noted that the assessments are precautionary in that they assume that all allocations will be builtand do not take into account planned or longer-term increases in DWF and treatment capacity. For example, the recent upgrades to Witney STW may serve to lower the Q80 and Q90 flow monitored at the works giving more headroom for development to take place.

In its response to Ofwat's PR24 draft determinations[7] [8] Thames Water has committed to achieving 100% compliance with all permits to discharge wastewater in AMP8. However, Thames Water has stated that this will be challenging due to climate change and the inclusion of DWF assessment under AMP8. Currently, EA assessment of compliance with DWF permit conditions at each STW is ad-hoc. The EA has stated that it will be formalising and standardising its DWF compliance assessment for application in AMP8.

Upgrades have been completed recently or are planned for many of the STWs assessed, however the specific impacts these upgrades have on headroom is yet to be confirmed. Thames Water may need to invest in further upgrades and apply for new permits to ensure compliance up to 2043. The EA will need to consider development against infrastructural and environmental capacity in agreeing these permits to ensure that development can progress sustainably without presenting a risk to the water environment.

Once funding has been obtained for upgrading and/or building new infrastructure, there remain significant lead times for planning and construction before infrastructure can be considered functional. In this respect, wastewater companies require detailed information on likely housing development well in advance. Table 9 outlines the lead time estimates provided by Thames Water.

[7] Ofwat (2024) *PR24 draft determinations: Sector summary* https://www.ofwat.gov.uk/publication/pr24-draft-determinations-sector-summary/

[8] Thames Water (2024) *TMS-DD-039: Thames Water PR24 DD response – Outcomes* https://www.thameswater.co.uk/media-library/home/about-us/regulation/our-five-year-plan/draft-determination-2024/thematic-chapters/TMS-DD-039-Thames-Water-PR24-DD-response-Outcomes.pdf

Table 9- Thames Water estimate of infrastructure lead in time

Resource	Lead in time
Sewerage network upgrades	1-3 Years
Wastewater treatment upgrade	3-5 Years
Major resource development (new reservoir, new STW etc)	8-10 Years

In developing their emerging local plan, West Oxfordshire District Council published a draft preferred policy options paper in June 2025[9]. This included Policy *CP7 – Water Environment*, which aims to ensure that development does not adversely impact water bodies or aquatic ecosystems, requiring a detailed wastewater and water quality strategy for all major development proposals.

Further to this policy, it is recommended that West Oxfordshire District Council take the following actions:

- In liaison with Thames Water, consider available STW capacity in the assessment of planning applications and seek to align the delivery of development and infrastructure upgrades. This is particularly the case for large scale developments (>1000 Dwellings).
- Share their Annual Monitoring Reports and Housing Land Supply Statements, which details projected housing growth in their administrative areas, with Thames Water.
- Provide a copy of the WCS to planning colleagues at neighbouring local authorities, Thames Water, the EA, and Oxfordshire County Council as the waste planning authority.
- West Oxfordshire District Council should promote the use of SuDS at development sites and where appropriate sewer separation.

In response to these actions, Thames Water will need to assess growth demands as part of their wastewater asset planning activities and feedback to West Oxfordshire District Council if concerns arise. Thames Water will also need to secure relevant planning permissions to upgrade its wastewater facilities. Thames Water should work proactively with the EA as the principal environmental regulator for the water industry and Oxfordshire County Council as the waste planning authority to do this.

[9] WODC (2025) *Draft Preferred Options Paper* https://www.westoxon.gov.uk/media/qf3bnn0n/wodc-local-plan-preferred-policy-options-consultation-paper-june-2025.pdf

4 Water Quality Assessment

4.1 Introduction

An increase in the discharge of effluent from STWs due to development can lead to a negative impact on the water quality of the receiving watercourse. Under the Water Framework Directive (WFD) [10], a watercourse should not deteriorate from its current WFD status either as an overall watercourse or for each of the individual elements assessed. Table 10 gives a description of how the WFD defines each of the status or classes. For this study, the elements assessed include the following:

Ammonia- Ammonia is an inorganic chemical compound of nitrogen and hydrogen with the formula NH_3. It is used as a fertilizer, cleaning product and in the production of plastics. Sewage is also a source of ammonia.

Biochemical Oxygen Demand (BOD)- BOD is a measure of how much oxygen is used to break down organic matter in water. It is an important indicator of water quality and organic pollution. A high BOD indicates that there is more organic pollution in the water. BOD is used to measure the level of organic pollution in wastewater before it's released to a watercourse.

Total Phosphorous- Total phosphorus is the sum of all phosphorus in a sample, including dissolved and particulate forms. It is a key measurement used to assess water quality and wastewater treatment. Sewage, fertilizer and urban runoff are key human-made sources.

Orthophosphate- Orthophosphate is the most readily used form of phosphorous. It is a phosphorus compound commonly used in water treatment of lead and copper. Sewage, fertilizer and urban runoff are key sources.

The impact of development on these elements has been determined by undertaking water quality modelling. The study also provides results for total phosphorous which is a key measurement to assess water quality, however not one of the individual elements assessed by the WFD.

Table 10- Definition of status in Water Framework Directive

Status/Class	Definition
High	Near natural conditions. No restriction on the beneficial uses of the waterbody. No impacts on amenity, wildlife, or fisheries.
Good	Slight change from natural conditions because of human activity. No restriction on the beneficial uses of the waterbody. No impact on amenity or fisheries. Protects all but the most sensitive wildlife
Moderate	Moderate change from natural conditions because of human activity. Some restriction on the beneficial uses of the waterbody. No impact on amenity. Some impact on wildlife and fisheries.
Poor	Major change from natural conditions because of human activity. Some restrictions on the beneficial uses of the waterbody. Some impact on amenity. Moderate impact on wildlife and fisheries.
Bad	Severe change from natural conditions because of human activity. Significant restriction on the beneficial uses of the waterbody. Major impact on amenity. Major impact on wildlife and fisheries with many species not present.

[10] European Commission, *Water Framework Directive (2000)*, http://ec.europa.eu/environment/water/water-framework/index_en.html

Where the scale of development is such that a deterioration in water quality is predicted, a variation in the STW's Environmental Permit (EP) to improve the quality of the final effluent and prevent deterioration will be required. This is known as no deterioration load standstill and satisfies the no deterioration requirement of the WFD. In addition to safeguarding against deterioration, a further aim of the WFD is for all surface water bodies to achieve good ecological status. Thus, the WFD's aim of good ecological status and the need to meet other river quality targets is also considered by the EA when setting or varying a permit.

The standard framework for how the requirements and aims of the WFD should be implemented on inland waters has been set out by the EA. The potential impact of development is assessed in relation to the following criteria:

- **Could the development cause a deterioration in WFD status of any element assessed?** This is a requirement of the WFD to prevent a deterioration in status of individual contaminants.
- **Could the development alone prevent the receiving watercourse from reaching good ecological status?**

  This is a requirement of the WFD, it assesses whether good ecological status is possible after development with current technology or is technically possible when considering TALs for wastewater treatment.
- **Could the development cause a greater than 10% deterioration in water quality?** This objective is to ensure that all the environmental capacity is not taken up by one stage of development and ensure there is sufficient capacity for future development. It is assessed against current technology and TALs.

To assess these three criteria, the EA's SIMCAT model for the Thames catchment has been used. This has included a review of the model, baseline model runs, post-development model runs with current technology, post-development model runs considering TALs and consideration of any AMP8 schemes.

4.2 Review of EA SIMCAT River Thames Model

The EA's water quality river model SIMCAT (Simulation of Catchments) is a crucial tool for setting and reviewing discharge permits at a catchment scale and to quantify the source apportionment of both point and diffuse pollutant load within receiving watercourses.

In terms of wastewater, SIMCAT has been used for calculating the impact of discharges from STWs at a catchment scale and is often used to determine the permit standards required to meet the WFD's targets and requirements.

Driven by summary statistics defining the mean and standard deviations of flow and quality, SIMCAT uses Monte Carlo simulation to predict in-river summary statistics. Monte Carlo Simulation is a type of modelling that uses repeated random sampling to obtain the likelihood of a range of results of occurring.

In this study, the EA provided the SIMCAT model for the River Thames in April 2026. It has been run using SIMCAT v15.7. The EA have confirmed that the model has been calibrated for phosphate at a sub-catchment and water body scale. Whilst Ammonia and BOD has been calibrated using auto-calibration techniques at the catchment scale, followed by local checks.

To assess whether the model was fit for purpose at the reach scale, the modelled results were compared to the observed results at the water quality points closest (in terms of distance downstream) to each of the 13 STWs scoped in for assessment. Ultimately this applied to only 8 of the STWs as Bampton, Bledington, Burford Cassington and Chipping Norton STWs did not have a downstream monitoring point on their reaches.

The modelled and observed mean and 95th percentile values for Ammonia, BOD and orthophosphate were compared and in general showed a good level of agreement, confirming that the model is fit for purpose. Note, whilst modelled results are generated for total phosphorous, observed results are not available.

In terms of the WFD classifications, the 2019 classifications already contained in the EA's SIMCAT model have been used. However, a review has been undertaken of all of the STWs comparing the latest 2022 classifications against the 2019 classifications applied. This has identified whether there has been a change in WFD class for any of the metrics assessed. Where a change is identified, the potential implications on water quality and development are considered. Table 11 lists the receiving watercourses and WFD waterbody for each STW.

Table 11- Receiving watercourse and WFD waterbody for each STW

STW Name	Receiving Watercourse	WFD Waterbody
Bampton	Shill Brook	Shill Brook and Tributaries
Bledington	River Evenlode	Evenlode (Bledington to Glyme confluence)
Burford	River Windrush	Windrush and tributaries (Little Rissington to Thames)
Carterton	Shill Brook	Shill Brook and Tributaries
Cassington	River Thames	Thames (Evenlode to Thame)
Charlbury	River Evenlode	Evenlode (Bledington to Glyme confluence)
Chipping Norton	River Evenlode	Cornwell Brook and tributaries (Source to Evenlode)
Church Hanborough	River Evenlode	Evenlode (Glyme to Thames)
Enstone	Heythrope Stream	Heythorpe Stream and tributaries
Middle Barton	River Dorn	Dorn (Source to Glyme)
Standlake	River Windrush	Windrush and tributaries (Little Rissington to Thames)
Tackley	River Cherwell	Cherwell (Nell Bridge to Bletchingdon)
Witney	Colwell Brook	Windrush and tributaries (Little Rissington to Thames)

The overall ecological classification and the specific classifications for the parameters assessed in this study are reviewed where possible. Note, at the majority of the waterbodies BOD is not monitored. The 2019 and 2022 chemical classifications are not compared, given changes to assessment method between the two cycles.

Table 12 compares the 2019 and 2022 WFD classifications, where class changes have occurred, these are highlighted in bold text. For the majority of WFD waterbodies, the 2019 and 2022 classifications are the same. This indicates that no significant improvement or deterioration in the parameters assessed. However, in some cases, the 2019 classifications will have been used to inform and contribute to the 2022 classifications. This will be the case if the monitoring of a particular parameter has ceased at a monitoring location, meaning that there is no data to inform the 2022 classification. In these cases, the 2019 classifications will be utilised for the 2022 classification and cycle 3 assessments.

Table 12- Comparison between 2019 and 2022 WFD Classifications

WFD Waterbody	Classification	Ecological	Ammonia	Phosphate
Cherwell (Nell Bridge to Bletchingdon)	2019	Moderate	High	Poor
	2022	Moderate	High	Poor
Cornwell Brook and tributaries (Source to Evenlode)	2019	Moderate	High	Poor
	2022	Moderate	High	Poor
Dorn (Source to Glyme)	2019	Poor	High	Moderate
	2022	Poor	High	Moderate
Evenlode (Bledington to Glyme confluence)	2019	Moderate	High	Poor
	2022	Moderate	High	Poor
Evenlode (Glyme to Thames)	2019	Poor	High	Poor
	2022	Poor	High	Poor
Heythrop Stream and tributaries	2019	Moderate	High	High
	2022	**Poor**	High	High
Shill Brook and Tributaries	2019	Poor	High	Good
	2022	Poor	**Good**	**Moderate**
Thames (Evenlode to Thame)	2019	Moderate	High	Moderate
	2022	**Poor**	High	Moderate
Windrush and tributaries (Little Rissington to Thames)	2019	Moderate	High	Moderate
	2022	Moderate	High	**Good**

Of the nine WFD Waterbodies, there are four WFD Waterbodies where changes in classification have occurred. For the Heythrop Stream and Tributaries waterbody and the Thames (Evenlode to Thames) waterbody the overall ecological status has fallen from Moderate to Poor. This is related to a deterioration in biological quality elements, rather than the physico-chemical quality elements assessed in this study. Specifically, there was a fall in fish populations between the cycles, attributed mostly to land drainage and physical modifications to the channel rather than sewage discharge.

For the Shill Brook and Tributaries waterbody the classification for Ammonia has fallen from High to Good and for Phosphate from Good to Moderate. The reason for the deterioration in Phosphate is attributed to sewage discharge. For the Windrush and tributaries (Little Rissington to Thames) waterbody, the Phosphate status has improved from Moderate to Good. The reason for not achieving Good status for Phosphate in 2019 was attributed to sewage discharge.

Overall, the 2019 and 2022 classifications are very similar. For the majority of waterbodies where changes have occurred, they are either not related to the physico-chemical quality elements assessed in this study or show an improvement in one of these elements, meaning that the 2019 classification used in this study can be considered precautionary. This is with the exception of the Shill Brook and Tributaries waterbody. For this waterbody, the fall in the classification for Phosphate is attributable to sewage discharge and therefore is relevant to this study. The discrepancy effects Bampton STW and Carterton STW and will be considered when reviewing the results at these STWs.

4.3 Review of TALs against existing effluent quality

Once the model had been confirmed as fit for purpose, the existing effluent quality values at each STW (contained in the SIMCAT data files provided by the EA) were compared to the proposed TAL values for ammonia, BOD and total phosphorous. The TALs are levels of effluent quality that can be consistently achieved in practice using standard wastewater treatment, they are not theoretical maximums especially at sites where pollutant loads from influent are low. Orthophosphate was not included as there are no proposed TAL values for this parameter. The proposed TALs for ammonia and BOD relate to the 95th percentile whilst the TAL for total phosphorous is related to the mean.

The SIMCAT model provides a mean value and standard deviation for each parameter. To allow a comparison of the existing effluent quality to the TALs for ammonia and BOD, it was necessary to estimate the 95th percentile values for the existing effluent quality. This was achieved using the RQP software[11], it applies Monte Carlo methods which consider the mean, standard deviation and number of samples associated with a parameter before estimating the relevant percentiles. For the parameters assessed in this study a log-normal distribution was assumed.

The results of this exercise are shown in Table 13. These show that in most cases the TAL values for effluent quality were better than the existing effluent quality values at the STWs, these are marked as green in the table. There were some exceptions, at Bampton STW, Burford STW, Chipping Norton STW and Witney STW where the existing effluent concentrations are generally lower than the TAL values for Ammonia and BOD ammonia, these are marked in red in the table. In these cases, it is important to note that TALs are not theoretical maximums, but rather the levels that can be reliably achieved using standard wastewater treatment processes. At certain sites, the incoming pollutant loads may be lower than elsewhere, meaning effluent quality could exceed the TALs.

The approach taken updates all existing effluent values to the TAL values even where the existing values show lower concentrations. This means that applying the standard TAL values at such sites would therefore represent a deterioration in effluent quality for some parameters, potentially leading to a decline in water quality in the receiving watercourse.

Table 13- Comparison of the existing STW effluent quality and TAL values

STW Name	Parameter	Existing effluent (mg/l)	TAL values (mg/l)
Bampton	Ammonia	0.29	1.0
	BOD	8.37	5.0
	Total Phosphorous	6.00	0.25
Bledington	Ammonia	1.60	1.0
	BOD	9.23	5.0
	Total Phosphorous	6.00	0.25
Burford	Ammonia	0.60	1.0
	BOD	4.94	5.0
	Total Phosphorous	6.00	0.25
Carterton	Ammonia	2.21	1.0
	BOD	6.28	5.0
	Total Phosphorous	0.55	0.25
Cassington	Ammonia	1.00	1.0
	BOD	7.52	5.0
	Total Phosphorous	1.06	0.25
Charlbury	Ammonia	4.95	1.0
	BOD	9.31	5.0
	Total Phosphorous	8.58	0.25
Chipping Norton	Ammonia	0.67	1.0
	BOD	4.34	5.0
	Total Phosphorous	6.00	0.25
Church Hanborough	Ammonia	1.22	1.0
	BOD	7.50	5.0
	Total Phosphorous	5.10	0.25
Enstone	Ammonia	1.04	1.0
	BOD	7.58	5.0
	Total Phosphorous	3.00	0.25
Middle Barton	Ammonia	11.20	1.0
	BOD	14.60	5.0
	Total Phosphorous	8.10	0.25

[11] Environment Agency (2025) *RQP_v6c* https://github.com/DEFRA/rqp-mper/tree/main/executables/Files

Standlake	Ammonia	6.84	1.0
	BOD	12.80	5.0
	Total Phosphorous	6.00	0.25
Tackley	Ammonia	4.71	1.0
	BOD	6.47	5.0
	Total Phosphorous	7.88	0.25
Witney	Ammonia	0.21	1.0
	BOD	4.83	5.0
	Total Phosphorous	0.78	0.25

4.4 Model Results

The SIMCAT model was subsequently run for three scenarios, i). a baseline considering the averaged 2020-2024 Q80 values with current technology applied, ii). a post-development scenario considering growth up to 2043 with current technology applied and iii). a post-development scenario considering growth up to 2043 with TALs applied.

Table 14 compares the existing flows in the SIMCAT model against the updated 2020-2024 baseline Q80 flows and the post-development flows.

Table 14- Comparison between existing, baseline (20-24) and post-development Q80 flows (m^3/day)

STW Name	Existing	Baseline (2020-2024)	Post-Development
Bampton	997	931	1036
Bledington	162	187	214
Burford	519	358	451
Carterton	3758	3677	4547
Cassington	4991	3030	3890
Charlbury	519	447	497
Chipping Norton	2123	1963	2320
Church Hanborough	1907	1875	2076
Enstone	537	382	425
Middle Barton	370	285	315
Standlake	944	692	774
Tackley	258	278	305
Witney	13233	11486	14418

For the final post-development run with TALs applied, the effluent quality at each STW was updated to match the TALs for Ammonia, BOD and Phosphorous. Phosphorus and orthophosphate levels are not linked in the model, so orthophosphate is insensitive to the application of the TAL for Phosphorous. However, in reality if the removal of total phosphorous is improved at a STW it should also lead to a lowering of orthophosphate which is a phosphorous compound and included in the measurement of total phosphorous.

To obtain an estimate of the impact of the TALs on orthophosphate concentrations and WFD status at each STW (noting that total phosphorous has no defined standard in the WFD), the ratio of orthophosphate to total phosphorous in the post-development runs with current technology has been estimated. It has then been multiplied by the total phosphorous estimated following the application of TALs. It should be noted that the relationship between total phosphorous and orthophosphate is complex, so the orthophosphate values derived using this method are subject to greater uncertainty. Table 15 shows the orthophosphate to total phosphorous applied at each of the STWs.

Table 15- Orthophosphate/Total Phosphorous Ratios

STW Name	Parameter	Baseline water quality (mg/l)	Orthophosphate/ Total Phosphorous Ratio
Bampton	Orthophosphate (Mean)	0.422	0.676
	Total Phosphorous (Mean)	0.624	
Bledington	Orthophosphate (Mean)	0.334	0.656
	Total Phosphorous (Mean)	0.509	
Burford	Orthophosphate (Mean)	0.066	0.566
	Total Phosphorous (Mean)	0.116	
Carterton	Orthophosphate (Mean)	0.250	0.553
	Total Phosphorous (Mean)	0.452	
Cassington	Orthophosphate (Mean)	0.117	0.459
	Total Phosphorous (Mean)	0.255	
Charlbury	Orthophosphate (Mean)	0.315	0.743
	Total Phosphorous (Mean)	0.424	
Chipping Norton	Orthophosphate (Mean)	1.480	0.585
	Total Phosphorous (Mean)	2.530	
Church Hanborough	Orthophosphate (Mean)	1.630	0.791
	Total Phosphorous (Mean)	2.060	
Enstone	Orthophosphate (Mean)	0.198	0.283
	Total Phosphorous (Mean)	0.699	
Middle Barton	Orthophosphate (Mean)	0.209	0.259
	Total Phosphorous (Mean)	0.808	
Standlake	Orthophosphate (Mean)	0.0947	0.696
	Total Phosphorous (Mean)	0.136	
Tackley	Orthophosphate (Mean)	0.217	0.687
	Total Phosphorous (Mean)	0.316	
Witney	Orthophosphate (Mean)	0.778	0.763
	Total Phosphorous (Mean)	1.020	

Table 16 shows the changes in the relevant parameters between the baseline run with current technology, the post-development run with current technology and the post development run with TALs applied. The colours show the WFD status. Values are presented in bold in the final column where there has been a WFD status change with the application of TALs relative to the baseline WFD status. The key findings from the post-development runs with TALs applied are summarised after the table.

Table 16- Comparison of Baseline, Post-Development and Post-Development (TALs applied) water quality results

STW Name	Parameter	Baseline Existing water quality (mg/l)	Post-Development water quality (mg/l)	Post-Development water quality TALs applied (mg/l)
Bampton	Ammonia (90-percentile)	0.185	0.185	0.195
	BOD (90-percentile)	1.850	1.970	1.530
	Orthophosphate (Mean)	0.403	0.422	0.127
	Total phosphorus (Mean)	0.601	0.624	0.188
Bledington	Ammonia (90-percentile)	0.0712	0.0713	0.0712
	BOD (90-percentile)	1.20	1.20	1.19
	Orthophosphate (Mean)	0.332	0.334	0.313
	Total phosphorus (Mean)	0.505	0.509	0.477
Burford	Ammonia (90-percentile)	0.0627	0.0637	0.0642
	BOD (90-percentile)	0.861	0.865	0.865
	Orthophosphate (Mean)	0.0561	0.0657	0.0590
	Total phosphorus (Mean)	0.104	0.116	0.104
Carterton	Ammonia (90-percentile)	1.20	1.26	0.906
	BOD (90-percentile)	3.54	3.72	2.75
	Orthophosphate (Mean)	0.230	0.250	0.145
	Total phosphorus (Mean)	0.432	0.452	0.262
Cassington	Ammonia (90-percentile)	0.0565	0.0570	0.0568
	BOD (90-percentile)	0.779	0.782	0.765
	Orthophosphate (Mean)	0.112	0.117	0.097
	Total phosphorus (Mean)	0.249	0.255	0.211
Charlbury	Ammonia (90-percentile)	0.0596	0.0632	0.0492
	BOD (90-percentile)	1.04	1.04	1.04
	Orthophosphate (Mean)	0.300	0.315	0.215
	Total phosphorus (Mean)	0.405	0.424	0.290
Chipping Norton	Ammonia (90-percentile)	0.226	0.246	0.382
	BOD (90-percentile)	2.29	2.38	2.70
	Orthophosphate (Mean)	1.34	1.48	0.111
	Total phosphorus (Mean)	2.30	2.53	0.189
Church Hanborough	Ammonia (90-percentile)	0.561	0.592	0.565
	BOD (90-percentile)	3.41	3.53	2.36
	Orthophosphate (Mean)	1.53	1.63	0.169
	Total phosphorus (Mean)	1.95	2.06	0.214
Enstone	Ammonia (90-percentile)	0.0752	0.0789	0.0321
	BOD (90-percentile)	1.74	1.77	1.59
	Orthophosphate (Mean)	0.181	0.198	0.152
	Total phosphorus (Mean)	0.684	0.699	0.563
Middle Barton	Ammonia (90-percentile)	0.300	0.324	0.0288
	BOD (90-percentile)	1.60	1.61	1.45
	Orthophosphate (Mean)	0.192	0.209	0.163
	Total phosphorus (Mean)	0.790	0.808	0.632
Standlake	Ammonia (90-percentile)	0.0529	0.0544	0.0584
	BOD (90-percentile)	0.741	0.749	0.742
	Orthophosphate (Mean)	0.0835	0.0947	0.064
	Total phosphorus (Mean)	0.126	0.136	0.091
Tackley	Ammonia (90-percentile)	0.0667	0.0670	0.0622
	BOD (90-percentile)	0.708	0.708	0.707
	Orthophosphate (Mean)	0.216	0.217	0.209
	Total phosphorus (Mean)	0.315	0.316	0.305
Witney	Ammonia (90-percentile)	0.199	0.199	0.938
	BOD (90-percentile)	3.72	3.78	3.95
	Orthophosphate (Mean)	0.767	0.778	0.269
	Total phosphorus (Mean)	1.00	1.02	0.353

WFD Status
High
Good
Moderate
Poor
Bad

Baseline Results

- The baseline model results for ammonia indicate that for 11 of the 13 STWs, the receiving watercourses achieve High WFD status. The exceptions are Church Hanborough STW, which discharges to the River Evenlode, where ammonia was modelled as Good and Carterton STW, which discharges to the Shill Brook, where ammonia was modelled as Poor.
- The baseline model results for BOD indicate that for all 13 STWs, the receiving watercourses achieve High WFD status.
- The baseline model results for orthophosphate indicate that the receiving watercourse downstream of Burford STW has Good WFD status. Receiving watercourses downstream of Cassington, Enstone, and Standlake STWs have Moderate status, while those downstream of Bampton, Bledington, Carterton, Charlbury, Middle Barton, Tackley, and Witney STWs have Poor status. The receiving watercourses downstream of Chipping Norton and Church Hanborough STWs have Bad status.

Post- Development Results

- The post-development modelling results for ammonia indicate modest increases in ammonia concentrations downstream of 12 of the 13 STWs. However, in all but one case, the WFD status remains unchanged from the baseline. The exception is at Middle Barton STW, where the increase in ammonia concentration results in a deterioration in the receiving watercourse from High to Good WFD status. At Bampton STW, no change in ammonia concentration is predicted. This is attributed to the effluent's ammonia concentration being similar to, or lower than, that of the receiving watercourse.
- The post-development modelling results for BOD indicate modest increases in ammonia concentrations downstream of 10 of the 13 STWs. In all of these cases, the WFD status remains unchanged from the baseline. At Bledington, Charlbury and Tackley STWs, no change in BOD concentration is predicted. This is once more attributed to the effluent BOD concentration being similar to, or lower than, that of the receiving watercourse.
- The post-development model results for Total Phosphorous and orthophosphate show an increase in concentrations at all of the sites. At all the sites the WFD status remains the same as in the baseline.

Post- Development Results with Application of TALs

- The post-development modelling results with TALs applied indicate a reduction or no change in downstream ammonia concentrations compared with the baseline scenario at 6 of the 13 STWs (Bledington, Carterton, Charlbury, Enstone, Middle Barton and Tackley STWs). At Carterton STW, this improvement also results in the WFD status improving from Poor to Moderate.
- At Cassington STW and Church Hanborough STW, although downstream ammonia concentrations are reduced relative to the post-development scenario with current technology, they remain above baseline levels. Importantly the WFD status remains unchanged across all three scenarios.
- For the remaining five STWs, downstream ammonia concentrations increase under the TAL scenario. This is expected at four of the sites, with Bampton, Burford, Chipping Norton, and Witney STWs all having existing effluent ammonia quality that is better than the applicable TAL. As such, the TAL scenario is not considered representative of future treatment improvements at these sites.
- The fifth site is Standlake STW whilst it has an existing effluent quality worse than the applicable TAL, it is located downstream of Burford and Witney STWs and is therefore influenced by the deterioration in their effluent quality. An additional model run with only Standlake set to the TALs

resulted in a reduction in downstream ammonia concentration relative to the baseline (0.0421 mg/L). This is considered more representative of the impacts of improved treatment at the works.

- The post-development modelling results with TALs applied indicate that downstream BOD concentrations are either reduced or unchanged relative to the baseline scenario at 10 of the 13 STWs. At the remaining three sites (Burford, Chipping Norton, and Witney STWs), the current effluent BOD quality is already better than the applicable TAL. Consequently, the TAL scenario is not considered to provide a realistic representation of future treatment improvements at these sites. Across all three scenarios, the WFD status remains unchanged for all sites.
- The post-development modelling results with TALs applied indicate a reduction in downstream total phosphorus and orthophosphate concentrations relative to the baseline scenario at all STWs. At six STWs, these reductions result in an improvement in the WFD status of the downstream receiving watercourses. Specifically, Bampton, Carterton, and Middle Barton STWs improve from Poor to Moderate status; Chipping Norton and Church Hanborough STWs improve by two WFD classes, from Bad to Moderate; and Standlake STW improves from Moderate to Good status.

To better visualise the results, three graphs have been generated showing the changes in ammonia (

Figure 17), BOD (Figure 18) and total phosphorus (Figure 19) across the three scenarios. These graphs show the impacts of development and the subsequent changes if TALs are applied. No graph is provided for orthophosphate, given that the results were post-processed using the method outlined in Section 4.4 and that the WFD standards are reach specific.

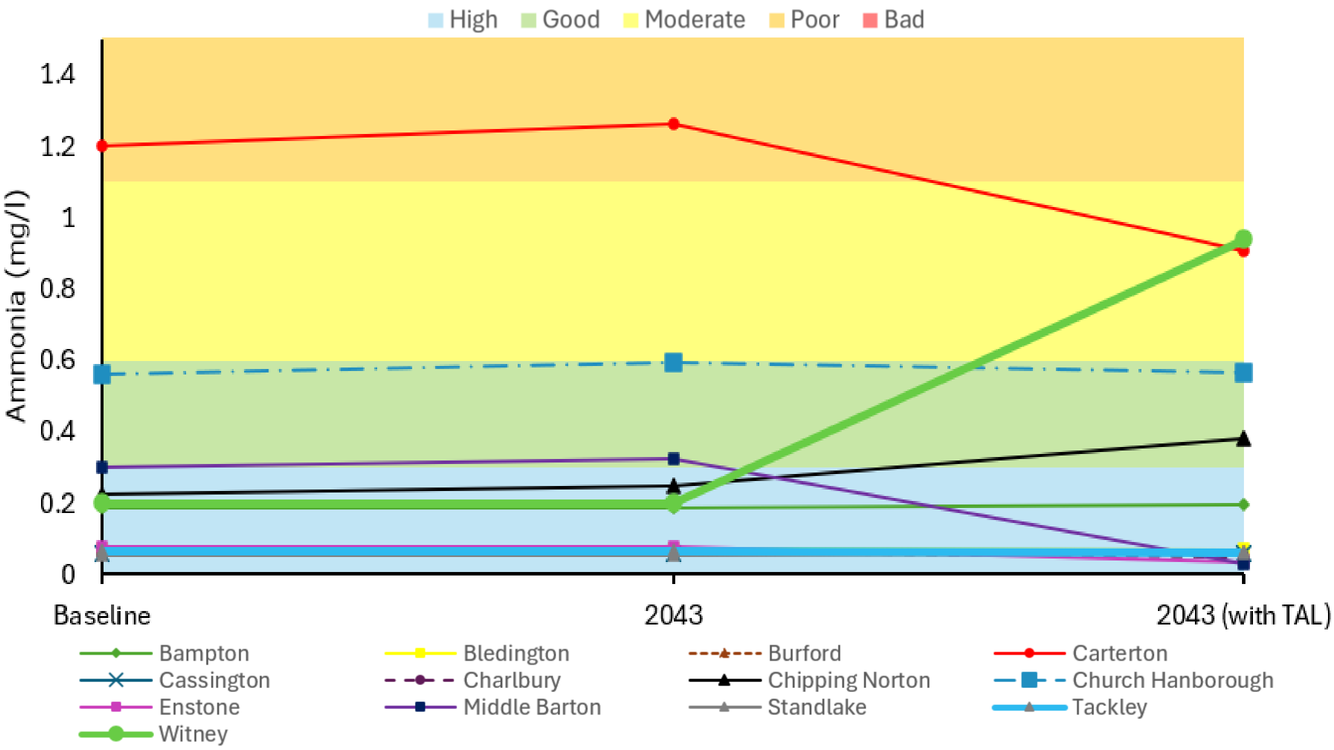

Figure 17- Changes in Ammonia (mg/l) across the three scenarios assessed

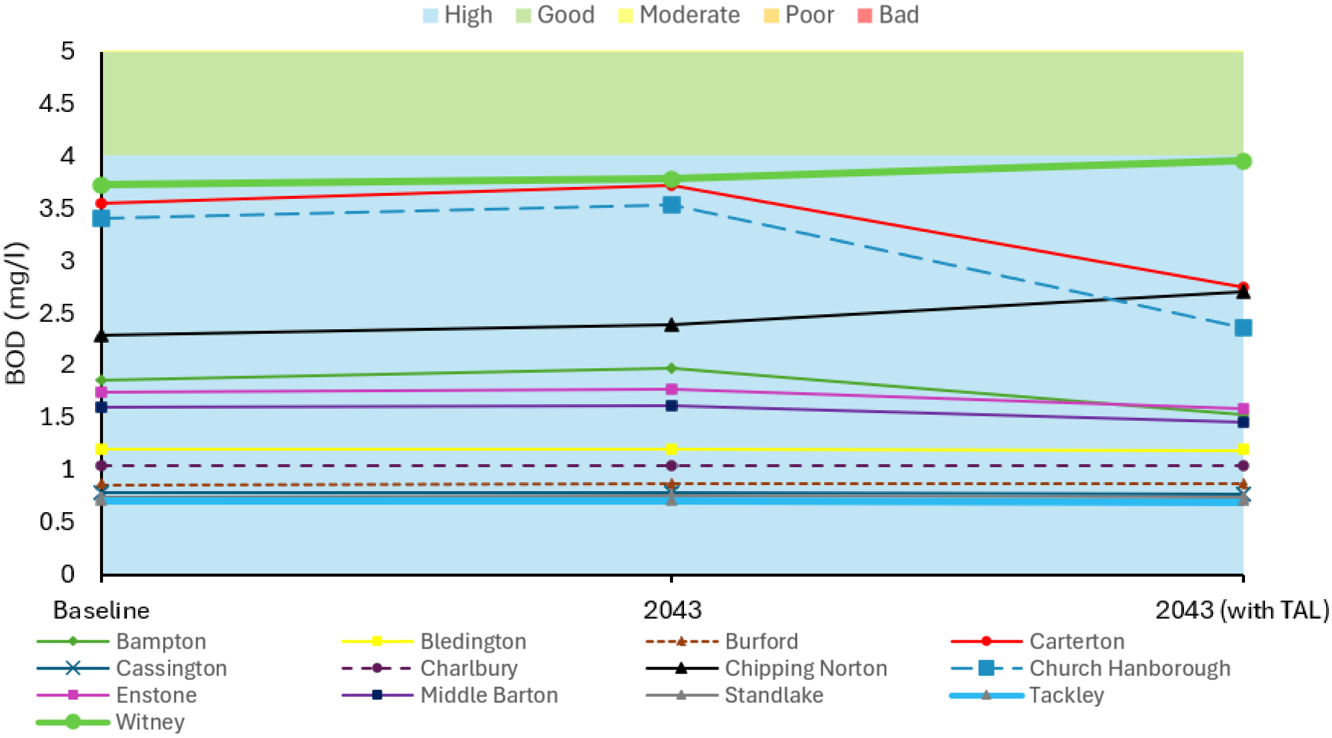

Figure 18- Changes in BOD (mg/l) across the three scenarios assessed

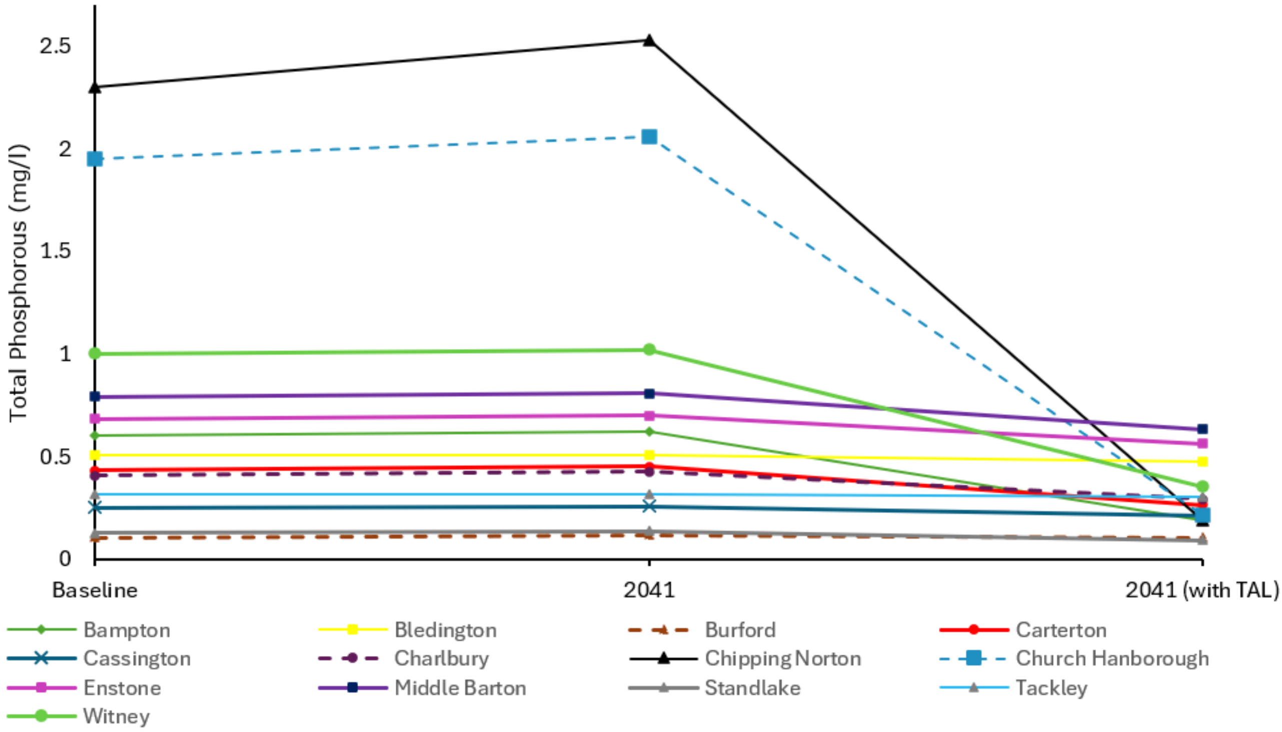

Figure 19- Changes in Total Phosphorous (mg/l) across the three scenarios assessed

4.5 Water Quality Deterioration

Following the generation of the model results, the percentage change in the four parameters assessed (ammonia, BOD, orthophosphate and total phosphorous) was estimated to determine if development could cause a greater than 10% deterioration in water quality. This is a key requirement when assessing water quality with respect to the WFD. The level of deterioration has been estimated both with current technology and with TALs applied. Table 17 presents the results of this analysis at each of the STWs. Values highlighted in yellow denote where there has been a greater than 10% deterioration. The key findings are summarised after the table.

Table 17- Percentage change in Baseline (BSC) and Post-Development (PDP) water quality results

STW name	Parameter	BSC-PDP % change	BSC-PDP with TALs applied % change
Bampton	Ammonia	0.0	5.4
	BOD	6.5	-17.3
	Orthophosphate	4.7	-68.5
	Total phosphorus	3.8	-68.7
Bledington	Ammonia	0.1	0.0
	BOD	0.0	-0.8
	Orthophosphate	0.6	-5.7
	Total phosphorus	0.8	-5.5
Burford	Ammonia	1.6	2.4
	BOD	0.5	0.5
	Orthophosphate	**17.1**	5.2
	Total phosphorus	**11.5**	0.0
Carterton	Ammonia	5.0	-24.5
	BOD	5.1	-22.3
	Orthophosphate	8.7	-37.0
	Total phosphorus	4.6	-39.4
Cassington	Ammonia	0.9	0.5
	BOD	0.4	-1.8
	Orthophosphate	4.5	-13.4
	Total phosphorus	2.4	-15.3
Charlbury	Ammonia	6.0	-17.4
	BOD	0.0	0.0
	Orthophosphate	5.0	-28.3
	Total phosphorus	4.7	-28.4
Chipping Norton	Ammonia	8.8	**69.0**
	BOD	3.9	**17.9**
	Orthophosphate	**10.4**	-91.7
	Total phosphorus	**10.0**	-91.8
Church Hanborough	Ammonia	5.5	0.7
	BOD	3.5	-30.8
	Orthophosphate	6.5	-89.0
	Total phosphorus	5.6	-89.0
Enstone	Ammonia	4.9	-57.3
	BOD	1.7	-8.6
	Orthophosphate	9.4	-16.0
	Total phosphorus	2.2	-17.7
Middle Barton	Ammonia	8.0	-90.4
	BOD	0.6	-9.4
	Orthophosphate	8.9	-15.1
	Total phosphorus	2.3	-20.0
Standlake	Ammonia	2.8	**10.4**
	BOD	1.1	0.1
	Orthophosphate	**13.4**	-23.4
	Total phosphorus	7.9	-27.8
Tackley	Ammonia	0.4	-6.7
	BOD	0.0	-0.1
	Orthophosphate	0.5	-3.2
	Total phosphorus	0.3	-3.2
Witney	Ammonia	0.0	**371.4**
	BOD	1.6	6.2
	Orthophosphate	1.4	-64.9
	Total phosphorus	2.0	-64.7

Overall Results

- When considering current technology, 10 of the 13 STWs show no downstream water quality deteriorations of 10% or greater as a result of planned development. However, deteriorations exceeding 10% are predicted at Burford STW, Chipping Norton STW and Standlake STW, all of which are associated with orthophosphate and total phosphorus.
- Under the TAL scenario, 10 of the 13 STWs also show no downstream water quality deteriorations of 10% or greater due to planned development. Importantly, at all STWs where deteriorations exceeding 10% are predicted under the current technology scenario, these trends are reversed following the application of TALs.
- The three STWs which show a downstream deterioration of greater than 10% in the TAL scenario, are Chipping Norton, Standlake and Witney STWs. At both Chipping Norton and Witney STWs, these deteriorations relate to parameters (ammonia and BOD) for which the current effluent quality is already better than the applicable TAL. Consequently, the TAL scenario is not considered to provide a realistic representation of future treatment performance at these sites.
- At Standlake STW, a deterioration in downstream ammonia concentration of more than 10% is predicted. However, this STW is located downstream of Burford STW and Witney STW and is therefore influenced by the deterioration in effluent quality at these upstream works under the TAL scenario. An additional model run in which only Standlake STW was assigned TALs predicted a 20.4% reduction in downstream ammonia concentration relative to the baseline (0.0421 mg/L). This is considered more representative of the impacts of improved treatment at the works.

4.6 Review against WFD Criteria

The aims of the WFD are to enhance the status and prevent further deterioration of surface water bodies, groundwater bodies and their ecosystems. In this regard, the water quality modelling results have been used to assess the following criteria:

- Could the development cause a greater than 10% deterioration in water quality?
- Could the development cause a deterioration in WFD class of any element assessed?
- Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) when considering technologically achievable limits (TAL)?

Table 18 provides a summary of the modelling results for meeting each of these criteria. A green, amber or red score is assigned to each criterion for the STWs assessed based on the barriers to future development. The findings are discussed further after the table.

Table 18- Summary of modelling results in relation to water quality objectives

STW name	Could development cause a greater than 10% deterioration in water quality?	Could development cause a deterioration in WFD Class of any element?	Could development prevent the receiving waterbody from achieving Good Status?
Key	No infrastructure upgrade required to achieve water quality objective.		
	Infrastructure upgrade required to achieve water quality objective, but achievable using TALs or other factors preventing objectives.		
	Water quality objective cannot be achieved using TALs.		
Bampton	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Poor status, development has a minor impact (<5%) on its concentration so this is not considered a factor preventing Good Status. Application of TALs leads to orthophosphate achieving Moderate Status.
Bledington	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Poor status, development has a minor impact (<5%) on its concentration so this is not considered a factor preventing Good Status.
Burford	Predicted deterioration is >10% for orthophosphate and total phosphorous. Deterioration is reversed with TALs.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD, and Good Status for orthophosphate. This remains the case when accounting for development.
Carterton	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for BOD. This remains the case when accounting for development. Ammonia and orthophosphate currently have Poor status. Development has some impact (>5%) on their concentrations but does not lead to a change in status. It is not considered a factor preventing Good Status on its own. Application of TALs leads to ammonia and orthophosphate achieving Moderate Status.
Cassington	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Moderate status, development has a minor impact (<5%) on its concentration so this is not considered a factor preventing Good Status.
Charlbury	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Poor status, development has a minor impact (<5%) on its concentration so this is not considered a factor preventing Good Status.
Chipping Norton	Predicted deterioration is >10% for orthophosphate and total phosphorous. Deterioration is reversed with TALs.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Bad status; development has a significant impact (>10%) on its concentration but does not lead to a change in status. Application of TALs leads to an improvement above the baseline and orthophosphate achieving Moderate Status. Development is not considered a factor preventing Good Status on its own

STW name	Could development cause a greater than 10% deterioration in water quality?	Could development cause a deterioration in WFD Class of any element?	Could development prevent the receiving waterbody from achieving Good Status?
Church Hanborough	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has Good Status and High Status for ammonia and BOD respectively. This remains the case when accounting for development. Orthophosphate currently has Bad status; development has some impact (>5%) on its concentration but does not lead to a change in status. It is not considered a factor preventing Good Status on its own. Application of TALs leads to orthophosphate achieving Moderate Status.
Enstone	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Moderate status; development has some impact (>5%) on its concentration but does not lead to a change in status. It is not considered a factor preventing Good Status on its own.
Middle Barton	Predicted deterioration is <10%.	Class deterioration is predicted for ammonia, but returns to baseline class with application of TALs.	Receiving waterbody currently has High Status for ammonia and BOD. For ammonia development does cause a deterioration to Good but this is reversed with the application of TALs. The status for BOD remains unchanged. Orthophosphate currently has Bad status; development has some impact (>5%) on its concentration but does not lead to a change in status. It is not considered a factor preventing Good Status on its own. Application of TALs leads to orthophosphate achieving Moderate Status.
Standlake	Predicted deterioration is >10% for orthophosphate. Deterioration is reversed with TALs.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Moderate status; development has some impact (>10%) on its concentration but application of TALs leads to orthophosphate achieving Good Status.
Tackley	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Poor status; development has a minor impact (<5%) on its concentration so this is not considered a factor preventing Good Status.
Witney	Predicted deterioration is <10%.	No WFD class deterioration is predicted.	Receiving waterbody currently has High Status for ammonia and BOD. This remains the case when accounting for development. Orthophosphate currently has Poor status, development has a minor impact (<5%) on its concentration so this is not considered a factor preventing Good Status.

4.7 Further Assessment of AMP8 Schemes

The SIMCAT model provided by the EA, and the scenarios tested above, do not account for the impacts of AMP8 schemes planned for the period 2025–2030. It is important that these schemes are incorporated when establishing baseline conditions that will need to be protected in the coming years and estimating best case post-development conditions (without the application of TALs). In addition, assessing the potential impacts of future development on water quality with these schemes in place, is likely to provide a more realistic representation of future regulatory controls.

To update the SIMCAT model to account for AMP8 schemes, the EA's price review 2024 (PR24) Water Industry National Environment Programme (WINEP) was reviewed. The programme details proposed changes during AMP8 to permit limits. The WINEP lists existing (AMP7) and proposed (AMP8) limits for Ammonia, BOD and Total Phosphorous.

Only 4 out of the 13 STWs assessed have AMP8 schemes. These relate to schemes for total phosphorous at Bledington, Charlbury, Chipping Norton and Church Hanborough STWs. The proposed limits were compared against the mean Total Phosphorous contained in the EA's supplied SIMCAT model. The review confirmed whether the existing effluent quality is already performing better than the AMP8 limits.

Table 19 presents the results of this exercise, the proposed AMP8 limits at the 4 STWs assessed represent an improvement on the effluent quality for total phosphorous in the model. At Chipping Norton STW the proposed limit is 0.25 mg/l, however it also has a single site stretch target (SSST) of 0.20 mg/l to contribute to achieving WFD Good status, in the table these are shown in red.

Table 19- Comparison of Total Phosphorous Effluent Limits

STWs	EA SIMCAT Model	Existing AMP7 Limit (mg/l)	Proposed AMP8 Limit (mg/l)
Bledington	6	No permit for P	**1.00**
Charlbury	8.58	No permit for P	**2.00**
Chipping Norton	6	No permit for P	**0.25 (0.20)**
Church Hanborough	5.1	No permit for P	**0.25**

The effluent quality for total phosphorous in the model has been updated to match the new limit. The SSST for Chipping Norton STW, this approach ensures that the baseline represents the best possible conditions to be protected against.

The model was subsequently run with baseline and post-development flows applying the AMP8 limits. Table 20 shows the changes in the relevant parameters between the baseline run with current technology and the baseline and post-development run with AMP8 schemes considered. The colours show the WFD status. The key findings from the baseline and post-development runs with AMP8 schemes applied are summarised after the table.

Table 20- Comparison BSc (Current), BSc (AMP8) & Post-Development (AMP8) results

STW Name	Parameter	Baseline Existing water quality (mg/l)	Baseline Existing water quality [AMP8] (mg/l)	Post-Dev water quality [AMP8] (mg/l)
Bledington	Orthophosphate (Mean)	0.332	0.316	0.316
	Total Phosphorous (Mean)	0.505	0.481	0.481
Charlbury	Orthophosphate (Mean)	0.300	0.221	0.221
	Total Phosphorous (Mean)	0.405	0.299	0.299
Chipping Norton	Orthophosphate (Mean)	1.340	0.098	0.098
	Total Phosphorous (Mean)	2.300	0.168	0.168
Church Hanborough	Orthophosphate (Mean)	1.530	0.166	0.168
	Total Phosphorous (Mean)	1.950	0.212	0.214

WFD Status
High
Good
Moderate
Poor
Bad

Results with AMP 8 Schemes

When the AMP8 schemes are applied in the model there are improvements in baseline levels at all the STWs assessed.

At two of the sites (Chipping Norton and Church Hanborough) there is a WFD status change in Orthophosphate, from Bad to Moderate status. This is attributed to the current effluent concentration being very high (6.0 mg/l and 5.1 mg/l) relative to the proposed AMP8 limits (0.20 and 0.25 mg/l). At the two remaining sites (Bledington and Charlbury) the improvements do not lead to a WFD status change.

The impacts of development on the adjusted baseline concentrations (with AMP8 schemes incorporated) are minimal. At many of the sites, downstream water quality remains unchanged. This is likely due to the improved effluent quality delivered by the AMP8 schemes, which reduces the effect of increased wastewater volumes on downstream water quality. In addition, development is limited across most of these STW catchments, further constraining potential impacts.

Across all STWs, WFD status remains unchanged, and the predicted percentage deterioration is well below the 10% significance threshold. On this basis, development is not considered to pose a significant risk to the water quality standards that will need to be protected in the future.

It should be noted that once the AMP8 schemes are in place they should improve the phosphorus effluent quality at Chipping Norton and Church Hanborough STWs to levels equal to or better than the relevant TAL value. This will limit the potential for further improvements in effluent quality to improve water quality and offset increases in DWF. Based on the model results this is not a significant concern over the plan period, given that the increases in DWF modelled lead to no changes in WFD status at these sites. However, beyond the plan period it may restrict increases in the permitted DWF. It also highlights the importance of reducing pollutant loads from other sources (e.g. agriculture, urban runoff) if water quality treatment at the STWs is maximised.

4.8 Summary

The findings show that at all the STW the WFD objectives can be met either with no infrastructure improvements or infrastructure upgrades within current TALs. In many cases, timely interventions implemented by Thames Water and the EA are required to prevent deterioration; this will include improving the technology currently employed at the STWs. Before these improvements, environmental capacity could be a constraint on development in the immediate future, however through upgrades to wastewater infrastructure, development phasing and mitigation against other pollution sources, development should be possible moving through the plan period.

The assessments undertaken to date adopt a precautionary approach and assume that all development will come forward and be built out. Additionally, the assessments do not take into account any planned or longer-term increases in treatment capacity at the STW sites, which could allow STWs to store effluent for longer and maintain existing discharge volumes. The TALs applied are based on present day technology and technology may improve over the plan period to 2043. The timing of development will therefore be an important factor.

For many of the receiving watercourses, other pollution sources (e.g. agriculture, industry) are also contributing reasons for the waterbodies not achieving Good Status. Therefore, reducing the contribution of other pollution sources should be a key priority to safeguard environmental capacity. The measures to achieve this should be set out by the EA through liaison with other stakeholders in the Thames River Basin Management Plan[12].

In developing their emerging local plan, West Oxfordshire District Council published a draft preferred policy options paper in June 2025 this included Policy CP7 – Water Environment, which aims to ensure that development does not adversely impact water bodies or aquatic ecosystems. Ensuring there is sufficient wastewater infrastructure capacity to serve development will be a key part of this. It is also recommended that West Oxfordshire District Councils take the following actions:

- Consider potential impacts on WFD status when assessing planning applications in liaison with the EA and Thames Water. This is particularly the case for larger scale developments (>1000 Dwellings) where current environmental capacity could be a constraint on development.
- Development phasing and liaison with the EA and Thames Water should also be a key consideration when assessing planning applications for larger scale developments (>1000 Dwellings) in STW catchments draining to receiving watercourses with Bad to Poor Status. This includes the Dorn (Source to Glyme), the Evenlode (Glyme to Thames), Shill Brook and Tributaries and Thames (Evenlode and Thame) WFD waterbodies.
- Share Annual Monitoring Reports and Housing Land Supply Statements, which detail projected housing development in their administrative areas, with Thames Water.
- Provide a copy of the WCS to neighbouring authorities, Oxfordshire County Council as the Waste Planning Authority, Thames Water and the EA.

In response to these actions, Thames Water will need to assess growth demands as part of their wastewater asset planning activities and feedback to the district councils if concerns arise.

Thames Water will need to secure relevant planning permissions to upgrade its wastewater facilities. Thames Water should work proactively with Oxfordshire County Council as the Waste Planning Authority to do this.

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[12] Thames Water (2022) *Thames river basin district management plan* https://www.gov.uk/guidance/thames-river-basin-district-river-basin-management-plan-updated-2022

5 Conclusions & Recommendations

The conclusions and recommendations from this study are as follows:

Headroom Assessment

A headroom capacity assessment at 13 key STWs within the district has been undertaken. The assessment has sought to determine whether the STWs have sufficient headroom under current permits and capacity to process the predicted additional wastewater flows to 2043. It should be noted that the assessments undertaken assume that all local plan, previously adopted local plans, undeveloped sites with planning permission and windfall sites will be built out. They also do not take into account planned or longer-term increases in DWF and treatment capacity.

Findings

- When considering Q80 flow, at 6 of the 13 STWs (Bledington, Burford, Cassington, Charlbury, Enstone and Middle Barton STWs) the Q80 flow will not exceed the current permitted DWF by the end of the plan period.
- At 4 STWs (Bampton, Carterton, Chipping Norton and Witney STWs) the current permitted DWF will be exceeded by the end of the plan period, though by less than 25%.
- At 3 STWs (Church Hanborough, Standlake and Tackley STWs) the current DWF permits will be exceeded by more than 25% by the end of the plan period
- When considering the Q90 flow, the same 7 STWs still exceed their permitted DWF, however only one site (Standlake STW) exceeds it by more than 25%.
- Upgrades are scheduled at the majority of STWs assessed, with the exception of Burford, Enstone, Standlake and Tackley STWs where no upgrades or permit changes are currently proposed.

Actions and Recommendations

To help protect water quality and to support the timely delivery of necessary infrastructure upgrades, the following actions and recommendations are provided:

- West Oxfordshire District Council will seek to protect and enhance water quality and to align the delivery of development with wastewater infrastructure being in place in accordance with Policy CP7 of the emerging local plan.
- West Oxfordshire District Council should consider the available STW capacity when phasing development in liaison with Thames Water. This is particularly important for larger scale developments (>1000 dwellings) in the STW catchments where capacity is most limited.
- West Oxfordshire District Council should provide Annual Monitoring Reports to Thames Water detailing projected housing growth in their administrative areas and larger scale developments coming forward.
- West Oxfordshire District Council should provide a copy of the WCS to planning colleagues at neighbouring authorities. A copy should also be provided to Oxfordshire County Council, Thames Water and the EA.
- West Oxfordshire District Council should promote the use of SuDS at development sites and where appropriate sewer separation.
- Thames Water will need to invest in many of the STWs assessed to ensure compliance to 2043. Some of the STWs have been identified for upgrades during AMP8 (2025-2030), however further investment may be required later into the plan period.
- Thames Water will need to assess growth demands as part of their wastewater asset planning activities and feedback to West Oxfordshire District if concerns arise.

- The EA will need to consider development against infrastructural and environmental capacity in setting future environmental permits which allow development to progress sustainably without presenting a risk to the water environment.

Water Quality Assessment

The potential impacts of development on water quality have been assessed using the EA's Thames SIMCAT model. Impacts are assessed against three criteria - percentage deterioration, WFD status deterioration and prevention from meeting Good WFD Status in the future. The assessment has included the same 13 STWs and investigated the water quality impacts to their receiving watercourses. It should be noted that the assessments undertaken assume that all local plan, previously adopted local plans, undeveloped sites with planning permission and windfall sites will be built out. They do not take into account any planned or longer-term increases in treatment capacity, which could allow STWs to store effluent for longer and maintain existing discharge volumes.

Findings

- In terms of percentage deterioration, future development does not lead to a deterioration greater than 10% at 10 of the 13 STWs assessed.
- At Burford STW, Chipping Norton STW and Standlake STW deteriorations of greater than 10% were modelled, all of which are associated with orthophosphate and total phosphorus. Importantly these were all reversed with the application of TALs.
- In terms of WFD deterioration, future development does not lead to a deterioration in WFD status for any of the elements assessed at 12 of the 13 STWs.
- Middle Barton STW is the exception, where ammonia deteriorates from High to Good Status. Importantly, this is reversed when TALs are applied.
- In terms of prevention from meeting Good WFD Status in the future, development is not considered a barrier on its own preventing the receiving water body from achieving Good Status at any of the sites.
- Where parameters are already achieving Good or High status, this remains the case when considering future development.
- Where parameters are not already achieving Good status, infrastructural upgrades will be required regardless of any development in order to meet this criterion.
- The model was re-run to include proposed AMP8 schemes at 4 of the STWs. The impacts of development on the adjusted baseline concentrations (with AMP8 schemes applied) are small. At all the STWs assessed, the WFD statuses remain unchanged, and the percentage deterioration is significantly below 10%.
- Future development tends to only cause a minor deterioration in water quality at the 13 STWs, however, infrastructure upgrades, phased growth, and mitigation against other pollution sources will be important to protect and enhance water quality during the plan period.

Actions and Recommendations

To help protect water quality and to support the timely delivery of necessary infrastructure upgrades, the following actions and recommendations are provided:

- West Oxfordshire District Council, in liaison with the EA and Thames Water, should consider WFD status when assessing planning applications to ensure the water environment is protected. This is particularly relevant for large scale developments (>1000 Dwellings).

- West Oxfordshire District Council will need to share their Annual Monitoring Reports and Housing Land Supply Statements detailing projected housing development in their administrative areas with Thames Water.
- West Oxfordshire District Council should provide a copy of the WCS to planning colleagues at neighbouring authorities. A copy should also be provided to Oxfordshire County Council, Thames Water and the EA.
- Where other pollution sources are contributing reasons for the waterbodies not achieving Good Status. The EA and other stakeholders including West Oxfordshire District Council should work to ensure measures to reduce their contributions are explored.
- The EA will need to consider development against infrastructural and environmental capacity in setting future environmental permits which allow development to progress sustainably without presenting a risk to the water environment.
- Thames Water will need to assess development demands as part of their wastewater asset planning activities and feedback to West Oxfordshire District Council if concerns arise.