Water Cycle Study

Scoping Report

Swindon Borough Council

Project Ref: 332610578/4001 | Rev: Final | Date: July 2025

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Document Control Sheet

Project Name: **Swindon Borough Council Water Cycle Study**

Project Ref: **332610578**

Report Title: **Water Cycle Study**

Doc Ref: -

Date: **21 July 2025**

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Revision	Date	Description	Prepared	Reviewed	Approved
DRAFT #1	May 2024	Draft for comments	RC/OJ	CB	RF
DRAFT #2	August 2024	Draft following SBC comments	OJ/CB	CB/AS	RF/AH
FINAL	May 2025	Final following updated residential and non-residential datasets	TB/CB	CB	RF
FINAL	July 2025	Updated 'Final' following Thames Water updated datasets and SBC's accessibility requirements	CB	-	RF

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Abbreviations

ALS	-	Abstraction Licensing Strategy
AMI		Advanced Metering Infrastructure
AMP		Asset Management Plan Period
AMR		Automatic Meter Reading
BGS	-	British Geological Survey
CEH		Centre of Ecology and Hydrology
CSL		Customer Side Leakage
DEFRA	-	Department for Environment, Food and Rural Affairs
DI		Distribution Input
DMA		District Metered Area
DO		Deployable Output
DWMP	-	Drainage and Wastewater Management Plan
DWF	-	Dry Weather Flow
DYAA		Dry Year Annual Average
DYCP		Dry Year Critical Period
EA	-	Environment Agency
eFLaG		Enhance Future Flows and Groundwater
FFGWL		Future Flows and Groundwater Levels
GIS	-	Geographic Information System
LLFA	-	Lead Local Flood Authority
LPA	-	Local Planning Authority
SBC	-	Swindon Borough Council
NEUB		Non-Essential Use Ban
NPPF	-	National Planning Policy Framework
NVZ	-	Nitrate Vulnerable Zone
PCC	-	Per Capita Consumption
PPG	-	Planning Practice Guidance
SESRO		South East Strategic Reservoir Option

SFRA	-	Strategic Flood Risk Assessment
SPA	-	Special Protection Area
SPZ	-	Source Protection Zone
SSSI	-	Site of Special Scientific Interest
STW	-	Sewage Treatment Works
SuDS	-	Sustainable Drainage Systems
TAL	-	Technical Achievable Limits
TH		Target Headroom
TUB		Temporary Use Ban
TWUL	-	Thames Water Utilities Ltd
SWOX	-	Swindon and Oxfordshire
WAFU		Water Available for Use
WCS	-	Water Cycle Study
WFD	-	Water Framework Directive
WINEP	-	Water Industry National Environment Programme
WRMP	-	Water Resources Management Plan
WRZ	-	Water Resource Zone

Executive Summary

Swindon Borough Council is expected to experience significant growth, over the period 2023-2043. This growth represents a challenge in understanding that both the water supply and the wastewater infrastructure have the capacity to sustain this level of growth and development proposed.

This Phase 1 Scoping Water Cycle Study (WCS) forms part of the evidence base that will help Swindon Borough Council determine the most appropriate options for development within the Borough that need to be identified in the Council's emerging Local Plan, covering the period from 2023 to 2043.

The Phase 1 Scoping WCS aims are:

- To audit relevant and emerging national planning policy, guidance and other relevant studies and plans.
- To collect and analyze baseline information about the current water system with regards to water resources and supply systems, wastewater and treatment provision and capacity, water quality, and flood risk and surface water management.
- To identify any infrastructure, environmental or geographic constraints on development that should be considered when preparing the draft Local Plan.

Water Resources and Supply

- The Thames Water - Water Resources Management Plan 2024 identified that future water demand and supply will need to be balanced through reduced water usage (demand management), reduced leakage, and the development of new SESROs and water transfers.
- Three water demand scenarios have been run for the duration of the Local Plan period and the water savings between each scenario were assessed.
- The WCS concluded that the new Local Plan should take into account the National Framework for Water Resources aspiration for long term reductions to reduce water usage to 110 litres per person per day (l/p/d) by 2050. The new Local Plan encourage all developers to meet the 110 l/p/d target in new developments. However, it is currently unclear though whether the Local Plan would be able to successfully impose a domestic household per capita consumption that is lower than the Building Regulations Optional requirement of 110 l/p/d consumption for new developments. In any case, all stakeholders should support ambitious water efficiency targets below this optional requirement level, targeting 80 l/p/d.
- In order to set out a feasible route of how the minimum standard of 110 l/p/d could be delivered, the WCS has considered some key delivery requirements. These has been developed in order to allow the Council to consider potential costs and benefits of developing a water use policy to require developers to build new homes to meet the minimum per capita consumption rate standard of 110 l/p/d and to consider working with Thames Water to develop further options for retrofitting existing properties with efficient fixtures and fittings.

Wastewater Collection and Treatment

- There are 7 Sewage Treatment Works (STWs) within Swindon. Currently, Swindon, Blunsdon, Wanborough and Highworth STWs do not exceed their current permitted Dry Weather Flow (DWF) capacity. It should be noted that the effluent data from Highworth STW are very low, suggesting a faulty instrument and therefore, conclusions cannot be drawn with accuracy regarding the STW's current and post-growth capacity. Castle Eaton, Hannington (Wilts) and

Sevenhampton STWs do not have any effluent monitoring data available, and therefore, it is not possible to determine whether these STWs exceed their current or future DWF permits.

- Swindon and Blunsdon STWs both exceed their capacity by 2043 and therefore, it would not be feasible to allocate all of the proposed development to these two STWs, since the flow headroom would be exceeded**.** Post-growth, Wanborough STW uses up to 74% of its DWF permit, implying that it potentially could accept more flows (and subsequently more development). Highworth STW shows that post-growth it would use approximately 9% of its DWF permit. However, as previously mentioned, the effluent data received from Thames Water contain very low values, and therefore the current, as well as the post-growth DWF and post-growth capacity, might be underestimated. There are several limitations in the calculation of the post-growth capacity, which are discussed in the relevant Chapter. One of the limitations discussed, is that the DWF permits and the effluent data for all the assessed STWs have been provided by TWUL in May 2024 and October 2023 and might be out of date. As a result, the results regarding the STWs current and post-growth capacity might not represent an accurate position. It has been agreed with SBC that the updated datasets (if any) will be requested by TWUL prior to the Detailed WCS.
- For the STWs showing an exceedance of their maximum permitted DWF post-growth, additional headroom could potentially be made available through an application by TWUL for a new or revised discharge permit from the Environment Agency (EA). Additionally, SBC should liaise with TWUL to assess alternative ways of discharging wastewater, as potentially wastewater could be directed to STWs with adequate treatment capacity. It is also recommended that SBC should continue to update TWUL on future development and changes to growth allocation to ensure that plans for STW upgrades in response to permit change requirement or flow capacity constraints take into account the most up to date planning position, to ensure that capacity has not been used up by other developments within the STW catchment.

  Prior to development, both SBC and TWUL should be satisfied that the development can be accommodated either within the capacity limits of the STWs or by sufficient additional capacity being made available. Additionally, it should be ensured that water quality requirements of the WFD will not be compromised. If necessary, a Grampian condition might have to be applied prohibiting development until the provision of the necessary infrastructure has taken place.

  As part of the Detailed WCS, it is suggested that an assessment of the actual wastewater generated across the Local Plan period should be undertaken in order to identify the year that the STW capacity for Swindon STW and Blunsdon STW would be exceeded, so that development could be planned accordingly. Furthermore, water quality modelling is also recommended to be undertaken as part of the Detailed WCS, in order to assess the future permit quality limits that may be required.

- Thames Water is planning to undertake the following upgrades in the STWs within Swindon:
  - **Swindon STW:** Thames Water will provide and continue to provide sewer network improvements in Swindon STW to meet growth and climate change drivers and invest and continue to invest in the Swindon STW to ensure compliance. Additionally, in response to repeat bursts, TWUL has brought forward work to replace a major sewage pipe at Haydon End. The replacement was completed in 2024.
  - **Blunsdon STW:** An upgrade is planned due to be completed in 2027, which will ensure a higher quality of treated effluent going to the river.
  - **Wanborough STW:** An upgrade is planned also planned for Wanborough STW, which will improve its ability to treat volumes of incoming sewage, reducing the need for untreated discharges in wet weather. The Thames Water Catchment Strategic Plan also indicates that for the Medium (2030-2035) and Long-Term (2035-2050), i.e. throughout a timeline that covers the new Local Plan period, Thames Water is seeking to provide sewer network improvements to meet growth and climate change drivers.

- **Highworth STW:** An upgrade is planned for Highworth STW, which aims to improve the STW's ability to treat the volumes of incoming sewage, reducing the need for untreated discharges in wet weather. The scheme is due to complete in 2026. The Thames Water Catchment Strategic Plan also indicates that for the Short-Term, TWUL is seeking to ensure 100% compliance and that for the Long-Term, Thames Water will continue to invest in the STW to ensure compliance.

- New development could be supported by new green/natural treatment options, such as constructed wetlands, at existing or new STWs, with additional low energy and low carbon benefits. The feasibility of these will be dependent on location and site constraints. Dependent on specific site location, timing of development may need to take into account any necessary STW upgrade works.

Water Quality

- There are 16 surface water bodies in Swindon assessed through Water Framework Directive (WFD), with the most recent WFD status classifications available from 2022. Water quality in surface water bodies is predominantly 'Moderate' (11 surface waterbodies), with 5 waterbodies classified as 'Poor'. There has been only one deterioration since the previous Cycle assessment in 2019, where the Overall Ecological status of the River Cole (Acorn Bridge to Bower Bridge), has been deteriorated from 'Moderate' (in 2019) to 'Poor' (in 2022). The main reasons for 'Not Achieving Good Status' include: physical modification (land drainage, barriers-ecological discontinuity and arable land use), diffuse source (poor nutrient management, poor livestock management and transport drainage), point source (sewage discharge) and physical modification (urbanisation – urban development).

- There are 4 groundwater bodies intersecting in the Borough, with the most recent WFD status classifications available from 2019. The overall status in 3 of these waterbodies is classified as 'Poor' and 1 is classified as 'Good'. The main reasons for 'Not Achieving Good Status' include: diffuse source (poor nutrient management) and point source (private sewage treatment).

- The upgrades in the Swindon, Blunsdon, Wanborough and Highworth STWs, which are identified in the TWUL DWMP, could allow improvements to the quality of all the water bodies that are currently not meeting the 'Good' standards, due to point source pollution from sewage treatment.

- Well-designed green / blue infrastructure would contribute to improved water quality and habitat both within sites and downstream, as well as providing wider benefits for people, wildlife, landscape, and mitigating the potential impacts of climate change. The improvements to storm overflows, which have been identified in the Thames Water's Drainage and Wastewater Management Plan, may be necessary to offset growth driven more frequent operation. The timing of upgrades will be important to avoid any deterioration in water quality as a result of development.

1 Introduction

1.1 Overview

1.1.1 Stantec UK Ltd was commissioned by Swindon Borough Council (SBC) to prepare a Water Cycle Study (WCS) to identify the baseline water scenario and to provide advice on the broad strategy options being considered for the location of growth and on the sites coming forward for potential allocation in the new Local Plan.

1.1.2 This Phase 1 Scoping WCS will be prepared following the recent National Planning policy Framework (NPPF) and Planning Practice Guidance (PPG) guidelines on water supply, wastewater and water quality. This Study has been compiled using the information and data available at the time of preparation.

1.1.3 This Phase 1 Scoping WCS will identify whether any further work is required as part of a Phase 2 Detailed WCS to identify specific risks and address evidence gaps.

1.2 Previous Studies

1.2.1 This report will provide updates to the previous assessments (Phase 1 WCS Study in 2007 and Phase 2 WCS Study in 2014) using the latest water quality and water quantity information, together with the most current pertinent planning policy available at the time of writing from the revised National Planning Policy Framework[1] (updated February 2025). The Council require this update to inform the evidence base for the new Local Plan.

1.3 Aims and Objectives

1.3.1 The aim of the Phase 1 Scoping WCS (hereafter referred to as WCS) is to support the preparation of the new Local Plan for Regulation 18 stage of the Town and Country Planning (Local Planning) Regulations of 2012. The objectives of this study are:

- To audit relevant and emerging national planning policy, guidance and other relevant studies and plans.
- To collect and analyse baseline information about the current water system with regards to water resources and supply systems, wastewater and treatment provision and capacity, water quality, and flood risk and surface water management.
- To identify any infrastructure, environmental or geographic constraints on development that should be considered when preparing the draft Local Plan.

1.3.2 The new plan period will extend to 2043 set within a longer ranging vision to 2050 and beyond. The new Local Plan provides the opportunity to consider how the Plan might be reimagined in a way that is aligned with current Council priorities for the Borough.

1.4 Water Cycle Study Structure

1.4.1 The remainder of this report is structured as follows:

- **Section 2** summarises the existing national and local legislation, policies and guidance;
- **Section 3** sets out the existing geographical context of the study area;

[1] https://www.gov.uk/government/publications/national-planning-policy-framework--2

- **Section 4** provides details on the water resources and supply baseline conditions, opportunities and constraints for development;
- **Section 5** presents the wastewater collection and treatment baseline conditions, opportunities and constraints for development;
- **Section 6** outlines water quality baseline conditions, opportunities and constraints for development; and
- **Section 7** provides an overview of the flood risk baseline conditions, opportunities and constraints for development (summary of Level 1 SFRA);

1.5 Stakeholder Engagement

1.5.1 A stakeholder engagement process was followed to seek information for this study. This engagement process did not constitute a formal consultation process, which will be undertaken as part of the new Local Plan programme. A full list of stakeholders contacted are shown below:

- SBC Planning Authority
- Thames Water Utilities (TWUL), which is the sole potable water supplier, as well as wastewater undertaker in the Borough of Swindon and
- The Environment Agency (EA).

1.6 Population, Household and Dwellings projections

1.6.1 The latest Office for National Statistics (ONS) population and household projections have been used to determine the occupancy rate of each household coming forward in the plan period and have been provided in **Table 1.1**.

Table 1.1: Population, number of households and occupancy rate (based on ONS datasets)

	Base year 2023	Projection for 2043
Population[2]	229,762	249,385
Number of Households[3]	97,798	112,149
Calculated Occupancy rate	2.35	2.22

1.6.2 ONS defines a household as (current definition, from 2011): *'one person living alone, or a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room, sitting room or dining area. A household can consist of a single family, more than one family or no families in the case of a group of unrelated people'.*

1.6.3 ONS defines a dwelling as: *'a self-contained unit of accommodation where all of the rooms (including kitchen, bathroom and toilet) in a household's accommodation are behind a single*

[2] Source: Population projections - local authorities: SNPP Z1 (2018 – based edition of this dataset). Population projections – local authorities: SNPP Z1 - Office for National Statistics

[3] Source: Household projections for England: detailed data for modelling and analysis (2018-based: principal projection edition of this dataset). Household projections for England: detailed data for modelling and analysis - Office for National Statistics, (Stage 2 projected households)

door that only the household can use. Households are therefore a subset of a dwelling as more than one household can be resident in a dwelling'.

1.6.4 SBC has provided population and household figures from other sources and studies. These are presented in **Table 1.2** below.

Table 1.2: Population and number of households (based on Swindon Housing Study and Swindon Data Story)

	Base year 2023 (Housing Study)	Base year 2023 (Swindon Data Story)	Projection for 2043 (Housing Study)	Projection for 2043 (Swindon Data Story)
Population	Not available	238,102	Not available	282,458
Number of Households	97,475	Not available	117,455	Not available

Position Statement 1.1 (May 2025)
For the purposes of this study, the population data from ONS will be used, as they contain population values for each year between 2023 and 2043.

Position Statement 1.2 (May 2025)
For the purposes of this study, and in order to remain consistent with the population data, the household data from ONS will be used.

1.6.5 The number of dwellings in Swindon in 2023 is not currently available through ONS. Dwellings datasets are available through ONS's portal for the last Census 2021. **Table 1.3** below shows the number of total dwellings in the Borough in 2021 and provides a breakdown to occupied dwellings vs unoccupied dwellings.

Table 1.3: Dwelling occupancy by dwelling type in Swindon Borough, 2021[4] (based on ONS datasets)

	Number of Dwellings in Swindon Borough (2021)
Total: All dwellings (excluding communal establishments)	99,850
Total: Occupied dwellings	95,800
Occupied, unshared dwellings	95,760
Occupied, shared dwellings	35
Unoccupied dwellings	4,050

[4] Number of dwellings by housing characteristics in England and Wales - Office for National Statistics (ons.gov.uk)

1.6.6 It is then assumed that the majority of the previously unoccupied 4,050 dwellings in 2021 were new-built dwellings and are mostly occupied in 2023. It is further assumed that 10% of those dwellings are currently empty.

1.6.7 Therefore, the total number of dwellings in 2023 is assumed to be: **95,800 + (4,050 x 90%) = 99,445**.

1.6.8 According to datasets received from SBC, the Housing Study identified **99,801** dwellings in 2021 (with no differentiation of whether the figure excludes communal establishments). The Swindon Data Story identified **95,862** dwellings in 2021, again, without any further definition.

1.7 Proposed Growth

Housing

1.7.1 SBC provided the following housing projections between 2023 and 2043. The total number of dwellings between 2023 and 2043, is provided in **Table 1.4.** The total number of dwellings between 2023 and 2043 within the Borough is **25,796**. The dataset provided on 28/04/2025, shown in **Table 1.4**, contains the final housing projection figures.

1.7.2 The total number of dwellings provided by SBC includes the following supply types:

- New site allocations
- Strategic (with planning permission)
- Strategic (rolled over parcels without planning permission)
- Windfall sites and
- Completions.

Table 1.4: Housing trajectory in Swindon Borough Council by Parish for 2023 to 2043 (Provided by SBC)

Type of Supply	Net Yield (dataset provided on 7th April 2025)	Net Yield (dataset provided on 28th April 2025)
New site allocations	8,713	8,700
Strategic (with planning permission)	13,860	9,949
Strategic (rolled over parcels without planning permission)		3,498
Windfall sites	2,818	2,818
Completions		831
TOTAL	**25,391**	**25,796**

1.7.3 Based on the above, the number of dwellings in Swindon in 2043, is assumed to increase to **99,445 + 25,796 = 125,241**.

Employment Land

1.7.4 According to the ONS datasets for employment (between January 2024 to December 2024), the total number of jobs was 120,000[5]. From these, 108,600 are classed as employees and 11,000 as self-employed.

1.7.5 SBC has recently undertaken an Employment Land Audit assessment. The total Gross Development area for both the non-allocated and the allocated sites (provided on 7th April 2025), sums up to **1,152 ha**.

Additionally, a Strategic Land Development Site, 'Panettoni' (Former Honda site) is proposed to the north-east of the Borough. 'Panattoni's' breakdown into Use Classes has been provided in the planning application description.

'*The total amount of development hereby permitted shall be limited to the following:*

a) ***No more than 672,000sqm of employment floorspace, of*** *which*
b) *No more than 671,250sqm of the total employment floorspace shall be within Use Class B8 (Storage and Distribution)*
c) *No more than 67,200sqm of the total employment floorspace shall be Use Class E(g)(iii) Light Industrial/ B2*
d) *No more than 33,600sqm of the total employment floorspace shall be used for dedicated B8 parcel distribution*
e) *No more than 750sqm of the total employment floorspace shall be used for the Central Hub building, comprising a maximum of 150sqm of Use Class E(b), 300sqm of Use Class E(g)(i) and 300sqm of Use Class F1(a / (e)*

1.7.6 It should be noted that the sum of the floorspaces for the Class Uses shown in points (a) to (e) above, sum up to 772,800 sqm. Hence, the individual floorspace areas have been adjusted to match the maximum floorspace of 672,000 sqm, as shown in **Table 1.5** below.

Table 1.5: Panattoni Site Maximum Floorspace

Use given in the Panattoni Site Planning Application description	Maximum floorspace (sqm) – taken from the Planning Application description	Maximum floorspace (sqm) reduced to match the maximum total of 672,000 sqm
Class B8 (storage and distribution)	671,250	583,316
Light industrial/ Class B2	67,200	58,397
B8 (parcel distribution)	33,600	29,198
Central Hub: Class E(b)	150	130
Central Hub: Class E(g)(i)	300	261
Central Hub: Class F1(a)/(e)	300	261
TOTALS	**772,800**	**671,563**

[5] Labour Market Profile - Nomis - Official Census and Labour Market Statistics (nomisweb.co.uk)

2 Legislation, Policy and Guidance

2.1 Overview

2.1.1 This WCS has been prepared in accordance with the relevant national, regional and local planning policy relevant to water resources, wastewater and water quality as detailed below. Aspects relevant to flood risk are reviewed in the accompanying Level 1 Strategic Flood Risk Assessment (SFRA).

2.1.2 The review is not exhaustive but focusses on information of particular relevance to this study.

2.2 National and European Legislation

2.2.1 Water resource management is regulated by national and European legislation, with Acts of particular relevance summarised in **Table 2.1.**

Water Framework Directive (2000)

2.2.2 The most significant legislation for this study is the Water Framework Directive (2000)[6]. Under this EU directive, management plans must be produced for river basin district, that seek to prevent deterioration, enhance and restore bodies of surface water and groundwater, reduce and prevent pollution and deterioration, and aim to achieve good chemical and ecological status. The Water Framework Directive (WFD) classifications and objectives for water bodies in the Swindon region are reviewed in **Chapter 6**.

2.2.3 The Water Framework Directive has been supplemented by subsequent EU legislation concerning the protection of groundwater against pollution and deterioration (The Groundwater Directive, 2006), the specification of environmental quality standards (The Priority Substances Directive, 2008), and the chemical analysis and monitoring of water status (2009).

2.2.4 The consolidated EU legislation has been transposed into UK law by the Water Environment Regulations (2017) which persist after the United Kingdom left the European Union until and if they are amended or replaced.

2.2.5 WFD's aim is to ensure all inland and near-shore watercourses and waterbodies (including groundwater) are of 'Good' status or better, in terms of ecology, and chemical, biological and physical parameters, by the year 2027. Therefore, any activities or developments that could cause detriment to a nearby water resource or prevent a water resource from reaching its potential status must be mitigated in order to reduce the potential for harm and allow Directive's goals to be implemented.

2.2.6 Water quality data for watercourses is available on the EA Catchment Data Explorer website[7]. This compromises catchment background data, existing water quality standards, and expected water quality requirements that the watercourse is projected to reach by set dates that are reviewed on a seven-year cycle. Any national or local protected areas are also included.

[6] Water Framework Directive (europa.eu)

[7] England | Catchment Data Explorer

Table 2.1: Summary of national and European legislation relating to water resource management

Legislation	Summary
The Water Act (1989), the Water Industry Act (1991) and the Water Resources Act (1991)	These acts provided for the privatisation of the former water authorities, and set out the main powers and duties of the water companies, Ofwat, and the National Rivers Authority (now the EA). Water quality classifications and objectives were introduced.
The Urban Wastewater Treatment Directive (1991)	This EU directive aimed to protect the water environment from being damaged by urban waste water and certain industrial discharges.
The Environment Act (1995)	This act restructured environmental regulation and led to the creation of the EA. Duties were imposed on water companies to promote the efficient use of water by customers.
The Drinking Water Directive (1998)	This EU directive set quality standards for drinking water, and requires drinking water quality to be monitored and reported.
The Water Industry Act (1999)	This act limited the circumstances in which companies can start charging on a metered basis rather than a rateable value.
The Water Act (2003)	This act amended the framework for abstraction licensing, changed the structure of economic regulation, and extended the scope for competition to large users.
The Bathing Water Directive (2006)	This EU directive set standards for classifying water quality at designated bathing waters.
The Floods and Water Management Act (2010)	This act modernised the list of activities that can be restricted in a drought and made it easier for companies to offer lower tariffs to certain groups.
The Water Act (2014)	This act enabled greater competition for non-household customers and gave Ofwat new powers to make rules about charges and charge schemes.
The Water Environment Regulations (2017)	These regulations set out requirements to prevent the deterioration of aquatic systems; protect, enhance and restore water bodies to 'good' status; and achieve compliance with standards and objectives for protected areas. The regulations consolidate and set out the provisions of the Water Framework Directive in more detail.

2.3 National Planning Policy Framework

2.3.1 National policy in relation to water resource management is contained within the **National Planning Policy Framework (NPPF)**[1] lastly updated in February 2025 and issued by the Ministry of Housing, Communities and Local Government, with particular reference to Section 3 'Plan-making', Section 14 'Meeting the challenge of climate change, flooding and coastal change', and Section 15 'conserving and enhancing the natural environment',

2.3.2 Paragraphs of particular relevance for this study are paragraph 20, paragraph 162, paragraph 187. .

2.3.3 The NPPF sets of the requirements for Strategic Policies in paragraph 20 – see below.

> *"**20.** Strategic policies should set out an overall strategy for the pattern, scale and design quality of places, and make sufficient provision for:*
>
> *a) homes (including affordable housing), employment, retail, leisure and other commercial development;*
>
> *b) infrastructure for transport, telecommunications, security, waste management, water supply, wastewater, flood risk and coastal change management, and the provision of minerals and energy (including heat);*
>
> *c) community facilities (such as health, education and cultural infrastructure); and*
>
> *d) conservation and enhancement of the natural, built and historic environment, including landscapes and green infrastructure, and planning measures to address climate change mitigation and adaptation.*

2.3.4 The NPPF sets out the requirement for planning for climate change in paragraph 162 – see below.

> *"**162.** Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating and drought from rising temperatures61. Policies should support appropriate measures to ensure the future health and resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure."*

2.3.5 The NPPF sets out the requirement for conserving and enhancing the natural and local environment in paragraph 187 – see below.

*"**187.** Planning policies and decisions should contribute to and enhance the natural and local environment by:*

.a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);

b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;

c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;

d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures and incorporating features which support priority or threatened species such as swifts, bats and hedgehogs;

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate

2.4 Planning Guidance for Water Supply, Wastewater and Water Quality

2.4.1 This guidance, from the Ministry of Housing, Communities & Local Government, was last updated in July 2019[8]. The guidance provides an overview of the water supply, wastewater and water quality concerns that Local Plans may need to address.

2.4.2 The planning for water infrastructure considerations is detailed in paragraph 005 of the guidance – see below.

[8] Water supply, wastewater and water quality - GOV.UK (www.gov.uk)

> ***"Planning for water infrastructure*** *- Plan-making may need to consider:*
>
> - *identifying suitable sites for new or enhanced waste water and water supply infrastructure. When identifying sites it is important to recognise that water and wastewater infrastructure can have specific locational needs (and often consists of engineering works rather than new buildings). This means exceptionally otherwise protected areas may have to be considered, where this is consistent with their designation.*
> - *existing and proposed development in the vicinity of a location under consideration for water and wastewater infrastructure. In two-tier areas there will need to be close working between the district and county councils.*
> - *whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure (for example, odour may be a concern).*
> - *phasing new development so that water and wastewater infrastructure will be in place when and where needed. The impact on designated sites of importance for biodiversity should be considered to ensure the required infrastructure is in place before any environmental effects occur."*

2.4.3 Water quality considerations are detailed in paragraph 006 of the guidance – see below.

> ***"Water quality*** *- Plan-making may need to consider:*
>
> - *how to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage. For example, can the plan steer potentially polluting development away from the most sensitive areas, particularly those in the vicinity of drinking water supplies (designated source protection zones or near surface water drinking water abstractions)*
> - *where an assessment of the potential impacts on water bodies and protected areas under the Water Environment Regulations 2017 may be required, consider the type or location of new development*
> - *whether measures to improve water quality, for example sustainable drainage schemes, can be used to address impacts on water quality in addition to mitigating flood risk*

2.4.4 Wastewater considerations is detailed in paragraph 007 of the guidance – see below.

> ***"Wastewater*** *- Plan-making may need to consider:*
>
> - *the sufficiency and capacity of wastewater infrastructure*
> - *the circumstances where wastewater from new development would not be expected to drain to a public sewer*
> - *the capacity of the environment to receive effluent from development in different parts of a strategic policy-making authority's area without preventing relevant statutory objectives being met."*

2.4.5 Cross-boundary considerations is detailed in paragraph 008.

> ***"Cross-boundary issues**:*
>
> *Water supply and water quality issues often cross local authority boundaries and can be best considered on a catchment basis. Liaison between strategic policy-making authorities, the Environment Agency, catchment partnerships and water and sewerage companies from the outset (at the plan scoping and evidence gathering stages of plan-making) will help to identify water supply and quality issues, the need for new water and wastewater infrastructure to fully account for proposed growth and other relevant issues such as flood risk. The duty to cooperate across boundaries applies to water supply and quality issues, and should be evidenced through a Statement of Common Ground.*
>
> *The Department for Environment, Food and Rural Affairs has published a policy framework to encourage the wider adoption of an integrated catchment-based approach to improving the quality of the water environment:*
>
> - *to deliver positive and sustained outcomes for the water environment by promoting a better understanding of the environment at a local level; and*
> - *to encourage local collaboration and more transparent decision-making when both planning and delivering activities to improve the water environment."*

2.5 Planning Policy Guidance for Housing: Optional Technical Standards

2.5.1 The Optional Technical Standards[9] (published in 2015) details how planning authorities can gather evidence to set optional technical standards for new housing. This includes the option for tighter water efficiency requirements for new homes to manage demand.

2.5.2 All new homes already have to meet the mandatory national standard set out in the Building Regulations (of 125 litres/person/day), described in **Section 2.12** below. Where there is a clear local need, Local Plan policies can require new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day.

2.6 Swindon Borough Council Local Plan

Swindon Local Plan 2026

2.6.1 The Swindon Local Plan is the principal planning policy document for the Borough, providing the development strategy to deliver sustainable growth to 2026. The Swindon Local Plan was formally adopted by SBC in March 2015.

2.6.2 The Local Plan sets out the relevant policy (**Policy IN2**) for Water Supply and Wastewater:

[9] Housing: optional technical standards - GOV.UK (www.gov.uk)

Policy IN2: Water Supply and Wastewater

a. Future water supply will be addressed through the implementation of demand management measures, particularly in new development to reduce the use of water, and the prevention of leakages, complimented by sustainable new water resources.

b. The development or expansion of water supply or sewerage waste/water treatment facilities, including sewage sludge, shall normally be permitted either where needed to serve existing or proposed new development, or in the interests of long-term water supply and wastewater management provided that the need for such facilities outweighs any adverse land use or environmental impact that any such adverse impact is minimised. There should be no adverse impacts on sensitive ecosystems, particularly SSSIs and the River Kennet.

c. Future wastewater treatment and improvements in related river quality will be addressed through the timely expansion of the Rodbourne Sewage Treatment Works and/or an additional Sewage Treatment Works to the east of Swindon to serve the New Eastern Villages developments, if proven to be the most sustainable option, particularly to ensure delivery of the housing trajectory.

d. Development proposals should take account of the capacity of existing off-site water and sewerage/wastewater treatment infrastructure and the impact of development proposals on them. Where necessary, the Council will seek improvements to water and/ or sewerage/wastewater treatment infrastructure related and appropriate to the development so that the improvements are completed prior to occupation of the development.

New Swindon Local Plan

2.6.3 The Council is currently in the process of developing a New Local Plan. This will build upon work undertaken on the Local Plan Review and include an update to plan evidence, site information and other supporting documents.

2.6.4 Once adopted, the New Local Plan will propose a number of updated strategies and policies, including site allocations, to provide sufficient housing, employment and town centre sites to meet the Borough's future needs and guide decisions on planning applications.

2.6.5 This WCS report will inform the evidence base for the new Local Plan.

2.6.6 The Swindon Borough Local Development Scheme[10] (March 2025) sets out the timeframe for the New Local Plan:

- Public consultation on New Local Plan – Scope, Issues and Preferred Options (Regulation 18): Commence Summer 2025
- Public consultation on Pre-submission (Regulation 19): Commence Spring 2026
- Submission to Secretary of State (Regulation 22): Autumn 2026

[10] https://www.swindon.gov.uk/downloads/file/10354/swindon_local_development_scheme_-2024

2.6.7 Subject to Inspector Programme, it is estimated that the New Local Plan will be adopted by December 2027.

2.7 The 25 Year Environment Plan (2018)

2.7.1 The 25 Year Environmental Plan[11] sets out the Government's goals for improving the environment over the next 25 years. It aims to deliver cleaner air and water in cities and rural landscapes, protect threatened species and provide richer wildlife habitats.

2.7.2 The relevant goal for this study is 'Clean and Plentiful Water' – see below.

> ***"We will achieve clean and plentiful water by:*** *Improving at least three quarters of our waters to be close to their natural state as soon as is practicable by:*
>
> - *Reducing the damaging abstraction of water from rivers and groundwater, ensuring that by 2021 the proportion of water bodies with enough water to support environmental standards increases from 82% to 90% for surface water bodies and from 72% to 77% for groundwater bodies.*
> - *Reaching or exceeding objectives for rivers, lakes, coastal and ground waters that are specially protected, whether for biodiversity or drinking water as per our River Basin Management Plans.*
> - *Supporting OFWAT's ambitions on leakage, minimising the amount of water lost through leakage year on year, with water companies expected to reduce leakage by at least an average of 15% by 2025.*
> - *Minimising by 2030 the harmful bacteria in our designated bathing waters and continuing to improve the cleanliness of our waters. We will make sure that potential bathers are warned of any short-term pollution risks."*

2.7.3 The plan also aims to reduce the risks of harm to people, the environment and the economy from natural hazards including flooding, drought and coastal erosion. This will include making sure that decisions on land use reflect flood risk, ensuring interruptions to water supplies are minimised during dry weather and drought, and boosting the long-term resilience of homes and infrastructure.

Environment Act 2021

2.7.4 The Environment Act[12] was established in 2021 to build on the vision of the 25 Year Environment Plan. Proposals for improving long term planning and regulation of the water industry were consulted on in 2019.

2.7.5 The Nature Recovery Network[13] (NRN) was established as a commitment to the government's 25 Year Environment Plan and enacted by the Environment Act 2021. This is an integrated approach to nature recovery, bringing together partners, policies and investment to actively restore and enhance the natural world, the benefits it provides and to enable us all to connect with nature in towns, cities and countryside alike.

[11] 25 Year Environment Plan - GOV.UK (www.gov.uk)

[12] Environment Act 2021 - Parliamentary Bills - UK Parliament

[13] Nature Recovery Network - GOV.UK (www.gov.uk)

2.8 The National Framework for Water Resources (2020)

2.8.1 The National Framework for Water Resources[14], published in 2020, identifies the strategic long-term water needs of England both nationally and within regional water resource zones. The report identified that Water Resource Management Plans (the statutory plans which address future water resources developed by individual water companies for their customers' needs alone) are unlikely to deliver the right strategic solutions for the nation as a whole.

2.8.2 Therefore, the framework establishes five regional groups to oversee strategic regional planning of water resources. Each regional group must produce a single plan that sets out the preferred options to provide best value to customers, society and the environment. The plans will include:

- Increasing resilience to drought – making provisions for up to a 1 in 500 annual exceedance probability drought event.
- Implementing sustainable abstraction regimes to deliver greater environmental improvement.
- Long term reductions in water usage to 110 litres per person per day by 2050, as well as reductions in non-household demand.
- Reduction of leakage of 50% by 2050.
- Reduced use of drought permits and orders.
- Increased water supplies, including reservoirs, water reuse schemes, desalination plants, shared resources with other sectors, and catchment management.
- Opportunities for water transfer, within and between regions, at all scales.
- Establishing an environmental destination clarifying the requirement to reduce current abstractions by 2050 to meet good status.

2.8.3 Funding to explore strategic options has been made available with the support of the Regulators' Alliance for Progressing Infrastructure Development[15] (RAPID).

2.8.4 The regional group for the Borough of Swindon is Water Resources South-East.

2.9 The Water Abstraction Plan

2.9.1 The Water Abstraction Plan policy paper[16], updated in July 2021, sets out how the Government plans to reform water abstraction management, to protect the environment and improve access to water.

2.9.2 The actions below set out how the EA will use its current regulatory tools to address unsustainable abstraction and guard against future pressures. In order to achieve the goals set out above, EA will focus on licences having the greatest impact and take action now to reduce future risks. The EA will:

- use the Water Industry National Environment Programme (WINEP), to make sure that water companies take a leading role in addressing unsustainable abstraction. This will bring

[14] Meeting our future water needs: a national framework for water resources - GOV.UK (www.gov.uk)
[15] RAPID - Ofwat
[16] Water abstraction plan: Environment - GOV.UK (www.gov.uk)

about investment to resolve historical issues and investigations to prevent future environmental impacts from abstraction;

- review more than half of time limited licenses by 2021 (2,300 in total), adjusting them as necessary to make sure they do not allow environmental damage now or in the future;
- adjust all permanent licenses shown to be seriously damaging. This includes completing the Restoring Sustainable Abstraction program, a list of 150 potentially damaging licenses, by March 2020;
- revoke an estimated 600 unused licenses by December 2018 that are no longer needed, and work with abstractors to reduce under-used licenses. This will prevent increased abstraction from these licenses creating new environmental pressures;
- regulate all significant abstractions that have been exempt historically (approximately 5,000) to make sure that they also play a part in protecting the water environment;
- update ten abstraction licensing strategies by 2021, and all remaining strategies by 2027, to capture agreed solutions to environmental pressures. These solutions will be developed through engagement in catchments facing particular environmental pressures from abstraction.

2.10 The National Policy Statement for Wastewater (2012)

2.10.1 This National Policy Statement for Wastewater[17] sets out the Government policy for the provision of major wastewater infrastructure. The policy statement is the primary basis for deciding development consent applications for wastewater developments that fall within the definition of Nationally Significant Infrastructure Projects as defined in the Planning Act (2008).

2.11 DEFRA Policy Framework for a Catchment Based Approach: Improving the Quality of our Water Environment (2013)

2.11.1 The Catchment Based Approach[18] established in 2013 sets out a framework to facilitate local approaches to managing the water environment and supporting river basin management planning as part of Water Framework Directive activities. The objectives of the Catchment Based Approach are:

- To deliver a better-quality water environment.
- To encourage collaborative working to support transparent decision making.
- To recognize the role of new and existing partnerships involved in collaborative catchment working.
- To encourage long term self-sustaining funding arrangements

2.12 Building Regulations Approved Document G: Sanitation, Hot Water Safety and Water Efficiency[19] (2015 edition incorporating 2016 and 2024 amendments)

2.12.1 These regulations cover the standards required for cold water supply, water efficiency, hot water supply and systems, sanitary conveniences and washing facilities, bathrooms and kitchens and

[17] National policy statement for waste water - GOV.UK (www.gov.uk)

[18] Catchment Based Approach: Improving the quality of our water environment - GOV.UK (www.gov.uk)

[19] BR_PDF_AD_G_2015_with_2016_amendments.pdf (publishing.service.gov.uk)

food preparatory areas in new buildings. Approved Document G provides practical guidance on compliance with Requirements G1 to G6 and regulations 7 and 36 of the Building Regulations (2010). Of particular relevance to this study are requirements relating to water efficiency:

- The estimated consumption of water must not exceed the standard of 125 litres per person per day, or 110 litres per person per day where the optional standard is applied (see **Chapter 4**).

2.12.2 The regulations provide a methodology to calculate water efficiency for new dwellings, known as the 'Water Efficiency Calculator for New Dwellings[20]'.

2.13 Code for Sustainable Homes (2006 – 2015)

2.13.1 The Code for Sustainable Homes[21] (CfSH) was an environmental assessment method for rating and certifying the performance of new homes. Launched in 2006, it was withdrawn in 2015 following the Housing Standards Review which aimed to simplify regulations into one set driven by Building Regulations. Local Plans are no longer able to require levels of the CfSH, but instead can vary some Building Regulations requirements.

2.13.2 The Code rated water sustainability in the following ways:

- Indoor water use: aiming to reduce the consumption of potable water in the home from all sources through the use of water efficient fittings, appliances and water recycling systems.
- External water use: aiming to promote the recycling of rainwater and reduce the amount of mains potable water used for external water uses.

2.13.3 Up to 6 credits could be obtained (**Table 2.2**), representing 9% of the total score achievable across all categories.

2.13.4 Although the Code has been withdrawn, information on the water sustainability standards has been included in here for comparison with other schemes now available.

Table 2.2: Code for Sustainable Homes Water Sustainability Credits Criteria

Category	Criteria	Credits	Mandatory Levels
Indoor water use	Water consumption limited to:		
	<120 l/p/d	1	Levels 1 and 2
	<110 l/p/d	2	
	105 l/p/d	3	Levels 3 and 4
	<90 l/p/d	4	
	<80 l/p/d	5	Levels 5 and 6
External water use	Correctly specified and sized rainwater collection system provided (e.g. rainwater butts or central collection system)	1	N/A

[20] The Water Efficiency Calculator for New Dwellings (wrcpartgcalculator.co.uk)

[21] code_for_sustainable_homes_techguide.pdf (publishing.service.gov.uk)

2.14 Buildings Research Establishment Environmental Assessment Method (BREEAM)

2.14.1 The Buildings Research Establishment Environmental Assessment Method[22] (BREEAM) is a sustainability assessment method which launched in 1990. It sets standards for environmental performance of buildings to reduce potable water demand through the installation of efficient sanitary fittings, rainwater collection and water recycling systems, through the design, specification, construction, and operation phases.

2.14.2 Local Authorities may require BREEAM certification as part of the Local Plan or as a specific planning condition imposed on developments. The Government's Construction Strategy requires public projects to aim to achieve an Excellent rating or equivalent.

2.14.3 Up to 9 credits can be achieved for sustainable water use (**Table 2.3**), with further credits available for flood resilience, surface water run-off management, and minimising watercourse pollution.

Table 2.3: BREEAM water sustainability credits criteria

Category	Criteria	No. of BREEAM Credits
Water Consumption	Percentage improvement over baseline building water consumption:	
	12.5%	1
	25%	2
	40%	3
	50%	4
	55%	5
	60%	Exemplary Performance
Water Monitoring	Water metering installed to meet standard specified.	1
Water Leak Detection	Leak detection system installed to meet standard specified.	1
	Flow control devices installed to regulate water supply.	1
Water Efficient Equipment	Demonstrable reduction in all other water demands not listed in other categories	1

2.14.4 Based upon the number of credits achieved, the development can be classified by a BREEAM rating as shown in **Table 2.4** below.

[22] BREEAM Water consumption - Designing Buildings

Table 2.4: BREEAM Ratings

BREEAM Rating	Score
Unclassified	< 30%
Pass	≥ 30%
Good	≥ 45%
Very Good	≥ 55%
Excellent	≥ 70%
Outstanding	≥ 85%

2.15 Home Quality Mark (2015)

2.15.1 The Home Quality Mark[23] is a voluntary national standard for new housing, launched by BRE (Buildings Research Establishment) as part of the BREEAM family of schemes. The Home Quality Mark is intended to allow builders to demonstrate the high quality of their homes and to differentiate them in the marketplace, while giving buyers confidence in the standard of the homes they are choosing.

2.15.2 The scheme allocates up to 17 credits for water efficiency (**Table 2.5**). In addition, up to 19 credits can be achieved for flood risk management, and another 19 credits for managing surface water runoff including water quality. Together, these represent approximately 10% of the Home Quality Mark score.

Table 2.5: Home Quality Mark water sustainability credits criteria

Category	Criteria	Credits
Water Efficient fittings	6 water efficient fittings in the Optional fittings standard (<110 l/p/d)	5
	All water fitting categories in the Optional fittings standard (<110 l/p/d)	8
	All water fitting categories in the Advanced fittings standard (<100 l/p/d)	11
Water Recycling	.>50% of total demand for WCS flushing met by rainwater or greywater	3
	100% of total demand for WCS flushing met by rainwater or greywater	6

[23] HQM-ONE-Technical-Manual-SD239-.pdf (homequalitymark.com)

2.16 Swindon Water Cycle Study (2014)

2.16.1 The Phase 2 Swindon WCS published in 2014[24], provides an update to the 2007 WCS (Phase 1) due to the significant changes in NPPF and environmental legislation such as the Flood and Water Management Act of 2010. The study determined the extent to which growth can be supported by existing infrastructure.

2.16.2 In addition, it determined whether adequate water resources were available at the time to meet forecast demand, the available capacity of existing drainage and Wastewater Treatment Works, and determination of watercourse capacity in surrounding areas due to additional water discharge without impacting water quality and biodiversity. As a result, the WCS needed to assure that proposed developments have no negative impact on the current water cycle environment and that new water services infrastructure may be implemented using sustainable methods.

2.16.3 The key challenges raised from the study were uncertainty about the environmental capacity of water resources and uncertainty about the capacity of the river systems to accommodate an increase in treated effluent without initiating water quality concerns. A summary of the Water Quality, Water Availability and Water Services Infrastructure assessment is shown below.

Water Quality

2.16.4 In terms of water quality, it was concluded that Swindon STW will be one of many STWs in England that will need to have expensive and energy consuming upgrades applied to meet the good status standards for Phosphate in the River Ray. For phosphate, the results showed that the effluent quality will need to be improved to meet Water Framework Directive moderate status (to 0.29 mg/l) and significantly improved to meet Water Framework Directive good status (to 0.11 mg/l). The 0.11mg/l standard for phosphate was within the band currently agreed by the EA and Water Companies as being achievable with current wastewater treatment works technology.

2.16.5 However, upgrades to STW and catchment improvement schemes to achieve good status could not be determined through a single site water cycle study. In order for Water Companies to obtain approval to invest in their assets to meet these new standards, the EA and Water Companies would need to develop and agree a company-wide prioritisation of investment in STWs. In order to be compliant with the Water Framework Directive this process would need to be completed and delivered by 2027. Whilst this process was underway, the improvements to the wastewater treatment infrastructure at Swindon STW would prevent any deterioration in water quality.

Water Availability

2.16.6 The 2014 WCS study concluded that whilst there were still uncertainties about the availability of water for Swindon within the Swindon and Oxfordshire (SWOX) zone, these were not material considerations for the Local Plan. TWUL and the EA considered that the demand for water within the SWOX zone to 2026 can be met with a combination of demand management measures and planned water resource infrastructure schemes.

Water Services Infrastructure

2.16.7 According to the Phase 2 Swindon WCS (2014), TWUL had an on-going programme of upgrades to water services infrastructure, which would ensure that infrastructure would be delivered alongside development. This programme needed to remain flexible because of uncertainties in the market demands for new housing, and TWUL investment in modelling the

[24] CIL - Supporting documents | Swindon Borough Council

upgrades required, which must be proportionate to the level of certainty associated with each development. Specifically:

- The wastewater treatment works infrastructure scheme planned for Asset Management Plan Period 6 (AMP6) would provide capacity to 2021, but this would be subject to approval by Ofwat in December 2014.
- Additional wastewater treatment improvements were needed to provide capacity to 2026, and these will be included in Thames Water's PR19 for delivery in the period 2020 – 2026.
- A major wastewater network upgrade scheme was delivered to provide strategic capacity in the main trunk sewer at the inlet to the treatment works. This scheme would provide capacity for all development planned to 2026 and resolve local sewer flooding issues in the Cheney Manor and Rodbourne areas.
- Ofwat only allowed TWUL to invest customer's money in other wastewater network improvements to provide capacity to 2015. These schemes were being delivered at the time the 2014 WCS was prepared.
- TWUL considered that wastewater network upgrade schemes to provide capacity to 2021 could be provided with targeted improvements to the existing sewerage system delivered through the requisition process. More significant strategic upgrades were likely to be required after 2021, in particular to serve the Eastern Villages. These could not be planned until there would be greater certainty about the exact phasing of the villages, and Thames Water will work with SBC and the EA to deliver a Drainage Strategy following the drainage strategy framework principles for Swindon by 2017. This Drainage Strategy will inform the Thames Water PR19 business plan, and provide a credible investment basis for strategic upgrades.

2.17 Thames Water –Water Resources Management Plan (2024)

2.17.1 The TWUL Water Resources Management Plan 2024 (WRMP24)[25] was published in October 2024. The WRMP24 builds on the previous WRMP19 plan (and reflects the draft South East regional plan). It sets out how TWUL will keep taps flowing for customers over the next 50 years, looking ahead to 2075.

2.17.2 The TWUL WRMP24 highlights the significant future shortfall in water resources in the TWUL's supply area and the actions TWUL plan to take to maintain the balance between water supply and demand.

2.17.3 Conclusions from the TWUL WRMP24, focusing on the baseline, forecast supply-demand balance and on the Preferred Plan, are outlined in **Section 4.5.**

2.18 Drainage and Wastewater Management Plan 2025-2050

2.18.1 A changing climate and growing population present increasing challenges to how water companies manage wastewater now and in the future. TWUL have developed a Drainage and Wastewater Management Plan[26] with customers and stakeholders, published in May 2023. This 25-year plan will reduce future pressures on TWUL's wastewater service. It sets out the company's approach and the investment needed to deliver a sustainable service that protects the environment, for generations to come.

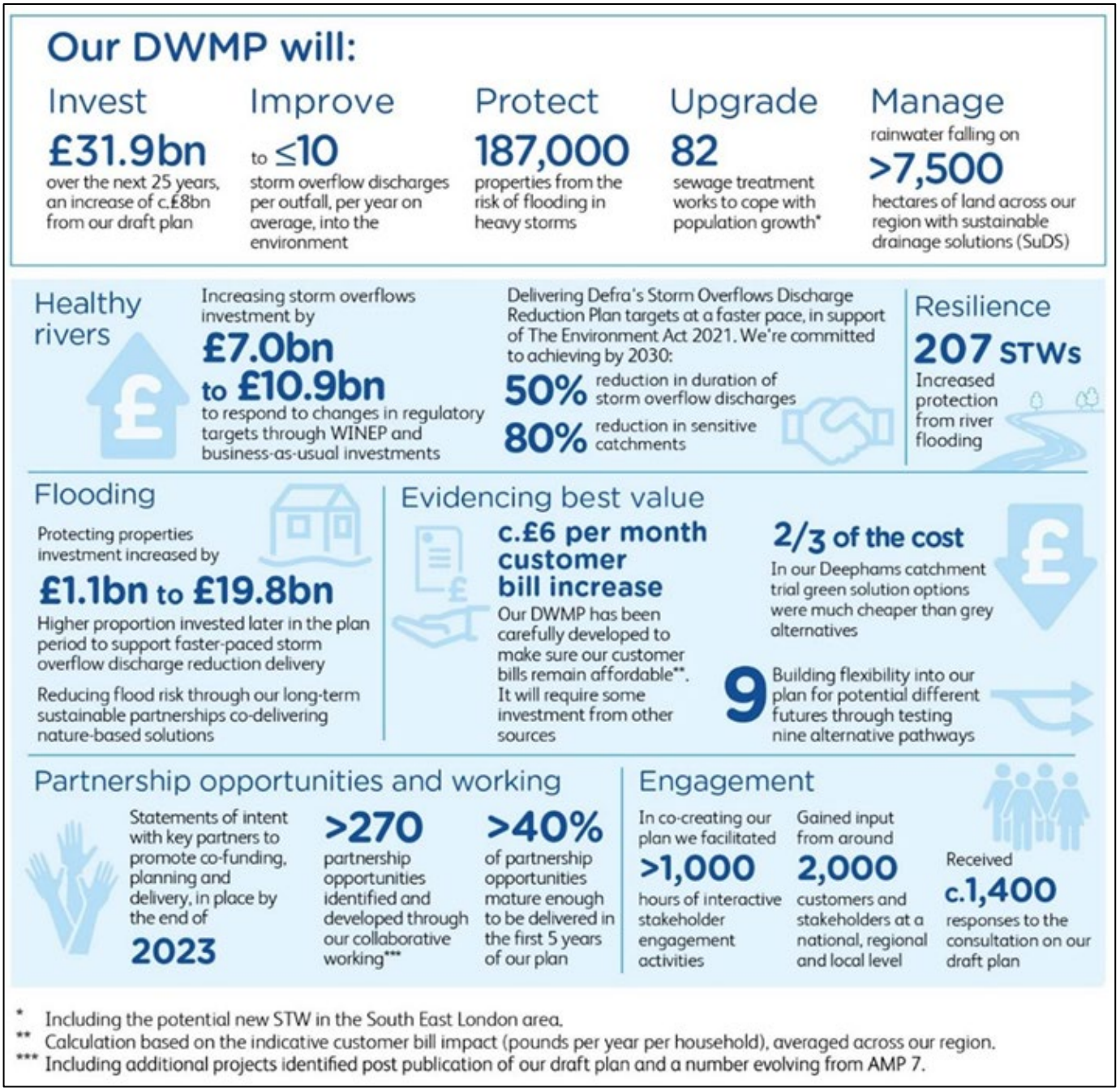
[25] https://www.thameswater.co.uk/about-us/regulation/water-resources

[26] Our DWMP | Drainage and wastewater management | Thames Water

2.18.2 It is the first time a long-term plan for drainage and wastewater has been co-created with TWUL's customers and stakeholders. TWUL will continue to build on this work as they develop DWMP Cycle 2. TWUL will update the DWMP every 5 years, asking for stakeholders' and customers' feedback as part of the process. TWUL will begin shaping its next DWMP, which will publish for public consultation in 2027.

2.18.3 The preferred plan for Oxfordshire, Swindon, Wiltshire, Gloucestershire and Warwickshire indicates that over the next 25 years TWUL will invest in both surface water management and network improvements. These are summarised in **Figure 2.1** below.

Figure 2.1: TWUL Headlines of Preferred plan for Oxfordshire , Swindon, Wiltshire, Gloucestershire and Warwickshire (Source: TWUL Drainage and Wastewater Plan, 2023)



2.18.4 Further challenges and the related proposed solutions for the STWs in Swindon are outlined in **Section 5.4**.

3 Geographical Context

3.1 Climate

3.1.1 The Met Office climate station nearest to Swindon is located in Lyneham approximately 30 miles from the study area. The average rainfall recorded from the Lyneham climate station has an average annual rainfall of 771 mm compared to the UK annual average of 1163 mm (**Figure 3.2**). It appears rainfall is generally evenly distributed throughout the year, but the winter months experience the highest rainfall near Swindon (**Figure 3.1**).

Figure 3.1: Monthly rainfall records at Lyneham Met Office Climate Station (nearest to Swindon), 1991 to 2020.

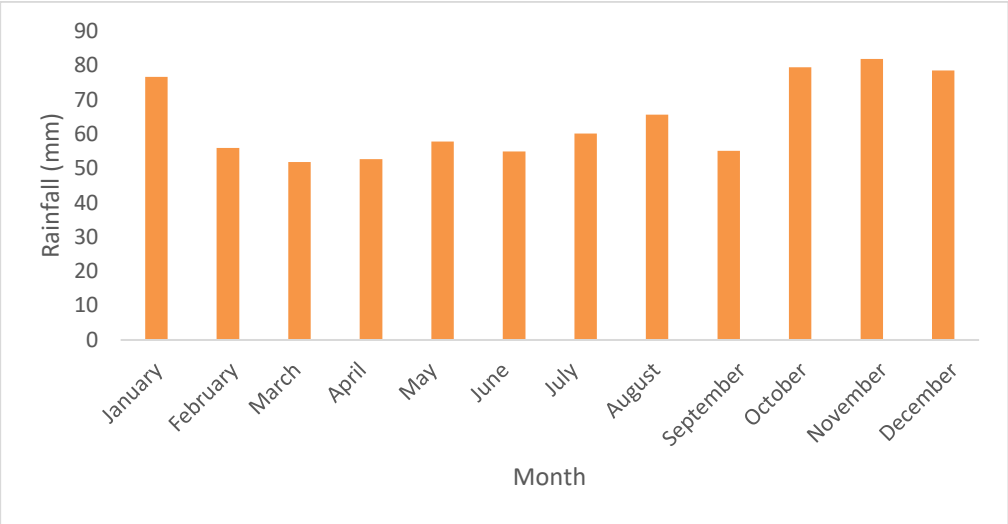
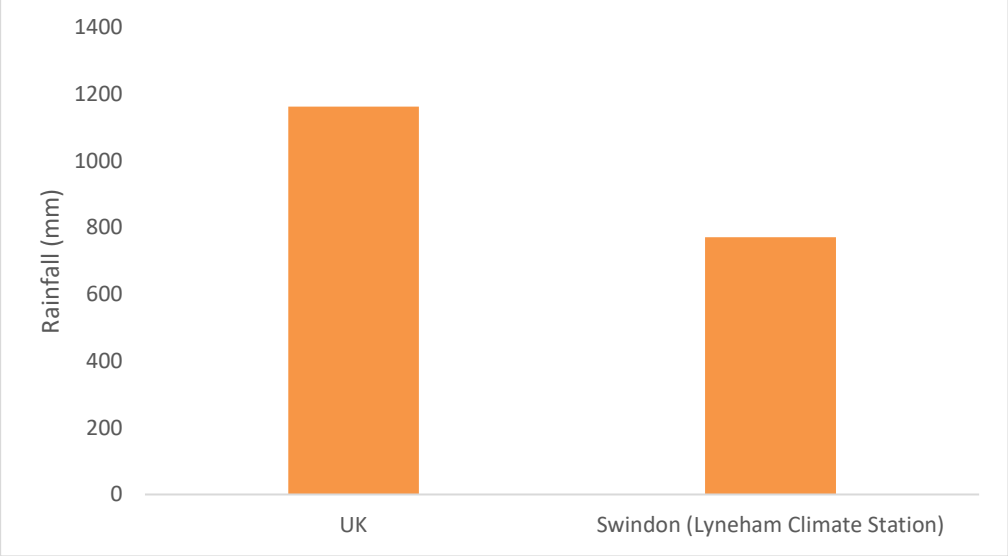
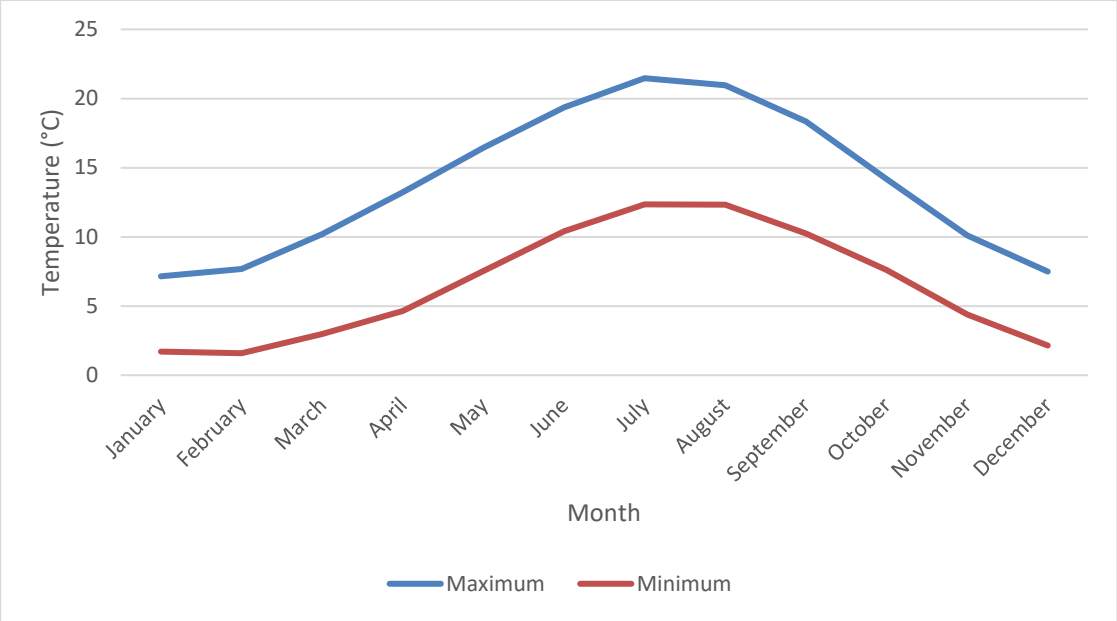


Figure 3.2: Monthly rainfall records at Lyneham Met Office Climate Station (nearest to Swindon), 1991 to 2020 in comparison to UK rainfall records



3.1.2 Met Office data from the climate station shows temperature that are both seasonal and a diurnal variation. As shown in **Figure 3.3**, January/February are the coldest months with mean daily minimum temperatures equating to approximately 1.7 °C and 1.6 °C respectively. On the other hand, July is the warmest month with mean daily maximum temperature equal to 21.5°C.

Figure 3.3: Daily temperature records at Lyneham Met Office Climate Station (nearest to Swindon), 1991 to 2020



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3.2 Geology, Land Use and Topography

Geology

3.2.1 An overview of the geology across the Borough has been obtained from the publicly available data from the British Geological Survey (BGS). This provides an overview of the Bedrock geology and presence of Superficial Deposits.

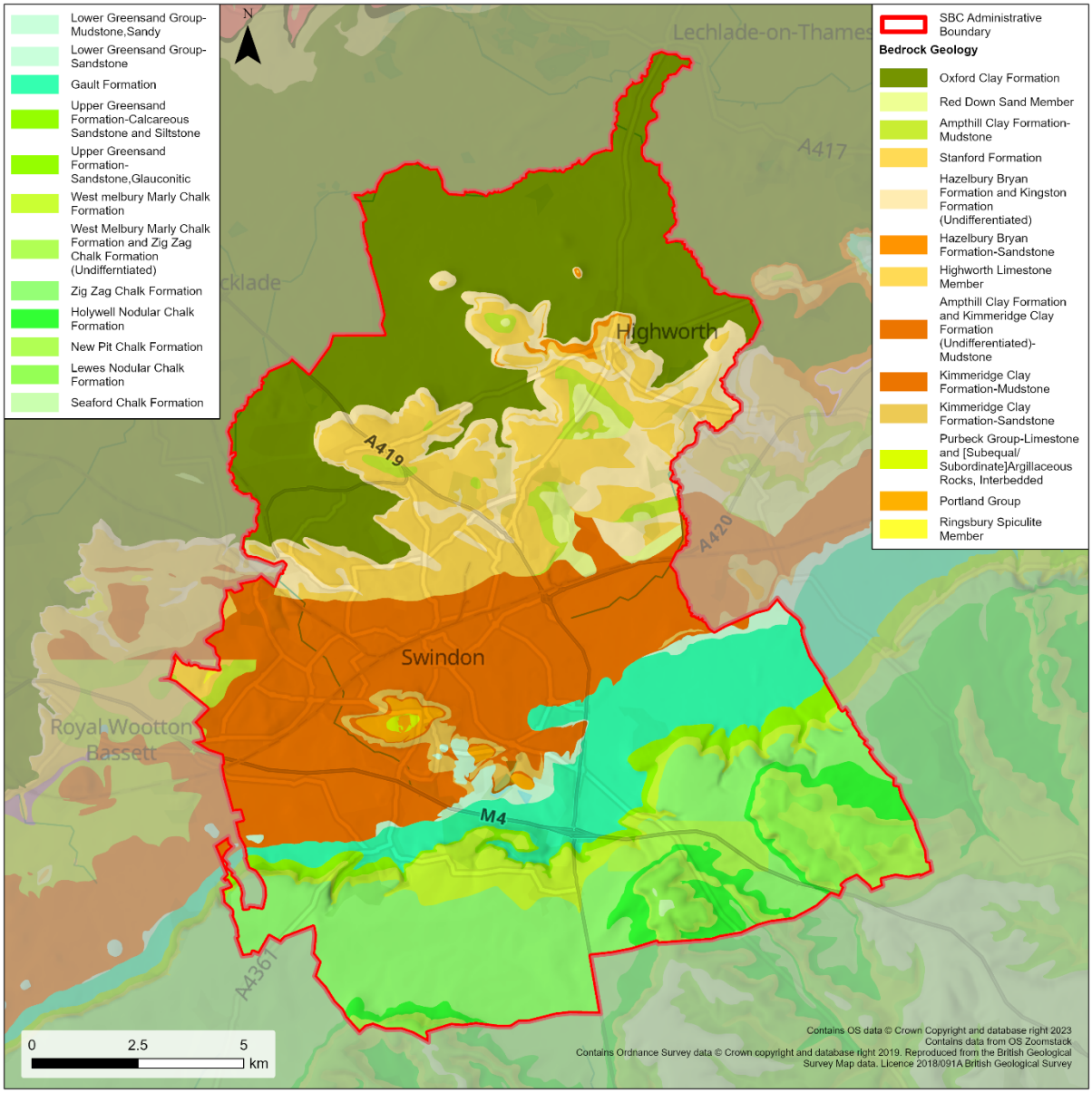
3.2.2 The Borough bedrock geology is characterised as clay across the north and central area, becoming chalk to the south on the approach to the North Wessex Downs – see **Figure 3.4**

3.2.3 Oxford Clay runs across the northern end of the Borough alongside the River Thames, giving way to Stanford and Hazelbury Bryan formations south of Highworth through to Stratton and the south of Haydon Wick.

3.2.4 Ampthill Clay and Kimmeridge Clay formations through the centre of the Borough, and through Swindon town, becoming Gault Formation south of Wroughton.

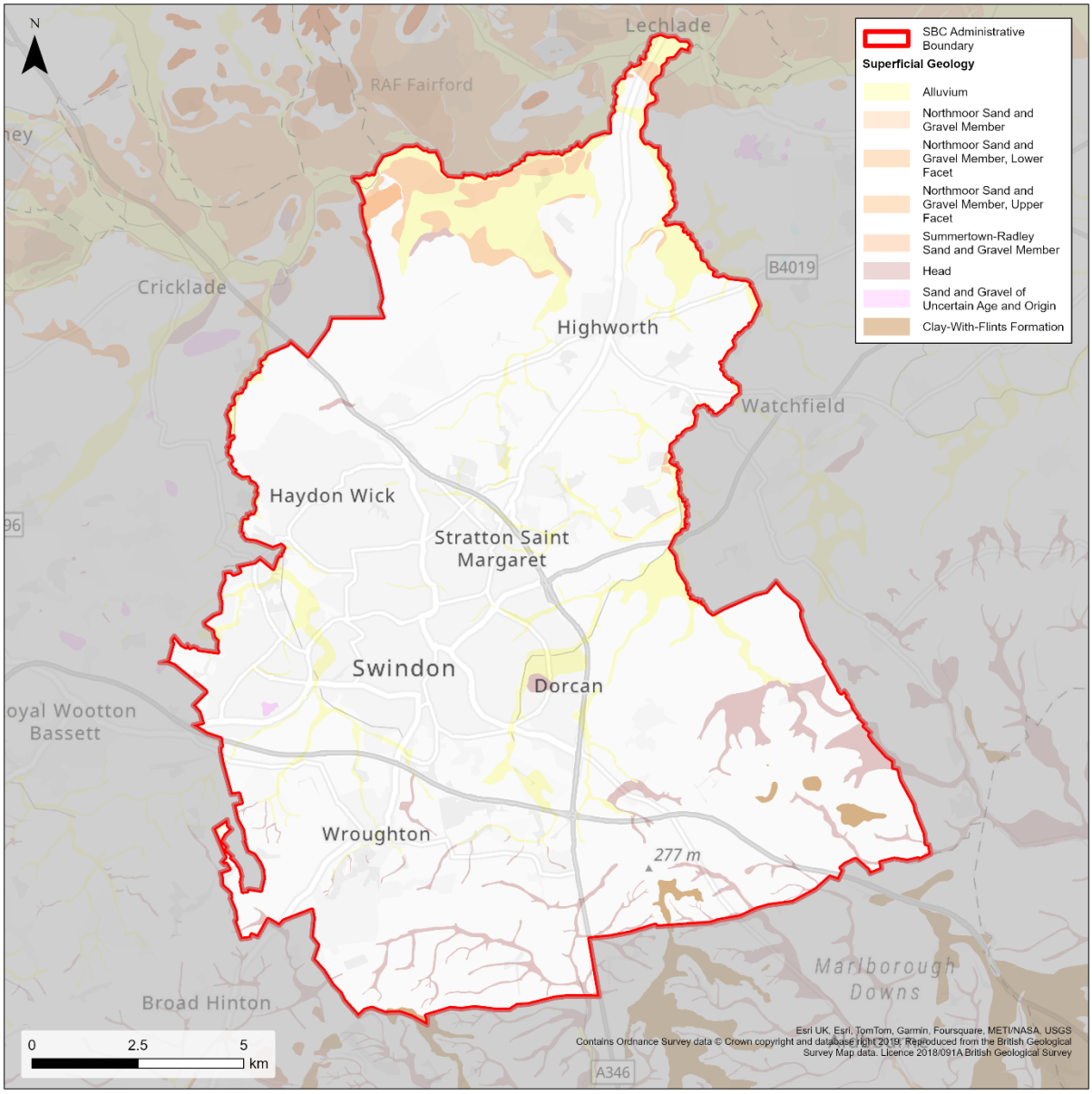
3.2.5 West Melbury Marly Chalk and Zig Zag Chalk formations cover the remaining area over the southern part of the Borough, south of the approximate line north-east to south-west from Bishopstone to Elcombe.

Figure 3.4: Bedrock Geology



3.2.6 Areas of superficial deposits (refer to **Figure 3.5**) are concentrated in the northern part of the Borough, consisting of Northmoor Sand and Gravel member and Alluvium deposits located north of Hannington. Alluvium deposits are also located in the south-east of the Borough. Head deposits comprised of clay, silt, sand and gravel are found throughout the south of the Borough.

Figure 3.5: Superficial Geology



3.2.7 A significant part of the northern and central part of the borough is underlain by Secondary A aquifer[27]. There is a strip of Secondary Undifferentiated aquifer[28], associated with the deposits and the rest of the southern part of the borough is underlain by Principal aquifer[29], associated the Chalk bedrock.

3.2.8 The Chalk principal aquifer in particular stores large quantities of groundwater that sustain river flows and are the principal source of freshwater and potable water supply for southern Swindon. This is referred to as the 'Chalk Group' which forms the most important aquifer unit within the

[27] Secondary A aquifers comprise permeable layers that can support local water supplies and may form an important source of base flow to rivers.

[28] Secondary undifferentiated are aquifers where it is not possible to apply either a Secondary A or B definition of the variable characteristics of the rock type. These have only a minor value.

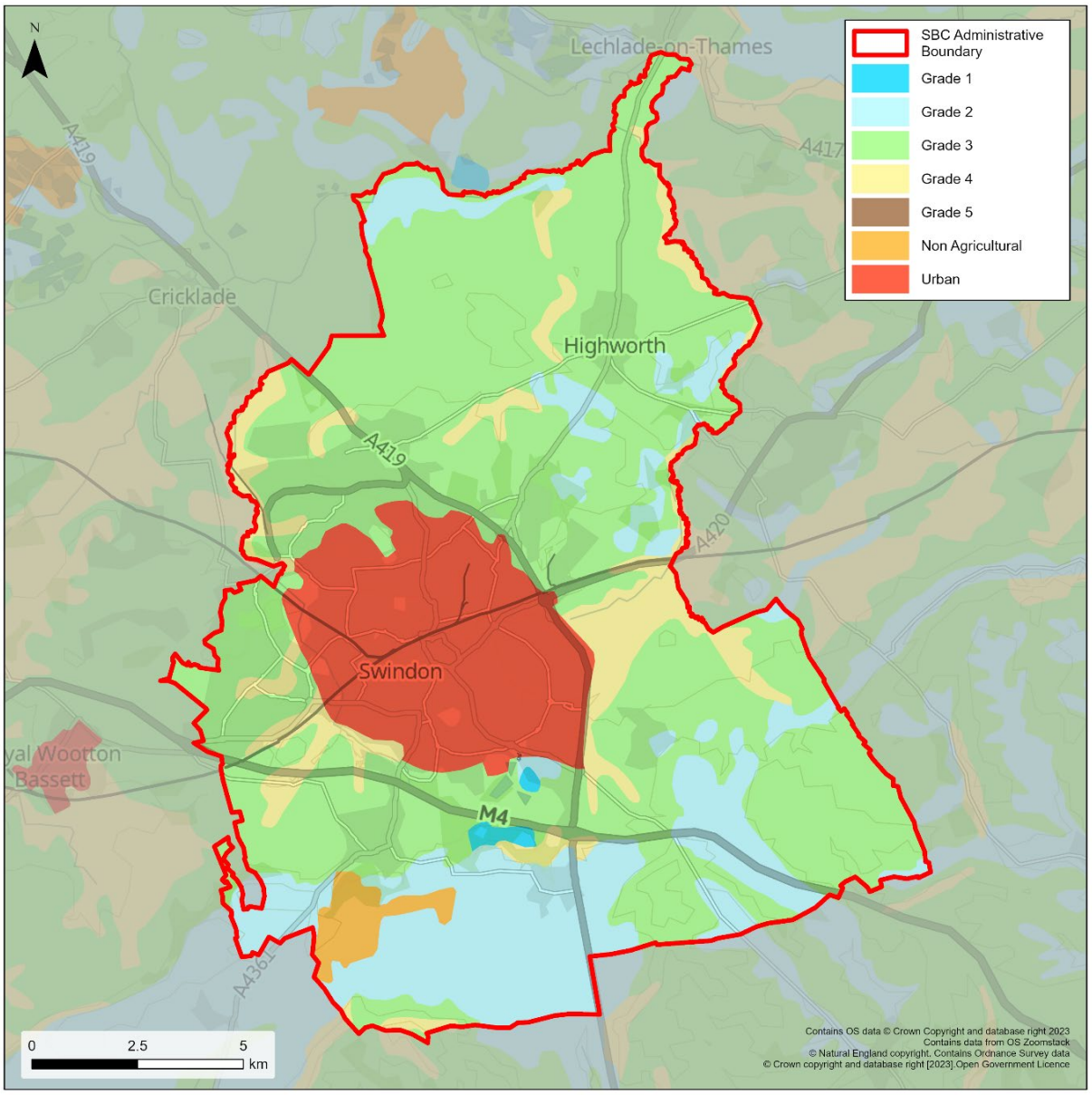
[29] Principal aquifers provide significant quantities of drinking water, and water for business needs. They may also support rivers, lakes and wetlands.

Thames Basin and supports river flows within chalk bournes characteristic of the Berkshire and Marlborough Downs, the Chilterns and North Downs.

Land Use

3.2.9 Swindon Borough is currently mostly agricultural land Grade 3, with some areas categorised Grade 2, to the south of the Borough (see **Figure 3.6**). The central part of the Borough is classified as urban. There are small areas of Grade 1, 4 and non-agricultural land dispersed around the Borough.

Figure 3.6: Agricultural Land Classification



3.2.10 The Agricultural Land Classification (ALC), is a system used in England and Wales to grade the quality of land for agricultural use, according to the extent by which physical or chemical characteristics impose long-term limitations. It is used to inform planning decisions affecting greenfield sites. The system classifies land into five grades:

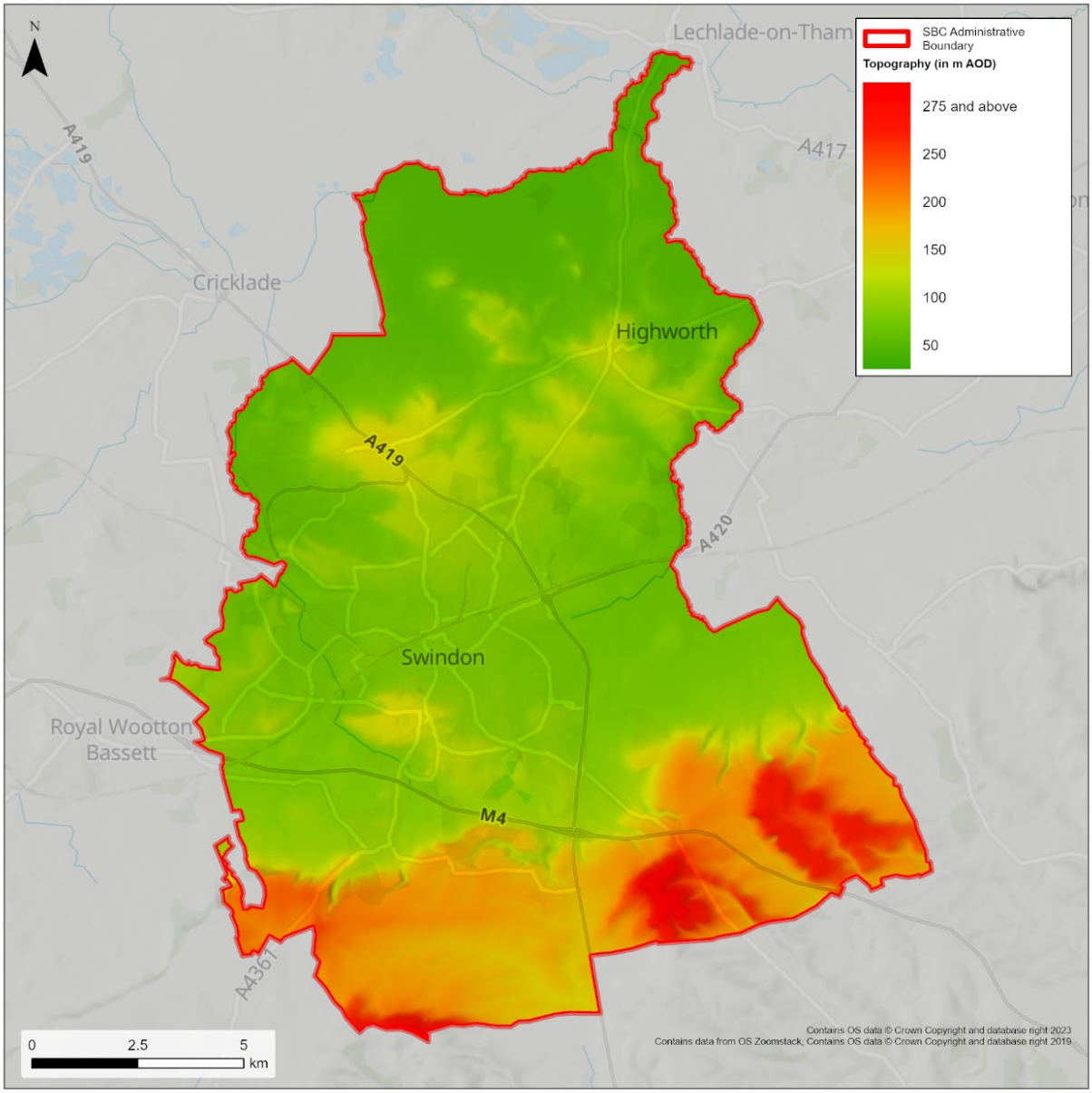
- Grade 1 - excellent quality agricultural land with no or very minor limitations.
- Grade 2 - very good quality agricultural land with minor limitations which affect crop yield, cultivations or harvesting.
- Subgrade 3a – good quality agricultural land with moderate limitations that affect the choice of crop, timing and type of cultivation/harvesting or level of yield. This land can produce moderate to high yields of a narrow range of crops or moderate yields of a wide range of crops.
- Subgrade 3b – moderate quality agricultural land with strong limitations that affect the choice of crop, timing and type of cultivation/harvesting or level of yield. This land produces moderate yields of a narrow range of crops, low yields of a wide range of crops and high yields of grass.
- Grade 4 – poor quality agricultural land with severe limitations which significantly restrict the range and level of yield of crops.
- Grade 5 - very poor quality agricultural land with very severe limitations which restrict use to permanent pasture or rough grazing with the exception of occasional pioneer forage crops.

Topography

3.2.11 **Figure 3.7** provides an overview of the topography across the Borough, based on 'Light Detection and Ranging' (LiDAR) remote sensed survey data.

3.2.12 The map illustrates a general fall across the area from south to north, and a sharp divide in topography between the upland area over the southern part of the Borough, associated with the underlying chalk geology along the fringes of the North Wessex Downs, and the lower lying part of the central and northern parts of the Borough which lies over clay.

Figure 3.7: Swindon Topography



3.3 Surface Water and River Catchments

3.3.1 There are three main rivers within the Borough:

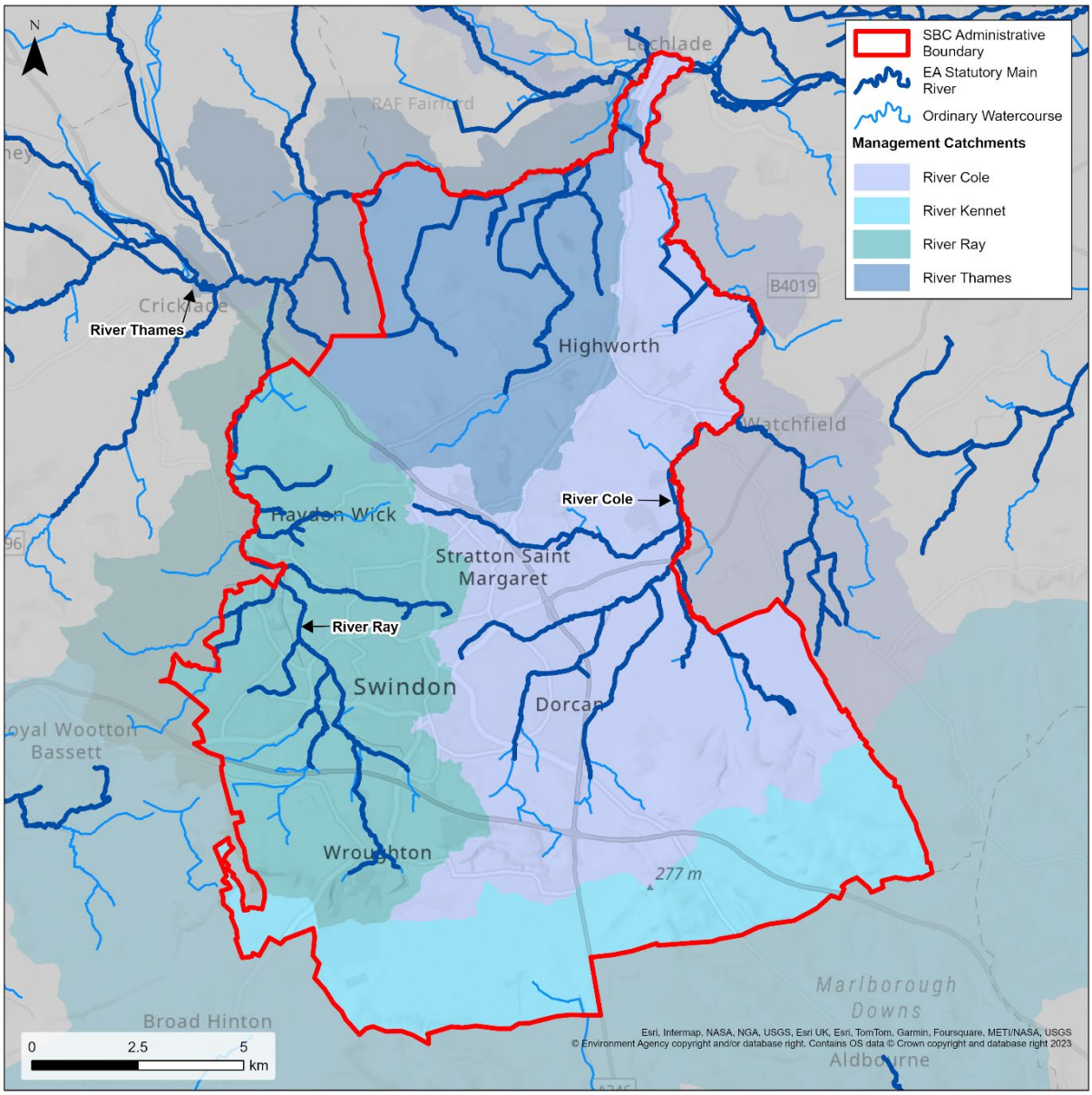
- The **River Thames** flows along the northern boundary of the site, between Cricklade and Lechlade, and a number of local tributaries, including the Share Ditch and the Bydemill Brook, flow north across the rural northern part of the Borough into the main Thames channel;
- The **River Ray**, a tributary of the Thames serving a mainly urban catchment, flows north along the western side of the Borough, rising at Wroughton and fed by tributaries including the Lydiard Brook and the Haydon Wick Brook;
- The **River Cole**, also a Thames tributary, flows north around the eastern side of the Borough and is fed by tributaries including the Lenta Brook and the South Marston Brook.

3.3.2 There is a section across the southern part of the Borough that is identified within the River Kennet catchment; this area feeds ordinary watercourses (the Og, Aldbourne and Lambourn) which drain south towards the Kennet at Marlborough, or further east.

3.3.3 There are many other smaller watercourses, drains and ditches across the Borough – designated as 'Ordinary Watercourses' - and the regulatory control of these features primarily lies with SBC as the LLFA.

3.3.4 **Figure 3.8** shows the main rivers, relevant catchments and the ordinary watercourses within Swindon.

Figure 3.8: Main Rivers and Ordinary Watercourses in Swindon



3.4 Future Climate

3.4.1 It is now accepted that human activities are leading to climate change of a scale and pace that could significantly impact our lives and those of future generations. Burning of fossil fuels since

the 1800s has led to a 40% increase in the level of carbon dioxide in the atmosphere. Evidence has shown that the high levels of carbon dioxide and other greenhouse gases in the atmosphere is a leading cause of increasing global temperatures. The average global temperature is now approximately 1°C higher than the 1850 – 1900 average.

3.4.2 The UK Climate Projections (UKCP) provides the most up-to-date assessment of how the climate of the UK may change in the future. UKCP is a climate analysis tool within the government funded Met Office Hadley Centre Climate Programme. The most recent climate projections were released in 2018 (UKCP18)[30], replacing the previous 2009 release (UKCP09).

3.4.3 The UKCP18 observations of current climate show evidence consistent with the expected effects of a warming climate, alongside considerable natural annual to multi-decadal variability. All of the top ten warmest years for the UK, in a series from 1884, have occurred since 2002. The 21st century so far has been warmer than the previous three centuries. Alongside warmer temperatures, winters and summers have also been wetter, although these patterns are potentially within long-term historic natural variability bounds.

3.4.4 The UKCP18 future climate projections indicate warming across all areas of the UK, especially during summer. The temperature and duration of hot spells during summer months will increase. Rainfall patterns will remain variable, but there will be future increases in the intensity of heavy summer rainfall events despite drier summers overall. All future projections also indicate an increase in winter rainfall, although varying between simulation details.

3.4.5 Therefore, it is anticipated that climate change will lead to an increase in the intensity and frequency of extreme weather events, including both summer and winter floods and droughts. The impact of climate change on flood risk is discussed further in the accompanying SFRA.

3.4.6 The relationship between climate change and groundwater levels is complicated and poorly understood. The Enhance Future Flows and Groundwater (eFLaG) Portal[31] was recently developed by the Centre of Ecology and Hydrology (CEH). The core deliverable of the project was an 'enhanced Future Flows and Groundwater' (eFLaG) dataset'[32] of nationally consistent climatological and hydrological projections based on UKCP18, that can be used by the water industry for water resources and drought planning – alongside a whole host of other potential uses by other sectors.

3.4.7 In this regard, eFLaG is a successor to the Future Flows and Groundwater Levels (FFGWL) dataset[33]. FFGWL has been widely used within the water industry but has also has found very wide application for diverse research purposes as well as other applied contexts outside the water industry.

[30] UK Climate Projections (UKCP) - Met Office

[31] Enhanced Future Flows and Groundwater (eFLaG) Portal (ceh.ac.uk)

[32] Hydrological projections for the UK, based on UK Climate Projections 2018 (UKCP18) data, from the Enhanced Future Flows and Groundwater (eFLaG) project - EIDC (ceh.ac.uk)

[33] Future Flows and Groundwater Levels | UK Centre for Ecology & Hydrology (ceh.ac.uk)

4 Water Resources and Supply

4.1 Overview

4.1.1 The purpose of this chapter is to:

- Review current water use, resources and abstraction regimes, using available information.
- Consider how water resource availability may change due to climate change.
- Identify what water resources are available for growth, taking into account environmental impacts and infrastructure constraints.
- Investigate current levels of uptake in water re-use systems and explore options for increasing uptake.
- Consider options for managing water demand and efficiency improvements.

4.2 Managing Water Abstraction

4.2.1 The EA is responsible for managing water resources in England. To ensure there is enough water for people (public water supply, industry and agriculture) and a healthy environment, the EA controls how much water is taken using an abstraction permitting system. The EA's approach to managing abstraction is set out in its "Managing Water Abstraction"[34] document.

4.2.2 The management of water resources is covered by a range of strategies and plans.

- **EA Abstraction Licensing Strategies (ALS):** these set out the EA's licensing approach for potential and existing abstraction. Swindon BC lies within the Kennet and Vale of White Horse Abstraction Licensing Strategy area[35]. The strategy was updated in 2019.
- **EA River Basin Management Plans:** these set out actions needed to achieve good ecological status or potential, under the Water Framework Directive, of which abstraction licensing is one mechanism. The Swindon region lies in the Thames River Basin District Management Plan[36].
- **EA Water Industry National Environment Programme (WINEP) [37]:** this is a program of investigations and actions for environmental improvement schemes that allow water companies to meet European Directives, national targets and statutory obligations. WINEP represents a set of actions that the EA have requested all 20 water companies operating in England, to complete between 2020 and 2025, in order to contribute towards meeting its environmental obligations.
- **EA Drought Plans:** these set out how the EA plans for and manages a drought[38]. These documents can be made available by the EA on application.
- **Water Company Water Resource Management Plans (WRMP):** these plans set out how water companies will manage the supply and demand of water over a 25-year period.

[34] Managing water abstraction
[35] Kennet and Vale of White Horse Abstraction Licensing Strategy (publishing.service.gov.uk)
[36] https://www.gov.uk/guidance/thames-river-basin-district-river-basin-management-plan-updated-2022
[37] Water industry national environment programme
[38] Drought management for England

WRMPs are revised every five years and subject to public consultation as highlighted in **Section 2**.

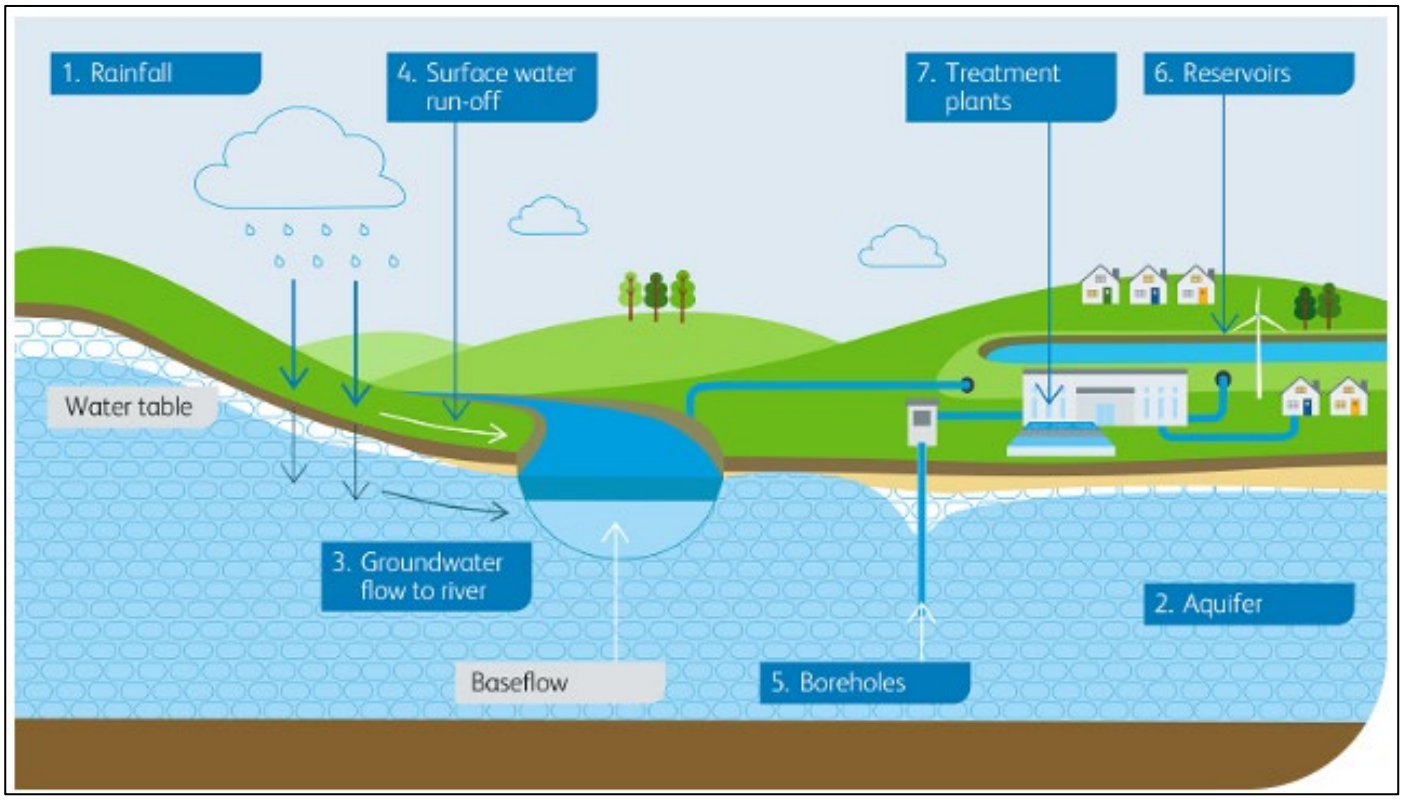
- **Water Company Drought Plans:** these plans set out what actions water companies will take to manage water supplies during drought periods. These plans are subject to consultation and are publicly available.

- **Water Company Water Resources Business Plans:** these business plans must be consistent with the WRMPs and are used to set price limits for the following five-year period. The plans are submitted to Ofwat who review pricing through the Periodic Review.

4.3 Sources of Water

4.3.1 Potential sources of water for anthropogenic activities include rainwater, surface water (e.g. rivers and lakes), groundwater, treated wastewater, and the sea. Thames Water provide an infographic of the water resource cycle as shown in **Figure 4.1**.

Figure 4.1: Where our water comes from[39] (Source: TWUL)



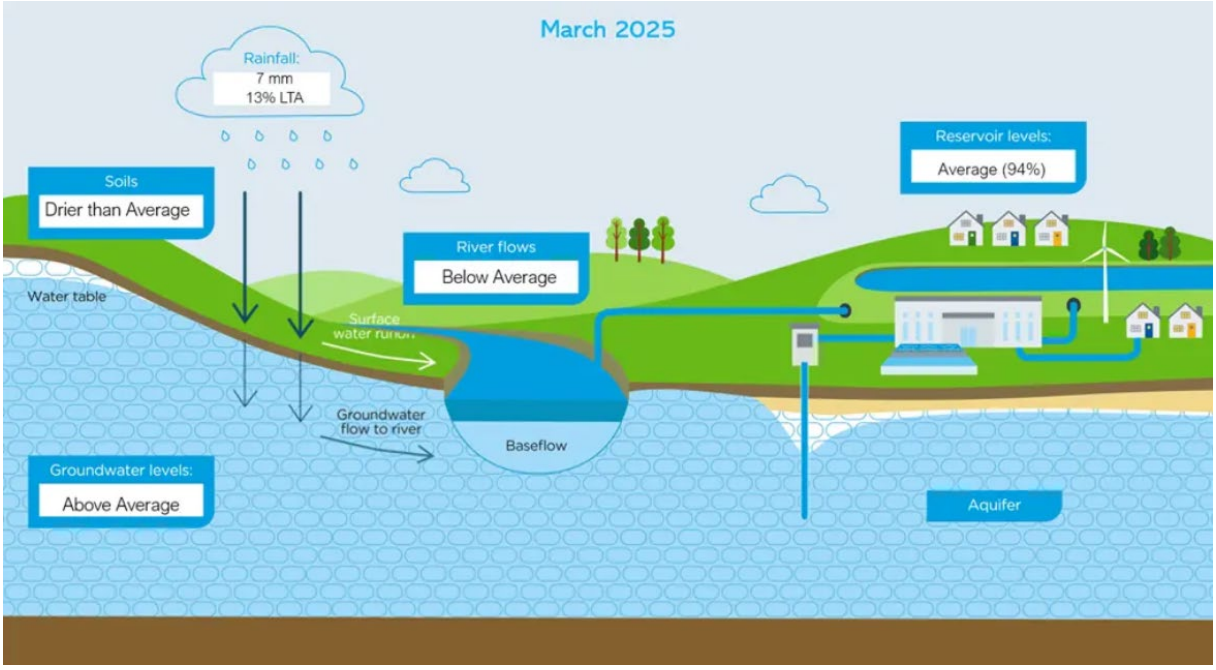
4.3.2 In Swindon, water is stored in large, open raw-water reservoirs prior to being pumped into Thames Water's treatment plants. Farmoor Reservoir, owned and administered by Thames Water, is located approximately 8km west of Oxford, near the east bank of the River Thames, and supplies potable water for most of Swindon.

4.3.3 This source is locally supplemented by groundwater abstractions, such as those at Moulsford, South Stoke and Latton. To the south of Swindon there is also an abstraction at Axford from the chalk aquifer.

[39] Reservoir levels | Performance | About us | Thames Water

4.3.4 TWUL have published an infographic (**Figure 4.2** below) depicting the water resource situation in the TWUL area coverage at the end of March 2025.

Figure 4.2: Water resources situation – March 2025[39] (Source: TWUL)



- Rainfall: In March 2025, TWUL experienced **below average** rainfall in the Thames catchment. At 7mm, it was 13% of the long-term average.
- Soil moisture: Soils moisture deficit was **above average** for the time of year across the Thames region by the end of March 2025.
- River flow: In March 2025, river flows in the River Thames and River Lee were **below average** for the time of year.
- Water levels in reservoirs: At the end of March 2025, Farmoor Reservoir in Oxfordshire was 99% full, which is **above average** for the time of year.

4.4 Resource Availability

4.4.1 The EA manages water resources at the local level through the use of abstraction licensing strategies. Within the abstraction licensing strategies, the EA's assessment of the availability of water resources is based on a classification system that gives a resource availability status which indicates:

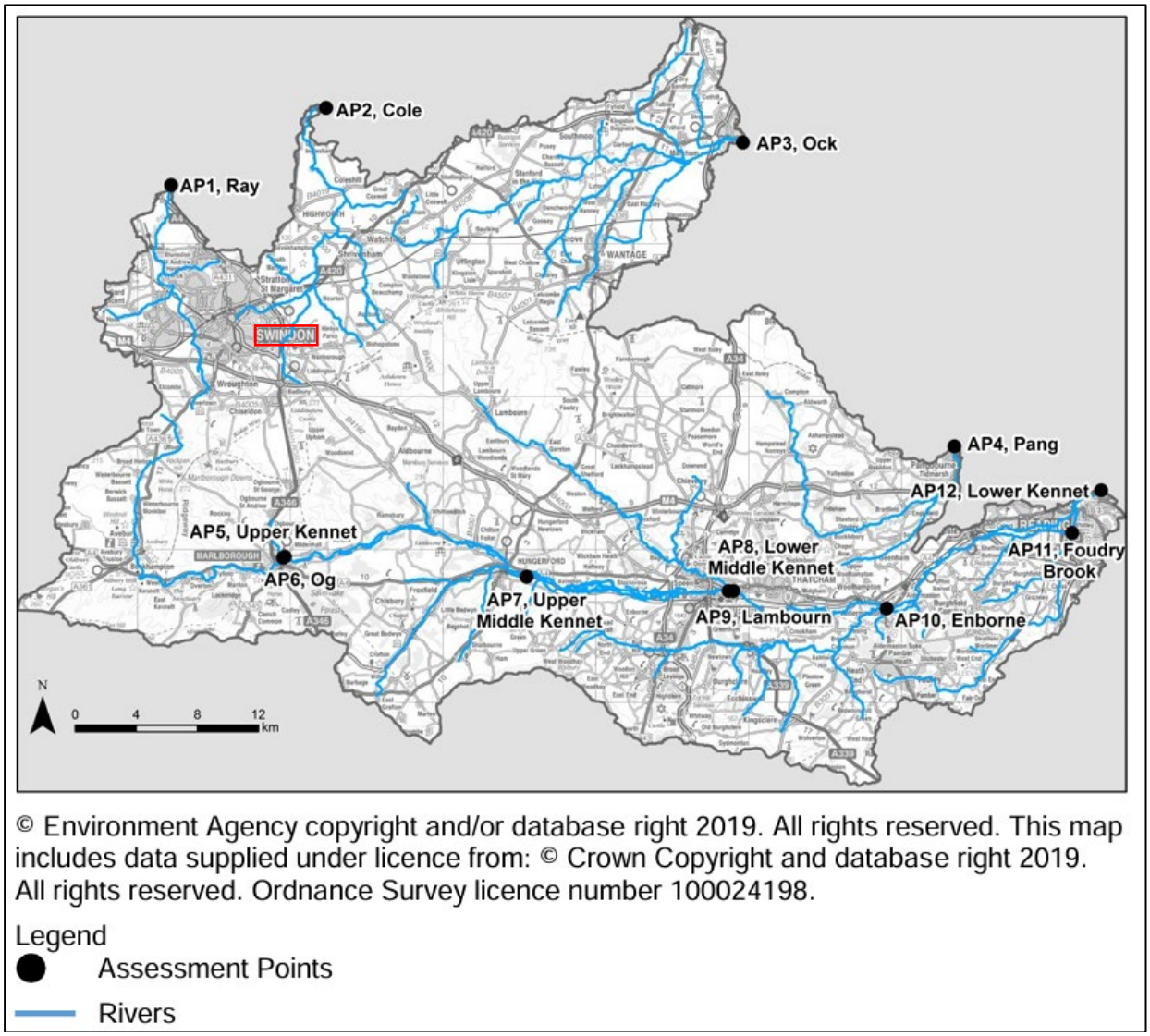
- The relative balance between the environmental requirements for water and how much is licensed for abstraction;
- Whether water is available for further abstraction; and
- Areas where abstraction needs to be reduced.

4.4.2 Swindon lies within **Kennet and Vale of White Horse Abstraction Licensing Strategy (ALS)** area, and a minor part of the River Thames that flows through the Borough lies within the **Thames ALS**.

4.4.3 The Assessment Points in the main rivers along the Kennet and Vale of White Horse ALS area are shown in **Figure 4.3**. Swindon is located to the south of AP1, Ray; in-between AP1, Ray and AP5, Upper Kennet.

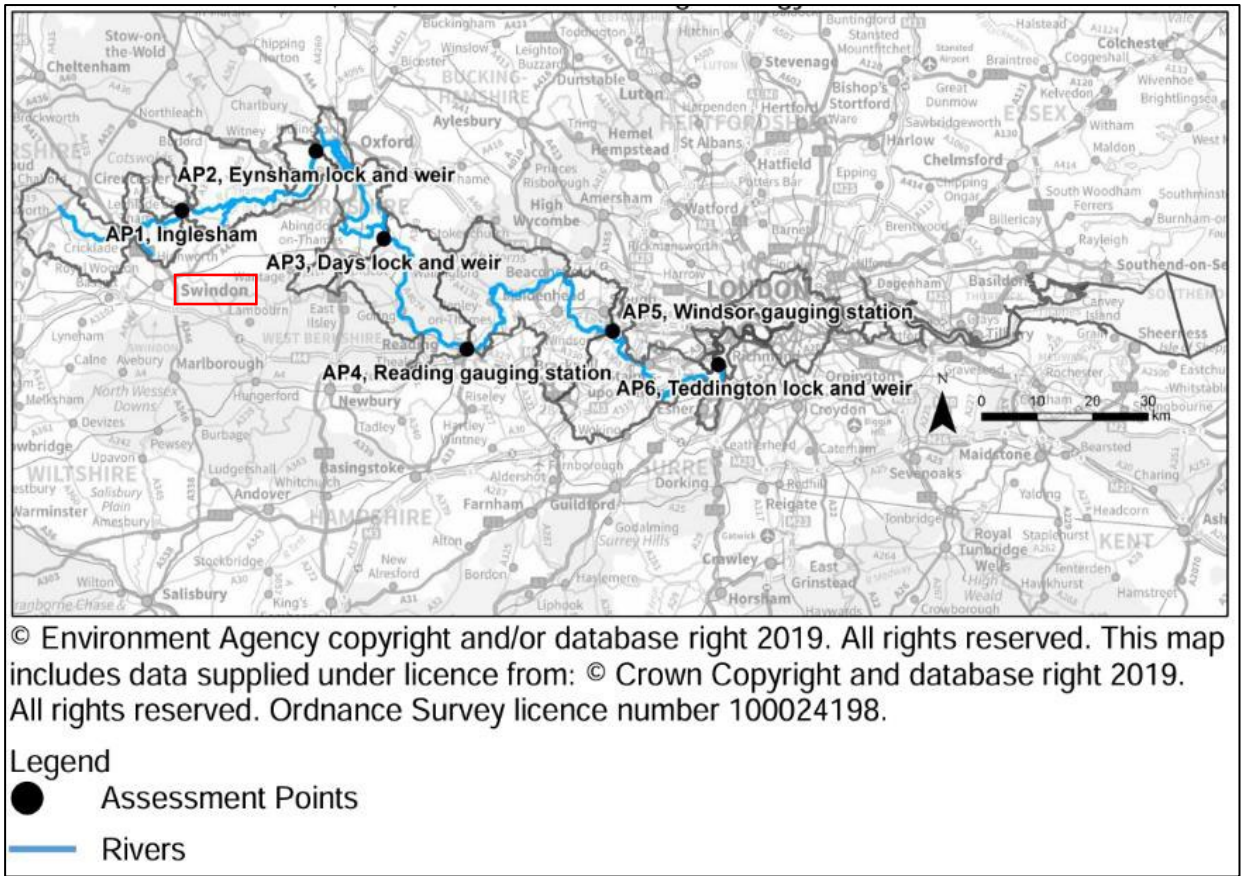
4.4.4 The Assessment Points on the main rivers along the Thames ALS area are shown in **Figure 4.4**. Swindon lies to the south of AP1, Inglesham.

Figure 4.3: The Kennet and Vale of White Horse ALS area showing Assessment Points



Legend
● Assessment Points
— Rivers

Figure 4.4: Thames ALS area (tidal and non-tidal) showing the Assessment Points (APs)



4.4.5 The categories of resource availability status are shown in **Table 4.1**. The classification is based on an assessment of a river system's ecological sensitivity to abstraction-related flow reduction. This classification can then be used to assess the potential for additional water resource abstractions.

Table 4.1: Water Resource Availability Status Categories

Indicative Resource Availability Status	License Availability
Water available for licensing (Green)	In this flow scenario, there is more water than required to meet the needs of the environment. New licences can be considered at this flow but may be constrained to protect local features.
Restricted water available for licensing (Yellow)	In this flow scenario, full licensed flows fall below the Environmental Flow Indicator (EFI) in this and/or a downstream water body(ies). If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted at this flow. Water may be available if you can 'buy' (known as water rights trading) the entitlement to abstract water from an existing licence holder. It is likely the EA will be taking action to reduce full licensed risks.
Water not available for licensing (Red)	In this flow scenario, recent actual flows are below the EFI in this and/or a downstream water body(ies). This scenario highlights water bodies in which abstraction is contributing to flows falling below the

Indicative Resource Availability Status	License Availability
	EFI. Flows should meet the EFI to help support a healthy ecology in the EA rivers. No new consumptive licences would be granted at this flow. Water may be available if you can 'buy' (known as water rights trading) the amount of water equivalent to that recently abstracted from an existing licence holder. 'Good Ecological Status' (GES) is when recent actual flows are meeting the EFI and supporting a healthy ecology in a river (known as 'Good Ecological Potential' (GEP) in water bodies that are heavily modified for reasons other than water resources). The EA is currently taking action in water bodies in which flows are not supporting GES or GEP.

4.4.6 The water resource availability is calculated at four different flows; Q95 (the flow of a river which is exceeded on average for 95% of the time i.e. low flow), Q70, Q50 and Q30.

Abstraction Licensing Strategy	River Water Resources Management Units	Surface water (flow exceedance scenarios)			
		Q30	Q50	Q70	Q95
Kennet and Vale of White Horse	AP1 Ray				
Kennet and Vale of White Horse	AP2 Cole				
Kennet and Vale of White Horse	AP5 Upper Kennet				
Thames	AP1 Inglesham				

4.4.7 **Table 4.2** shows the resource availability for the Kennet and Vale of White Horse ALS and Thames ALS based on the EA's resource assessment.

Table 4.2: Resource Availability Classification Summary

Abstraction Licensing Strategy	River Water Resources Management Units	Surface water (flow exceedance scenarios)			
		Q30	Q50	Q70	Q95
Kennet and Vale of White Horse	AP1 Ray				
Kennet and Vale of White Horse	AP2 Cole				
Kennet and Vale of White Horse	AP5 Upper Kennet				
Thames	AP1 Inglesham				

4.4.8 All of the above waterbodies (River Ray, River Cole, Upper Kennet and Upper Thames at Inglesham) are defined as having restricted water available for licensing during the high flow (Q30) period. However, **Table 4.2** indicates that the waterbodies do not have any water available for licensing during the medium flow (Q50), low flow (Q70) and very low flow (Q95) period.

Resource Availability - Thames Bespoke Licensing Strategy

4.4.9 The bespoke Thames licensing strategy applies to application for the following license types or variations to existing licenses:

- Consumptive surface water abstractions
- Groundwater abstractions in direct hydraulic continuity with a river or water dependent habitat features.

4.4.10 For the above abstractions, the bespoke strategy adopts a multi-tier Hands off Flow (HoF)[40] as detailed below:

- For consumptive abstraction licenses below 2 Ml/d, no abstraction will take place when the average of the daily mean flows of the preceding 5 days in the River Thames (as gauged at Kingston) is equal to or less than Q50 (1780 Ml/d).
- For all consumptive abstractions of 2 Ml/d or above, a HoF of between Q30 (5170 Ml/d) and Q50 (1780 Ml/d) (based on the average of the daily mean flows of the preceding 5 days as gauged at Kingston) will be applied based on the perceived level of risk to the water body or downstream water bodies. Supporting environmental assessments will be required to show the abstraction will not cause environmental deterioration or prevent water bodies achieving Good Ecological Status or Good Ecological Potential.
- For abstractions of all sizes, additional local HoFs or levels may be applied to protect local features or existing abstractors.

[40] Setting a flow rate below which abstraction cannot occur is often described as a Hands off Flow. It ensures that low river flows will always be protected from abstraction. All hydropower abstraction licences will have a HoF.

4.4.11 Consumptive groundwater licences which do not have a direct impact upon river flow and will not contribute to the deterioration of groundwater quantitative status may be permitted, but may be subject to restrictions. Restrictions will be determined on a case-by-case basis and applications will be subject to the normal licence determination process.

4.4.12 Applications for new non-consumptive abstraction licences – or those with net environmental benefit – may be permitted, but may be subject to restrictions to protect local features and any bypassed reach. Restrictions will be determined on a case-by-case basis and applications will be subject to the normal licence determination process.

4.4.13 **Table 4.3** below shows the revised resource availability with the Thames bespoke licensing strategy applied.

Table 4.3: Resource Availability Classification with Thames bespoke licensing strategy applied

Abstraction Licensing Strategy	River Water Resources Management Units	Surface water (flow exceedance scenarios)			
		Q30	Q50	Q70	Q95
Kennet and Vale of White Horse	AP1 Ray				
Kennet and Vale of White Horse	AP2 Cole				
Kennet and Vale of White Horse	AP5 Upper Kennet				
Thames	AP1 Inglesham				

4.4.14 **Table 4.3** confirms that, when the Thames bespoke licensing strategy is applied, all of the above waterbodies are defined as having more water than required to meet the needs of the environment during the Q30 period. However, during the Q50 period, the River Ray, River Cole and Upper Thames at Inglesham are defined as having restricted water available for licensing, whereas the Upper Kennet waterbody shows that has no water available for licensing. Finally, during the low flow (Q70) and very low flow (Q95) periods, all the waterbodies are identified as having no water available for licensing.

4.5 Future Water Resource Planning: TWUL Water Resources Management Plan 2024

4.5.1 In October 2024, following the government's approval, TWUL published their Water Resources Management Plan 2024 (WRMP24), which sets TWUL on the path to secure a sustainable water future. WRMP24 highlights the challenge TWUL face for their future water supply and sets out how TWUL plan to continue delivering potable water for all customers while caring for the environment and helping the economy over the next 50 years.

Baseline Supply Demand Balance

Introduction

4.5.2 The baseline supply-demand balance position is defined as ***'the resulting supply-demand balance assuming no activity beyond the immediate AMP period other than that required to maintain leakage, or that required by law'.***

4.5.3 By comparing the profiles of unrestricted demand (Section 3 of the WRMP24) against the available supply (Section 4 of the WRMP24), plus an allowance for uncertainty, and accounting for future sustainability reductions, the supply-demand balances are created.

4.5.4 TWUL's baseline includes a period (2025-2032) during which they would not impose emergency drought orders more often than once every 100 years; there then follows a period during which they would not impose emergency drought orders more often than once every 200 years (2033-2039), and then a period when they would not impose emergency drought orders more often than once every 500 years.

4.5.5 Where there is an upwards step change in the resilience level in TWUL's plan, there will be a step down in the supply-demand balance. The reason for this is that TWUL can reliably supply more water in less severe drought events. As TWUL increases the level of resilience that is aiming for, it will be able to rely on a smaller supply of water from the existing resources.

4.5.6 Swindon is located within the London and Swindon and Oxfordshire (SWOX) Water Resource Zone (WRZ).

4.5.7 TWUL's baseline in London and SWOX WRZ is presented slightly differently to WRMP19. In WRMP19 TWUL assumed that Temporary Use Bans (TUBs) and Non-Essential Use Bans (NEUBs, also known as DD11 Drought Orders) were part of the baseline. These are now excluded from the baseline. In the 'Baseline Supply Demand Balance' section of the WRMP24, TWUL has presented a set of baseline supply-demand balances excluding TUBs, NEUBs and media campaigns, and a set of supply-demand balances which include these actions, to reflect the fact that TWUL will certainly include these demand management actions within the WRMP.

4.5.8 TWUL has excluded transfers to companies within the Water Resources South East (WRSE) region from the baseline supply-demand balance, regardless of whether a contract exists for that transfer. The reason for this is that the WRSE plan has optimised transfers between WRSE companies. Transfers to those companies outside WRSE have been included within TWULs' baseline.

Baseline Supply-Demand Balance and Adaptive Planning

4.5.9 In WRMP19, TWUL formed single supply-demand balance profiles, using deterministic forecasts for supply, demand and target headroom. According to Section 6 of the WRMP24, TWUL has adopted an adaptive planning approach, reflecting the highly uncertain exogenous factors which they need to plan for, and so will instead set out multiple supply-demand balance profiles.

4.5.10 The key uncertainties within the WRMP24 are:

- Population growth, and so the demand forecast
- The volume of sustainability reductions
- The impact that climate change will have on the available supplies.

4.5.11 These exogenous uncertainties are the factors that TWUL will consider when building supply-demand balance scenarios. TWUL's plan will be one which provides an efficient solution to a very uncertain future, rather than being a plan which focuses on providing an optimised solution for a given future.

4.5.12 The scenarios considered and branch points adopted are consistent across the WRSE regional group.

4.5.13 TWUL's plan starts with a single supply-demand balance 'branch'. It starts off with a single branch, because the TWUL needs to have a single plan for actions which need to be undertaken

in AMP8. After AMP8, if appropriate to do so, TWUL can consider having different investment programmes which are suitable for different future scenarios. For example, if TWUL saw that population growth was following a low trajectory during AMP8, it may make different investments during AMP9 (2030-35) than if it saw that population growth was following a high trajectory. TWUL considered the magnitude of difference between different forecasts of uncertain factors over time, as well as the time at which they may be able to observe whether a more or less severe trajectory is being followed, as well as considering the allowances for uncertainty and the lead times associated with interventions, when considering when the supply-demand balance profiles should branch.

SWOX DYAA Supply-Demand Balance Profile

4.5.14 Comparing the WRMP19 and WRMP24 for 2024-25 (as shown in **Table 4.4**), the overall supply-demand balance slightly deteriorated. Distribution input has changed significantly between the two forecasts, with leakage, household consumption and non-household consumption all being higher in the WRMP24 forecast than WRMP19.

4.5.15 Underlying Source Deployable Output (SDO) have changed little, but datasets and methods used for calculating Deployable Output (DO) have changed significantly between WRMP19 and WRMP24, and this has resulted in a change to the calculated WRZ DO figure. The baseline DO figure has increased slightly, but when including the benefits of Temporary Use Bans and Non-Essential Use Bans, WRZ Deployable Output has increased significantly. This increase in DO is likely to be a combination of more dynamic modelling of the conjunctive use system (e.g., including time-variant groundwater yields, rather than worst-case DO values), and potentially due to 1976 having been a very severe event for SWOX (and as such, the WRMP19 "worst historical" Deployable Output perhaps being subject to a more than 1 in 100-year event).

4.5.16 Outage allowance has reduced significantly, as a result of the removal of "generic" outages. Target Headroom has increased as a result of exploration of the risks and uncertainty around TWUL's surface water sources.

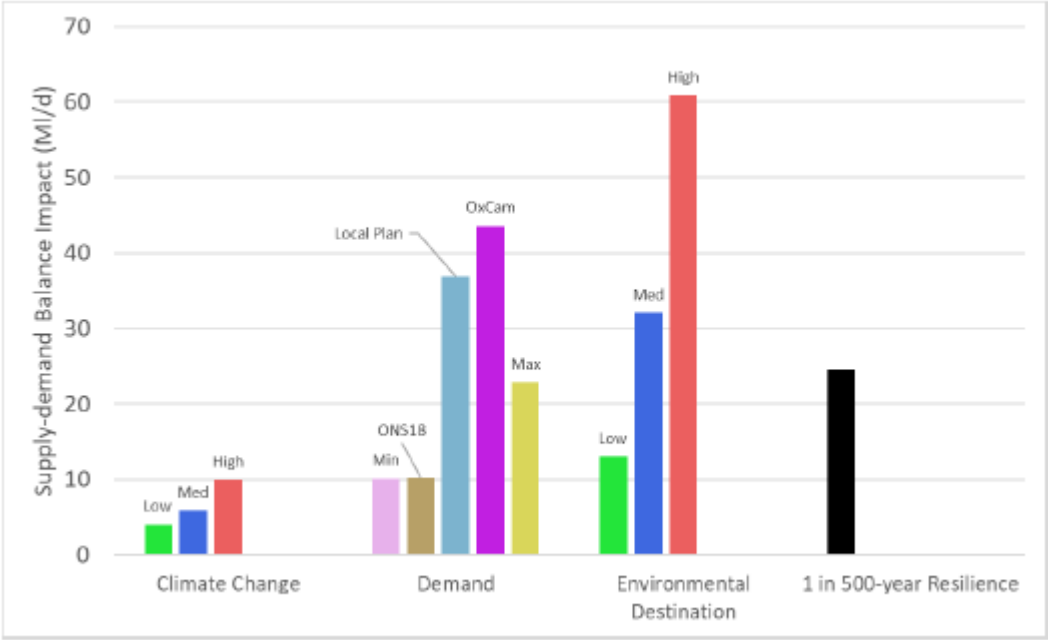
4.5.17 The overall result is that the supply-demand balance at 2024-25 is slightly worse than the value anticipated in WRMP19.

Table 4.4: Supply-demand balance component comparison between WRMP19 and WRMP24, SWOX DYAA[25]

Component (Ml/d unless stated)	WRMP19 (Yr 2024-25)	WRMP24 (Yr 2024-25)	Difference
Population (000s)	1191	1139	-52
Per Capita Consumption (l/h/d)	127.2	134.4	+7.2
Household Consumption	147.1	148.6	+1.5
Non-household Consumption	49.4	53.7	+4.3
Leakage	53.6	65.0	+11.4
Distribution Input	255.0	278.9	+23.9
Total Groundwater SDOs (worst historical)	177.9	178.9	+1.0
WRZ DO after process losses and network constraints**	316.3	317.9	+1.6
Outage Allowance	17.2	6.7	-10.5
Total Imports	2.1	0.4	-1.7
Total Exports	1.0	9.5	+8.5
Climate Change Impact	-3.4	-3.9***	-0.5
WAFU	296.8	298.2	+1.4
Target Headroom	14.8	29.3	+14.5
Benefit from Demand Savings During a Drought**	Included in DO	25.9	+25.9
Supply Demand Balance (SDB)	+27.0	+15.9	-11.1

4.5.18 **Figure 4.5** below shows that Environmental Destination and demand are the largest uncertainties associated with SWOX's DYAA supply-demand balance, with climate change posing a smaller uncertainty and 1 in 500-year resilience posing a moderate challenge.

Figure 4.5: SWOX DYAA – Supply-demand Balance Reductions for Different Components and Scenarios by 2050[25]



4.5.19 **Figure 4.6** and **Figure 4.8** show that SWOX is forecast to begin close to supply-demand balance for the DYAA planning scenario. It is important to note that this is only due to the removal of the benefits associated with media campaigns, Temporary Use Bans, and Non-Essential Use Bans - and that when these benefits are included, TWUL's supply-demand balance starts in a position of surplus, as shown in **Figure 4.7** and **Figure 4.9**.

4.5.20 A surplus in SWOX during AMP8 is identified, but a transition to deficit during the early 2030s, when TWUL moves to 1 in 200-year resilience.

4.5.21 When TWUL's supply-demand balances branch into three branches, a moderate gap of around 20 Ml/d between the most and least favourable supply-demand balances is identified.

4.5.22 When TWUL's supply-demand balances branch into 9, a much more significant variation between future supply-demand balance positions is present, particularly after 2050 when Environmental Destination DO reductions are accounted for. The gap between the most challenging and least challenging supply-demand balances is around 80 Ml/d by 2050, which equates to around a quarter of the supplies in the zone at present. Situations 1, 4, and 7 are the most challenging in the long-term.

4.5.23 In TWUL's forecast for situation 4, there are deficits, when accounting for benefits from Temporary Use Bans (TUBs) and Non-Essential Use Bans (NEUBs) of 25 Ml/d after TWUL's move to 1 in 200-year resilience, 92 Ml/d after moving to 1 in 500-year resilience and enabling a licence reduction at Farmoor, 102 Ml/d after all Environmental Destination DO reductions are accounted for, and 108 Ml/d by the end of the planning period.

4.5.24 When compared to the WRMP19 baseline supply-demand balance (refer to **Table 4.5**), TWUL's initial position, the supply-demand balance is initially slightly improved due to the AMP7 demand programme. A demand forecast which grows more quickly than the WRMP19 forecast means that this initial gap is closed by 2030, and as this increased growth, the Farmoor licence reduction, and 1 in 500-year resilience are accounted for TWUL has a much greater planning

problem by 2045 than was forecast in WRMP19. The size of the baseline deficit forecast continues to increase above that forecast in WRMP19 in the longer-term as significant licence reductions are accounted for.

Figure 4.6: Supply-demand balances Situation Tree for SWOX DYAA Scenario[25]

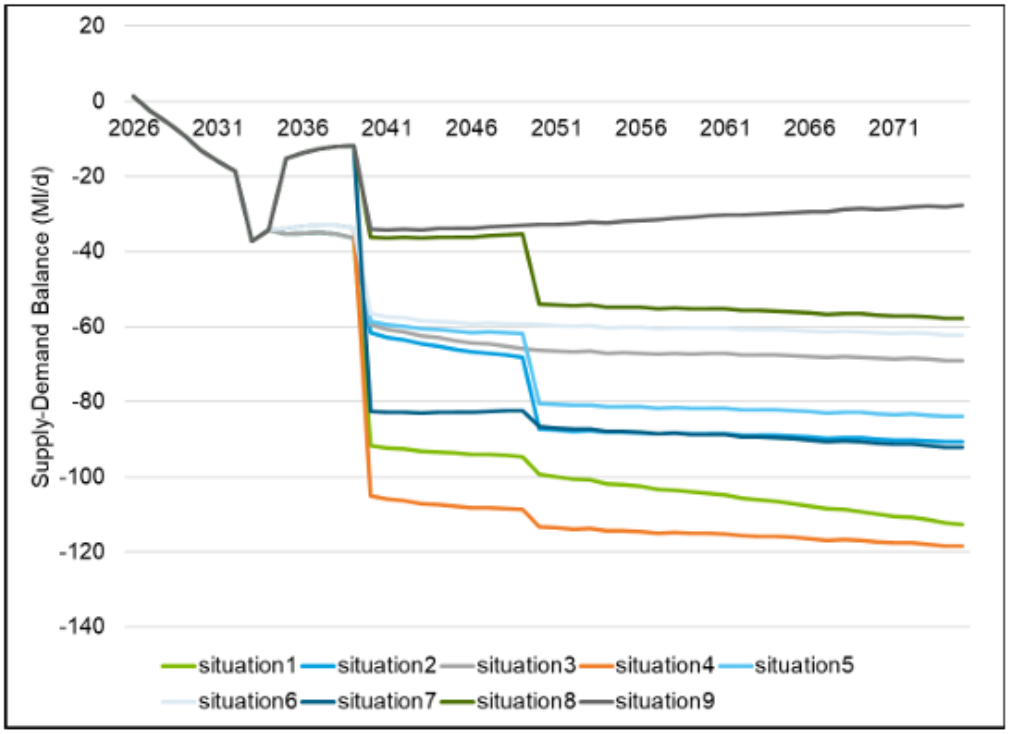


Figure 4.7: Supply-demand balances Situation Tree for SWOX DYAA Scenario (incl. Drought Demand Savings)[25]

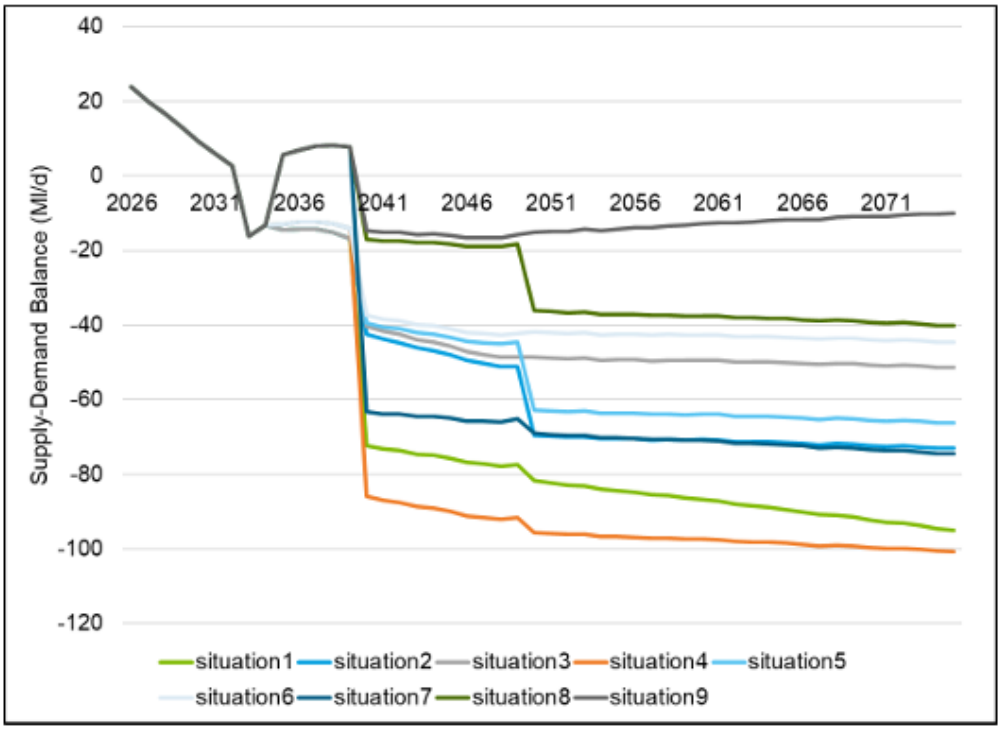


Figure 4.8: Baseline Supply-demand Balance for Situation 4, SWOX DYAA[25]

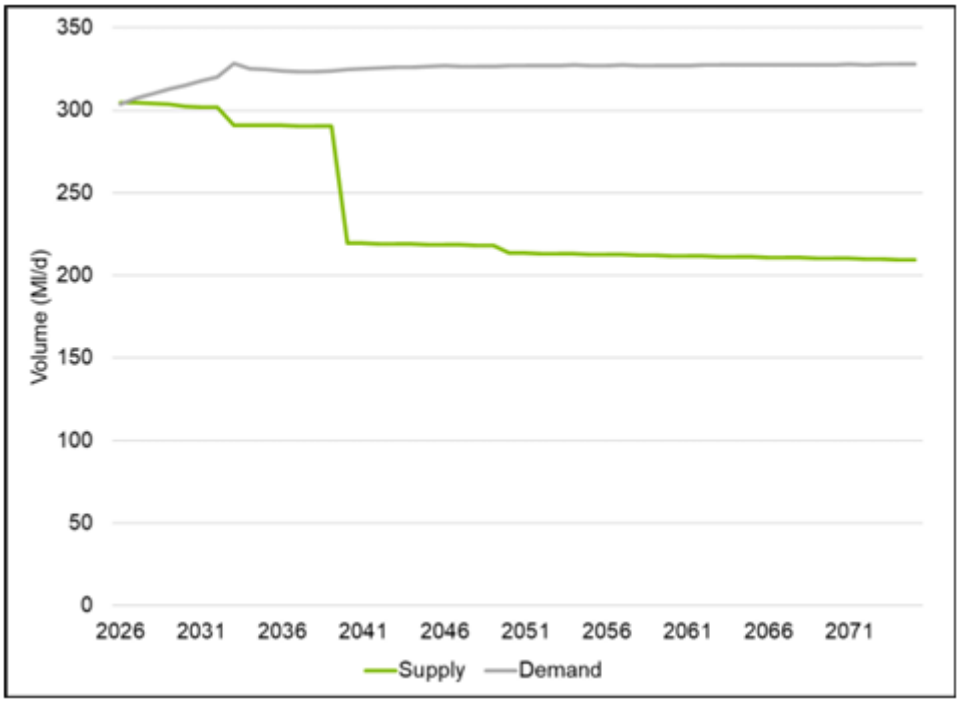


Figure 4.9: Baseline Supply-demand Balance for Situation 4, SWOX DYAA (incl. Drought Demand Savings)[25]

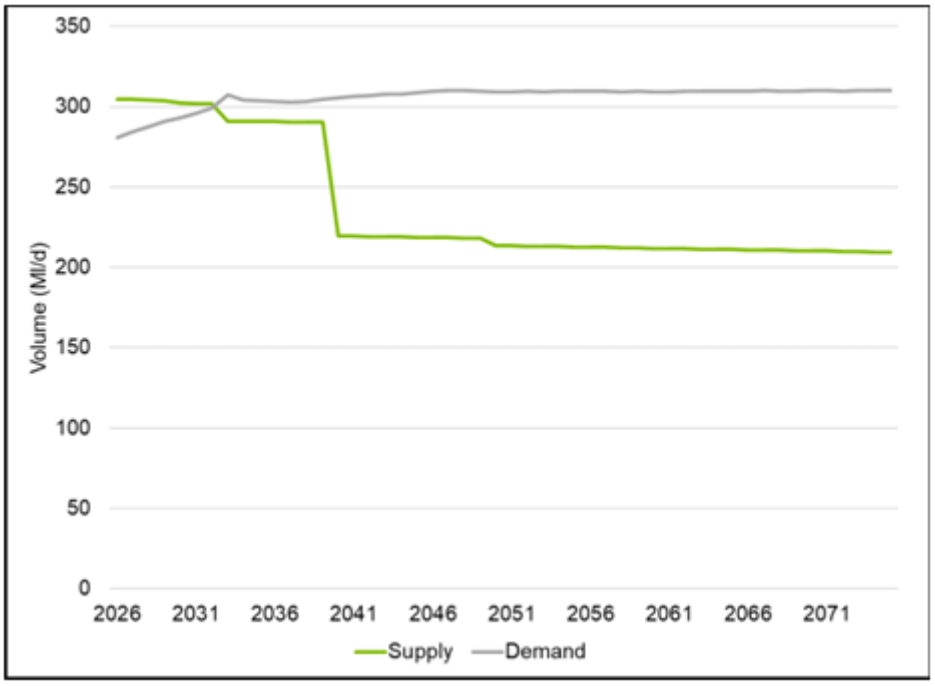


Table 4.5: Comparison Between WRMP19 and WRMP24 (Situation 4) Baseline Supply-Demand Balance for SWOX WRZ DYAA[25]

	2026	2030	2045	2075
WRMP19	+9	+6	+8	+9
WRMP24	+11	-3	-96	-108

Note: In order to provide a like-for-like comparison, benefits associated with Media Campaigns, TUBs and NEUBs are included for WRMP24

SWOX Dry Year Critical Period Supply-Demand Balance Profile

4.5.25 Comparing the WRMP19 and WRMP24 final plan forecasts for 2024-25 (as shown in **Table 4.6**), there are significant changes in its components. Distribution input has changed significantly between the two forecasts, with leakage, household consumption and non-household consumption all being significantly higher in the WRMP24 forecast than in WRMP19.

4.5.26 Underlying source DOs have changed little, but datasets and methods used for calculating DO have changed significantly between WRMP19 and WRMP24, and this has resulted in a change to the calculated WRZ DO figure. The baseline Deployable Output figure has reduced, but when including the benefits of Temporary Use Bans and Non-Essential Use Bans, WRZ Deployable Output has increased. Outage allowance has reduced significantly, as a result of a Dry Year Critical Period (DYCP) outage allowance. Target Headroom has increased as a result of exploration of the risks and uncertainty around TWUL's surface water sources.

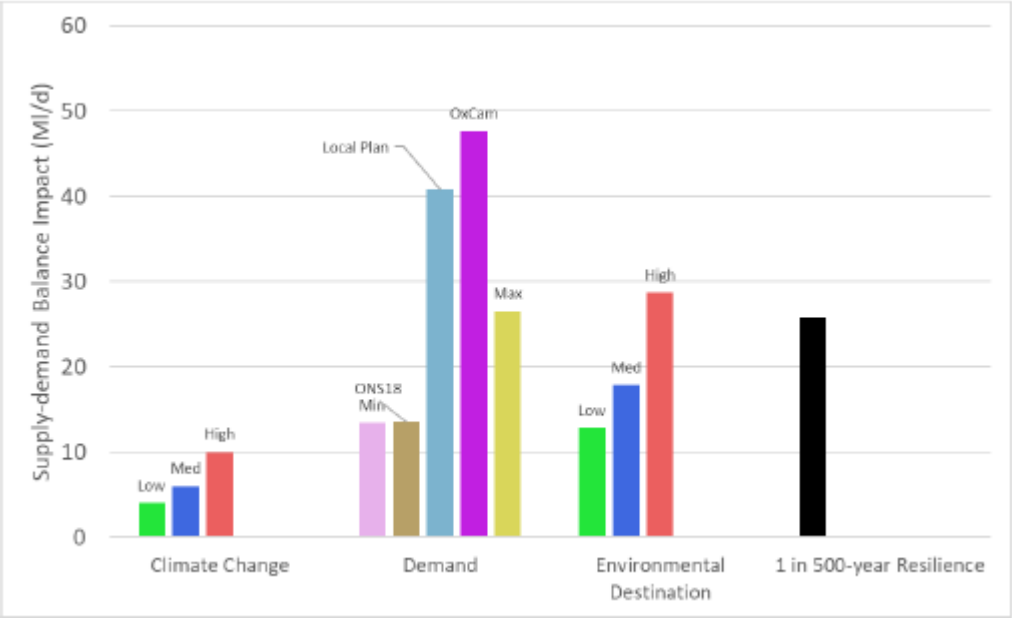
4.5.27 The overall result is a small improvement in the TWUL's supply-demand balance position.

Table 4.6: Supply demand balance component comparison between WRMP19 and WRMP24, SWOX DYCP[25]

Component	WRMP19 (Yr 2024-25	WRMP24 (Yr 2024-25)	Difference
Population (000s)	1,191	1,138	-53
Per Capita Consumption (l/h/d)	178.0	181.8	+3.8
Household Consumption	205.9	201.0	-4.9
Non-household Consumption	49.8	53.7	+3.9
Leakage	50.8	65.1	+14.3
Distribution Input	314.2	331.3	+17.2
Total Groundwater SDOs (worst historical)	193.4	191.5	-1.9
WRZ DO after process losses and network constraints**	370.6	339.9	-30.7
Outage Allowance	17.2	3.1	-14.1
Total Imports	5.0	0.4	-4.6
Total Exports	1.2	9.5	+8.3
Climate Change Impact	-3.8	-3.9***	-0.1
WAFU	353.3	323.9	-29.4
Target Headroom	20.5	29.1	+8.6
Benefit from Demand Savings During a Drought	Included in DO	60.4	+60.4
Supply-demand Balance (SDB)	18.7	23.9	+5.2

4.5.28 **Figure 4.10** shows that the demand contains the most important future uncertainty for the SWOX WRZ's DYCP scenario, although environmental destination and 1 in 500 year resilience also pose challenges.

Figure 4.10: SWOX DYCP – Supply-demand Balance Impact for Different Components and Scenarios by 2050[25]



4.5.29 **Figure 4.11**, **Figure 4.12** and **Figure 4.13** show that the SWOX DYCP scenario begins in a position of surplus.

4.5.30 Many of the futures for the SWOX DYCP scenario sit within a fairly narrow range, with the difference between the second-most challenging and second-least challenging situations being around 30 Ml/d by 2050. This is because Environmental Destination licence reductions pose less of a risk to the peak supply-demand balance than the annual average.

4.5.31 When compared with the WRMP19 baseline (**Table 4.7**), the reduced allowance for outage during the DYCP planning scenario and increased assessment of SWOX's DYCP DO, along with the AMP7 demand management programme, give a significant improved supply-demand balance at the beginning of the planning period in branch 4. Sustainability reductions and a higher demand forecast in the Local Authority plan-based demand forecast result in a more challenging supply-demand position than WRMP19 in the long-term.

Figure 4.11: Supply-demand balances Situation Tree for SWOX DYCP Scenarios[25]

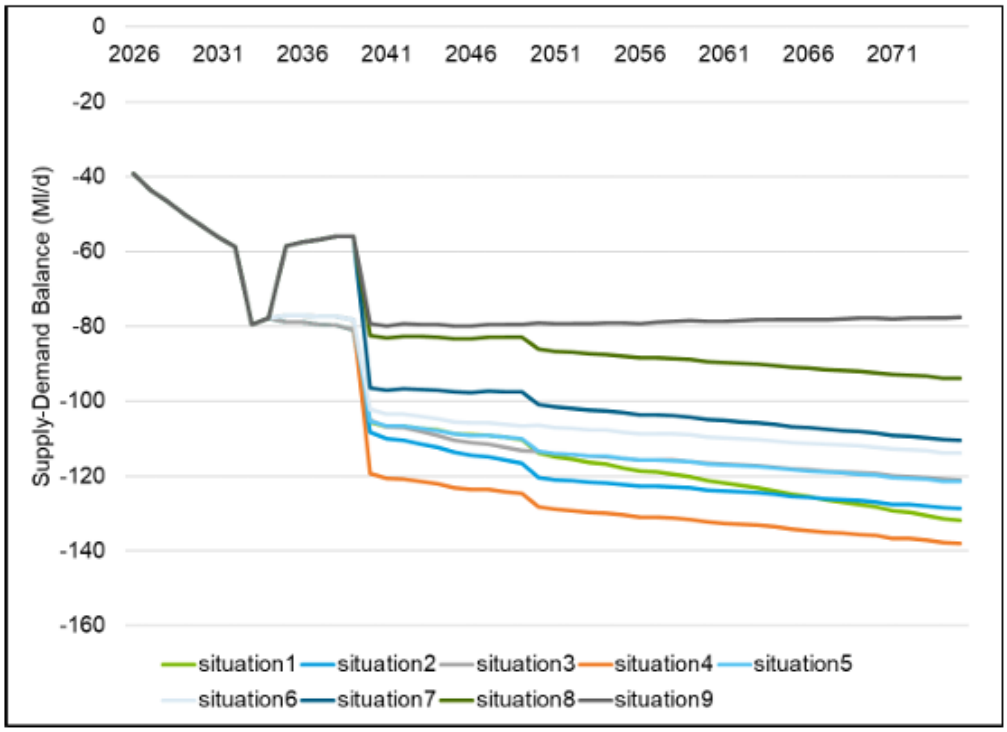


Figure 4.12: Supply-demand balances Situation Tree for SWOX DYCP Scenario (incl. Drought Demand Savings)[25]

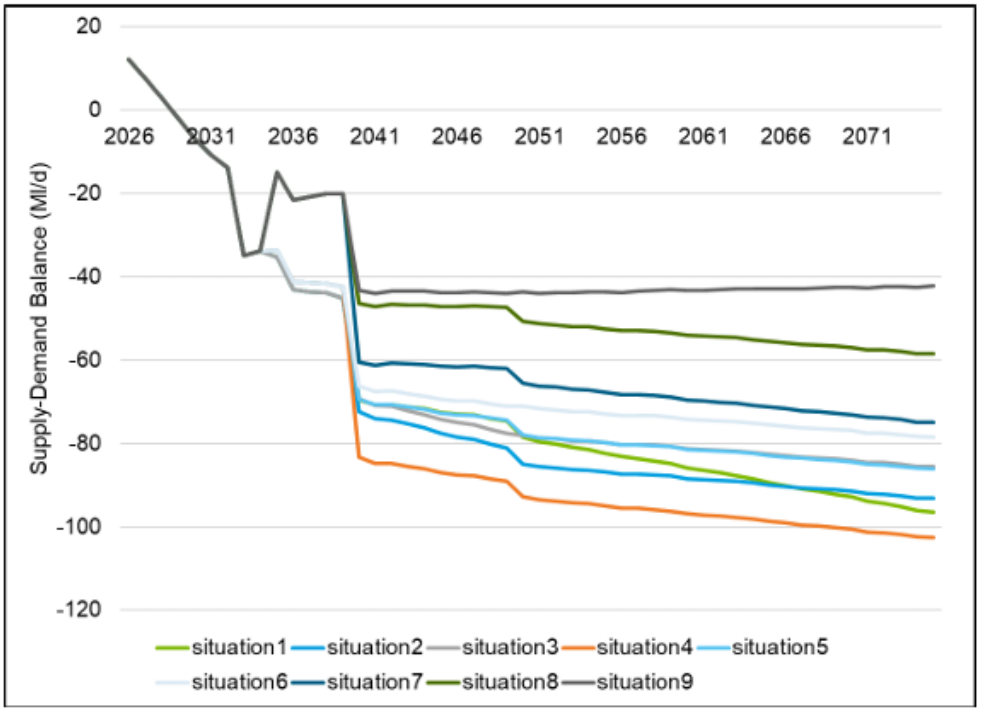


Figure 4.13: Baseline Supply-Demand Balance (Situation 4), SWOX DYCP (incl. Drought Demand Savings)[25]

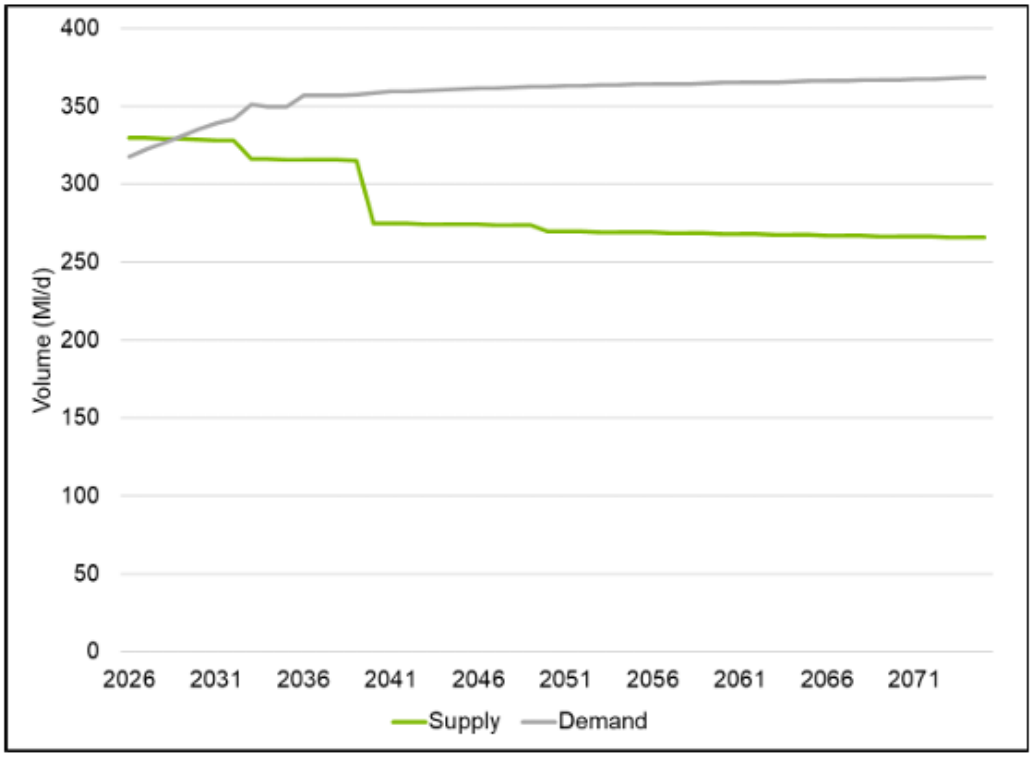


Table 4.7: Comparison Between WRMP19 and WRMP24 (Branch 4) Baseline Supply-Demand Balance for SWOX WRZ DYCP[25]

	2026	2030	2045	2075
WRMP19	-3	-7	-11	-18
WRMP24	+15	+1	-74	-89

Resource and Demand Options Appraisal

4.5.32 As described above, the WRMP24 illustrates the supply-demand balance situation across SWOX WRZ during the planning period. TWUL is faced with supply-demand deficits in all future scenarios throughout the planning period. By 2050 the range of deficits range from around 30 Ml/d to over 110 Ml/d.

4.5.33 The implementation of TWUL's preferred plan, a twin-track approach combining demand management with water resource development, will resolve the supply-demand deficit in all years of the planning period for the SWOX WRZ.

Demand Management

4.5.34 Demand management is the largest component of TWUL's plan for the SWOX WRZ, particularly in the short-term.

4.5.35 **Table 4.8** shows a detailed breakdown of the demand management options adopted in TWUL's preferred plan for the SWOX WRZ. **Figure 4.14** shows TWUL's leakage forecast, **Figure 4.15** shows TWUL's meter penetration forecast, and **Figure 4.16** shows TWUL's PCC forecast.

Table 4.8: SWOX WRZ Demand Management Programme Breakdown[25]

	Supply Demand Benefit (Ml/d)				
SWX	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 Carry-over leakage	0.00				
Household metering CSL	0.90	0.00	0.00	0.00	0.00
Non-household metering CSL	0.96	0.00	0.00	0.00	0.00
Bulk metering CSL	0.56	0.06	0.03	0.00	0.00
Replacement metering CSL	3.18	0.94	0.00	0.00	0.00
Mains replacement	0.20	1.18	0.80	1.24	0.88
Leakage innovation	0.10	0.10	0.00	0.85	1.23
Metering innovation CSL	0.00	0.00	0.00	0.00	0.00
Advanced DMA Intervention	2.80	2.60	2.40	2.20	2.00
Total leakage reduction	8.71	4.87	3.24	4.29	4.11
AMP7 Carry-over metering	0.00				
Household metering	2.40	0.00	0.00	0.00	0.00
Non-household metering	0.27	0.00	0.00	0.00	0.00
Household water efficiency	2.01	1.77	0.00	0.00	0.00
Non-household water efficiency	0.00	0.00	0.00	0.00	0.00
Metering innovation	0.08	0.52	0.26	0.00	0.00
Innovative tariffs	0.18	1.89	2.27	0.06	0.00
Total usage reduction	4.94	4.17	2.53	0.06	0.00
Total benefit from DMP	13.64	9.05	5.77	4.35	4.11

	New & Replacement Meters				
SWX	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Metering	1,024	1,130	879	0	0
Household Metering (New)	46,355	8,727	4,427	0	0
Household Metering (Upgrades)	162,778	64,343	6,192	0	0
Non-Household Metering (Upgrades)	21,592	0	0	0	0

Figure 4.14: SWOX WRZ Final Plan Leakage[25]

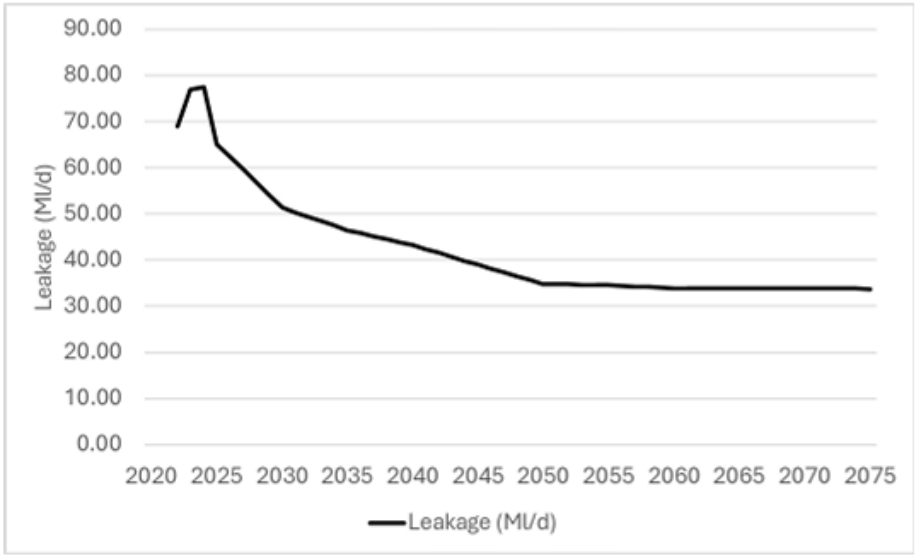


Figure 4.15: SWOX WRZ Final Plan Meter Penetration[25]

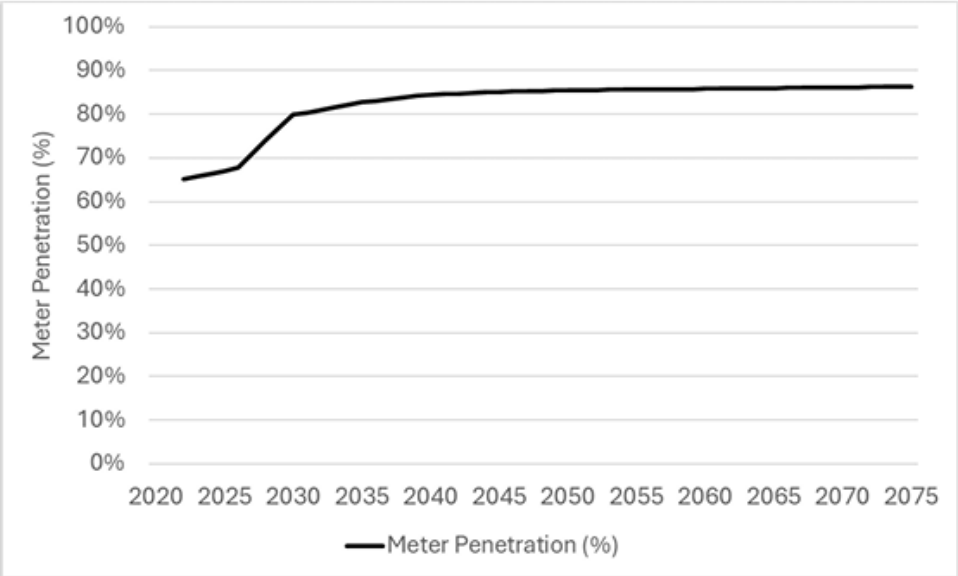
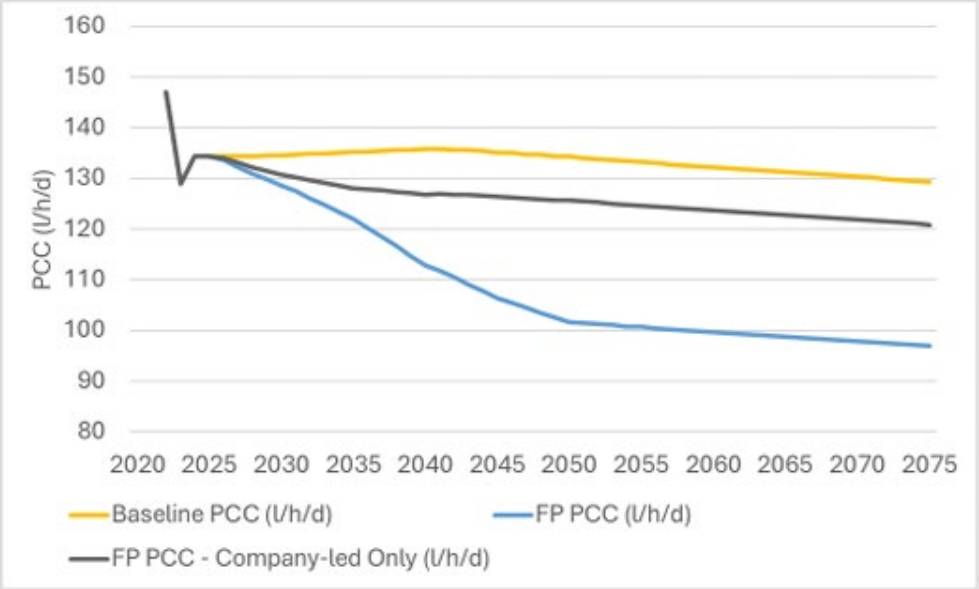


Figure 4.16: SWOX WRZ DYAA PCC[25]



4.5.36 Chronologically, the summary of the preferred plan demand management measures within the SWOX WRZ is presented below:

Short-term (2025-2030)

- TWUL will **continue the progressive metering programme (PMP),** with around 46,000 new household meters being installed in AMP8, finishing the household PMP campaign, achieving a total meter penetration of 80% by the end of AMP8. TWUL will also undertake a significant upgrade programme, replacing old meters with smart meters to ensure that they are able to harvest data about the customers' water use, allowing them to analyse this data to help customers reduce their water use.

- TWUL will **reduce leakage** by 14 Ml/d during AMP8. In AMP8 a considerable amount of their leakage reduction will be enabled by TWUL's smart meter programme, which allows analyse data to predict where leaks may exist on customer-owned pipes. In addition, TWUL will undertake Advanced District Metered Area (DMA) leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce leakage.

- TWUL will continue to **promote water efficiency activity** to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency.

- TWUL will continue to use **media campaigns, temporary use bans and non-essential use bans** according to the current levels of service.

Medium-term – (2030-2045)

- TWUL will **finish almost all of the metering efforts in AMP9**, continuing to install bulk meters and upgrade meters to ensure that all metered customers are using smart meters. TWUL **will achieve a total meter penetration of 85% (including voids) by 2045**.

- With enough of TWUL's supply area being covered by smart metering, it will implement a **financial incentive-based tariff scheme from 2035**. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage.

- TWUL will **deliver further leakage reduction over this period**, with an increasing proportion of our leakage reduction needing to be delivered through mains rehabilitation.

- TWUL will continue to **promote water efficiency activity** to help customers use water wisely.

- TWUL will **continue to use media campaigns, temporary use bans and non-essential use bans** according to their current levels of service.

- TWUL's plan relies on the introduction of government-led interventions from 2035 onwards, including **both minimum standards on white goods and the introduction of amendments to buildings regulations**. This will be required in order to achieve the government ambition of 110 l/p/d consumption.

Long-term (beyond 2045-2075)

- In the long-term, TWUL will **continue to undertake mains rehabilitation to continue to drive down leakage**. TWUL expect that a greater proportion of the mains rehabilitation efforts will make use of innovative techniques in the long-term, reducing costs.

- In the longer-term, TWUL's **demand management programme relies on the intervention of government**, as described earlier. When leakage has been reduced to very low levels, and TWUL has undertaken those actions which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes and the adoption of minimum standards and buildings regulations changes.

- TWUL will **continue to use media campaigns, temporary use bans and non-essential use bans** according to its current levels of service.

Supply Enhancement

4.5.37 The new resources required under different scenarios of future supply-demand balance are detailed in **Table 4.9**.

Table 4.9: Resource Options used in SWOX WRZ[25]

Option	Max DO (DYAA)	Year Option is First Utilised in each Pathway								
		1	2	3	4	5	6	7	8	9
Water from West-Thames Options	N/A	2040	2040	2040	2040	2040	2040	2040	-	-
Moulsford GW	2	2033	2033	2033	2033	2033	2033	2033	2033	2033
Woods Farm GW	2	2030	2030	2030	2030	2030	2030	2030	2030	2030
Import from Henley	5	2042	-	-	2040	2040	2040	-	-	-
Transfers with SWA	2	2026	2026	2026	2026	2026	2026	2026	2026	2026
Gatehampton Drought Permit	4	2033	2033	2033	2033	2033	2033	2033	2033	2033
Oxford Canal, Duke's Cut	12	2065	-	-	2040	-	-	-	-	-

4.5.38 A brief description of the Resource Options illustrated in **Table 4.9,** is shown below:

- **Moulsford Groundwater Source**: Construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames. Water abstracted from the borehole will be treated at the existing Cleeve Water Treatment Works located on the eastern side of the River Thames.

- **Woods Farm Groundwater Source**: New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4Ml/d to average licence of 4.99Ml/d or an additional 2.91Ml/d to peak licence of 5.5Ml/d). The option also includes a new 1.4km raw water pipeline from the new satellite borehole to Woods Farm Water Treatment Works.

- **Import from Henley**: The option is for one new 5Ml/d capacity main from New Farm Service Reservoir (Henley) to Nettlebed Service Reservoir (SWOX). This will require a new 5.9km, 350mm diameter main from New Farm to Nettlebed and a new pumping station at New Farm.

- **Gatehampton Drought Permit**: The Gatehampton licence includes a flow constraint which means abstraction must be reduced from the licence quantity of 105Ml/d to at or below 101.5Ml/d when flow in the River Thames at Reading Gauging Station falls below 400Ml/d for five days. The Gatehampton SWOX Drought Permit option is to change the Gatehampton licence to allow abstraction to remain at 105Ml/d even when the flow constraint is in place during drought periods.

- **Oxford Canal - Transfer from Duke's Cut to Farmoor**: The scheme includes a 15Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir, with abstraction from a point approximately 800m north of Duke's Cut on the Oxford Canal, discharging into the River Thames for subsequent re-abstraction at the existing Farmoor Reservoir intake. It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing intake structure or treatment facilities at Farmoor Reservoir.

4.5.39 Chronologically, the summary of the preferred plan supply enhancement options is presented below:

Short-term (2025-2030)

- In the short-term, TWUL's existing supplies will be sufficient to provide their customers with a 1 in 100-year Level of Service. TWUL will increase the output of the Woods Farm groundwater source in AMP8 to boost resilience. During this period, TWUL will also

need to **undertake the design and construction of the Moulsford groundwater source, in order to ensure that its output will be available in 2033**.

Medium-term (2030-2045)

- In order to facilitate achievement of a 1 in 100-year resilience level, in **2033 TWUL will need to begin using the Moulsford groundwater source**.
- In 2035 TWUL will need to appraise the **outcome from all of the investigations that it will undertake to determine the future licence reductions that will be necessary at TWUL's existing sources**. At this point TWUL will also need to assess what population growth has occurred and the success of the demand management schemes.
- **Water is needed from SESRO in SWOX WRZ** in all but the most benign scenarios, with water from SESRO being used in pathways 1-7. In some pathways, a transfer from Henley WRZ is also needed from 2040. In the final WRMP, the appraisal indicates that raw water transfer only is required, but TWUL will monitor the need for new treatment and network assets in the SWOX WRZ according to the success of demand management and licence reductions which may need to be made. In a very adverse scenario, TWUL may require works to expand the capacity of the existing source, Woods Farm**. If the 110 l/p/d target looks as though it will not be achieved, TWUL may need to develop additional treatment assets to treat water from SESRO**.

Long-term (beyond 2045)

- In the long-term, **if the 110 l/p/d target is hit, in many situations it is likely that water available from SESRO will be sufficient to provide SWOX with the water that it needs, along with construction of the Oxford Canal option being required in more adverse scenarios**. If the 110 l/p/d target is missed, then SWOX will require more water from SESRO and we may need to construct additional treatment assets or transfer water from TWUL's other zones.

4.5.40 In the supply-demand balance scenario in pathway four, TWUL's supplies would be supplemented from the following sources, as shown in **Table 4.10** and **Table 4.11**, under the DYAA and DYCP scenarios respectively.

Table 4.10: Preferred Programme Options Utilisation in SWOX WRZ, DYAA[25]

Option	Option Utilisation by Year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Water from West-Thames Options	0.0	0.0	24.0	24.0	24.0	24.0	24.0	21.8	24.0	18.1
Moulsford GW	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Woods Farm GW	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Import from Henley	0.0	0.0	3.2	0.4	1.2	1.2	1.2	1.2	1.2	1.2
Oxford Canal	0.0	0.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Gatehampton Drought Permit	0.0	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Import from SWA, existing transfers	0.4	0.4	3.5	3.2	-0.3	0.3	0.1	0.9	1.9	0.2

Table 4.11: Preferred Programme Options Utilisation in SWOX WRZ, DYCP[25]

Option	Option Utilisation by Year (Ml/d)									
	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075
Water from West-Thames Options	0.0	0.0	24.0	23.9	24.0	24.0	24.0	24.0	24.0	24.0
Moulsford GW	0.0	0.0	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Woods Farm GW	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Import from Henley	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Oxford Canal	0.0	0.0	0.5	0.0	1.4	3.1	4.1	5.7	7.2	6.0
Gatehampton Drought Permit	0.0	3.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Import from SWA, existing transfers	0.4	0.7	3.5	3.2	3.2	3.2	3.2	3.2	3.2	3.2

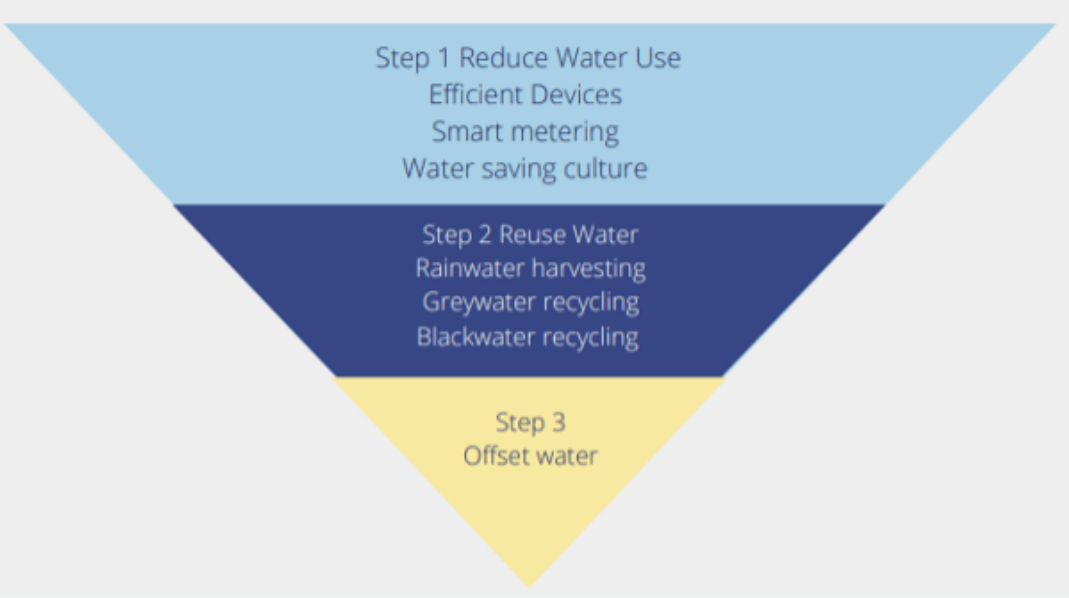
4.6 The Concept of Water Neutrality

Water Neutrality Definition

4.6.1 Water neutrality is a concept whereby the total demand for water within a planning area after development has taken place is the same (or less) than it was before development took place. If this can be achieved, the overall balance for water demand is 'neutral', and there is considered to be no net increase in demand as a result of development.

4.6.2 In order to achieve this, new development needs to be subject to planning policy which aims to ensure that where possible, houses and businesses are built to high standards of water efficiency through the use of water efficient fixtures and fittings, and in some cases rainwater harvesting and greywater recycling. For the majority of new development, in order for the water neutrality concept to work, the additional demand created by new development needs to be offset in part by reducing the demand from existing population and employment (see schematic in **Figure 4.17**).

Figure 4.17: The Water Neutrality Hierarchy [41]



Is Water Neutrality possible?

4.6.3 When considering neutrality within an existing planning area, it is recognised by the EA that achievement of 'total' (100%) water neutrality for new development is often not possible, as the levels of water savings required in existing stock may not be possible for the level of growth proposed.

4.6.4 This WCS therefore considers different water neutrality targets. The WCS highlights the importance of developing local policy in the study area for delivering aspirations like water neutrality as well as understanding the additional steps required beyond 'business as usual' to achieve it.

4.7 Water Re-Use Systems and Demand Management Measures

4.7.1 A 2018 study[42] examining the long-term potential for deep reductions in household water demand identified that it could be possible to achieve an average household consumption of between 50 and 70 litres per person per day without a reduction in the level of utility or quality of water use, by a combination of water demand reduction measures.

A summary of the water re-use systems and demand reduction measures is illustrated in **Table 4.12** below.

[41] https://www.graf.info/en-gb/knowledge-hub/blog/what-is-water-neutrality-in-new-construction-developments-in-the-uk.html

[42] 12 Artesia Ofwat long term water demand reductions final version 2018-04-26

Table 4.12: Water Re-Use Systems and Demand Management Measures

Water re-use systems and demand management measures	
Changing consumer choice of water using practices, through **smart metering, tariffs, pay-per-use applications, linking energy and water efficiency**	**Affecting the governance, funding and regulation of water service providers**, through water neutrality, supply pipe ownership, natural capital accounting and utility bundling.
Delivering greater efficiency with **ultra-low flush toilets, recycling showers, waterless washing machines**	Affecting resource provision with community **rainwater harvesting and greywater recycling**, and reducing the amount of water available for public supply
Changing public perceptions about water with **incentives, home water reports, smart bills, social norms and feedbacks**	**Reducing water waste**, focusing on leaky toilets and drop valve toilets, leak detectors, smart taps and smart showers
Affecting customer choice in purchasing decisions with **compulsory water labelling, rebates and scrappage schemes**	

4.7.2 The above reduction levels cannot be delivered by the water industry working in isolation. For example, national planning rules need to be updated to require all new developments to be more water efficient. There is a need to be a greater awareness of water scarcity issues in the UK, combined with stronger leadership to ensure that water companies, government, regulators, the supply chain, academia and innovators work in a concreted and coordinated way.

4.7.3 The current Swindon Local Plan does not impose any specific water usage rate. The New Swindon Local Plan can provide the opportunity to reduce water demand in new developments, beyond the Building Regulations Optional Requirement of 110 l/person/d, making full use of water efficiency and water-reuse measures at the individual property and site scale. However, it is currently unclear whether the New Local Plan would be able to impose a domestic household per capita consumption that is lower than the Building Regulations Optional Requirement of 110 l/person/d.

Changing Behaviours

4.7.4 There have been a number of campaigns aimed at encouraging consumers to take an active role in conservation of water resources. Research[43] indicates that while the public intuitively recognise water as a previous resource, it is simultaneously considered abundant and therefore although individuals are conscious of the issue they are not concerned (e.g. due to the frequency of rainy days, a lack of feedback between water availability and price, and a lack of threat of water restrictions other than hose pipe bans).

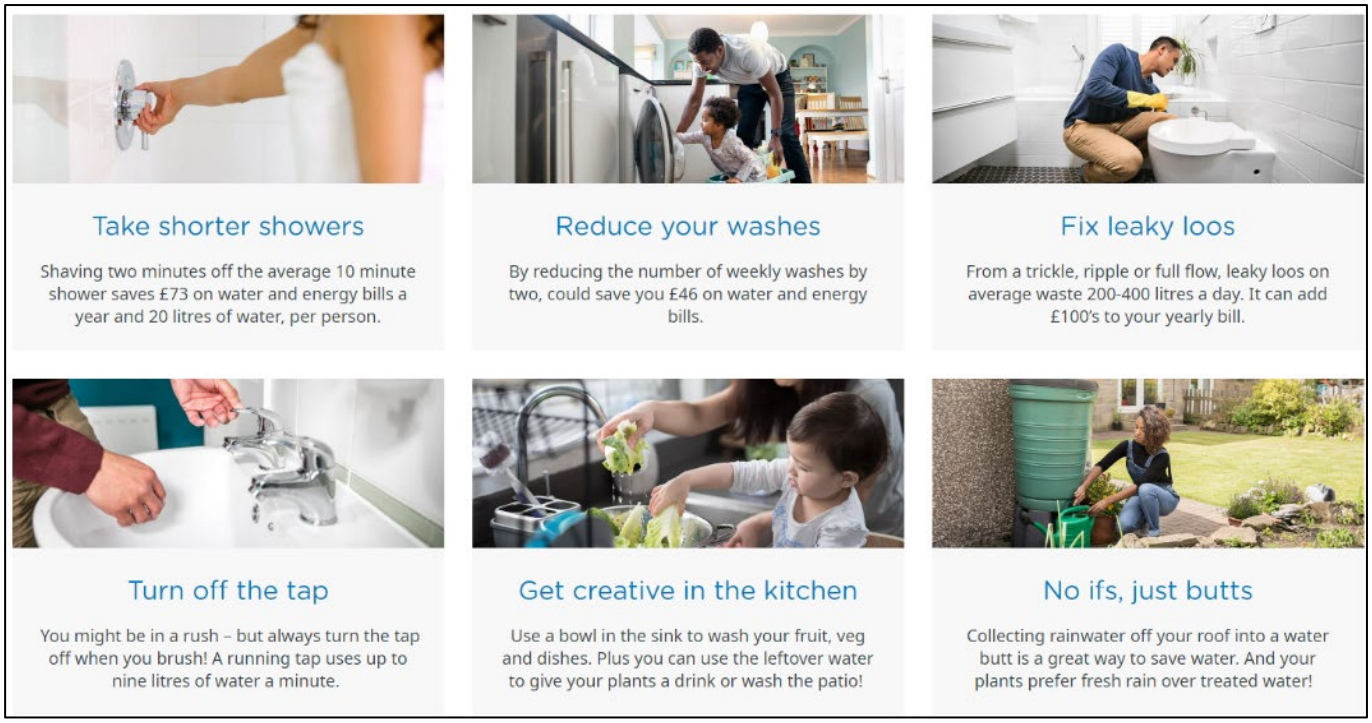
4.7.5 Households perceive there is little scope for change as they ‘use only as much as they need’, but are largely unaware of what “normal” is because many water use behaviours are private. There are competing motivations for water use including hygiene, luxury and relaxation, with higher water usage associated with the presence of children and especially teenagers.

4.7.6 Locally, TWUL actively encourage their customers to use less water. TWUL website includes water saving tips[44], illustrated in **Figure 4.18** below, on how customers could use less water.

[43] Icaro-Consulting-Report-2013_Understanding-Household-Water-Behaviours-and-Testing-Water-Efficiency-Messages.pdf (waterwise.org.uk)

[44] https://www.thameswater.co.uk/help/water-saving/water-saving-tips

Figure 4.18: Water Saving Tips (source: TWUL)



Water Efficient Fixtures and Fittings

4.7.7 Water efficient fixtures and fittings include dishwashers and clothes washing machines, toilets, showerheads and taps. These can be designed to use less water whilst maintaining comparable performance (e.g. low-flow showerheads). **Table 4.13** provides an indication of potential efficiency savings for water-efficient devices.

4.7.8 Water demand reduction measures are necessary to achieve the lower 110 l/p/d optional requirement. The Building Regulations document includes a Water Efficiency Calculator[45] to assist developers in estimating their water consumption to demonstrate compliance with the requirements.

4.7.9 The cost of using water efficient fixtures and fittings to achieve the lower 110 l/p/d is negligible, estimated at £9 per home. In comparison, reducing consumption from 125 l/p/d to 105 l/p/d was estimated to reduce energy, water and sewerage costs by around £24 per year. Therefore, imposing the lower 110 l/p/d requirement would not be an unreasonable financial burden on development.

4.7.10 User acceptability for water efficient fixtures and fittings is also generally high. A study by United Utilities indicated that aerated showers which reduced flow rates by 28% were accepted and kept by 8 out of 9 participants on average.

4.7.11 There are concerns regarding leakage in newer toilet designs. Waterwise estimates that between 5 and 8% of toilets are leaking due to faulty flush valves, most of which are dual flush toilets, and the majority of which are silent and difficult to detect. Toilet leakage represents 2.3 to 6.5 l/p/d of average per capita consumption. Some water companies are also using smart water meters to identify locations with constant background consumption levels that may be due to leaking toilets, and offering to fix leaking toilets for free during home visits. Waterwise is now coordinating a national campaign to raise awareness of the problem, identify best practices to

[45] The Water Efficiency Calculator for New Dwellings (wrcpartgcalculator.co.uk)

find and fix leaking toilets, develop new testing standards for products, and improve future designs to eliminate the problem. These leakage problems should not be viewed as a justification for not installing dual flush systems, but should be noted for maintenance purposes and as a potential “easy win” for reducing water demand.

Table 4.13: Indicative practice levels for water efficiency of common fittings and appliances (Source: WRAP Procurement Requirements for Water Efficiency, 2010[46])

Fitting / appliance	Baseline practice (meet legal requirements but do not offer appreciable water savings)	Efficient practice (offer reduced water consumption without materially impacting cost or performance)	Highly efficient practice (offer further reduced water consumption but may not be comparable in cost or performance)
Shower (mixer)	12 l/min	<10 l/min (domestic) <8 l/min (non-domestic)	<6 l/min
Shower (electric)	8 l/min	<6 l/min	<6 l/min
Showers	An aeration device or advanced spray pattern may increase user satisfaction while reducing water use.	Government Buying Standard specifies <8 l/min. In domestic properties, some householders want a higher flow rate.	These flow rates may be unacceptable to some householders but acceptable in commercial property. The hot water flow from certain water heating systems may become unstable at these lower flow rates.
WC	6 l/flush	<4.5 l/flush (effective)	<3.5 l/flush (effective)
	Appropriate for single flush male public WCs.	Either a 4.5 l single flush, or a 6/4 l dual flush system. A low volume single flush may be appropriate in public buildings.	E.g. a 4.5/2.6 l dual flush. May be inappropriate for plumbing systems requiring higher flow. Single flush system may be more appropriate in public buildings.
Urinal	1.5 l/bowl/use 7.5 l/bowl/hour during building occupancy period, 0 l/hour otherwise	3 l/bowl/hour during building occupancy period with user activated flush. 0 l/hour otherwise	0 l/hour
		Flush within the hour if one person activates the sensor.	May be inappropriate for high frequency use settings
Tap (basin)	Up to 12 l/min	<6 l/min	<4 l/min
		Two-stage or click taps help reduce effective flow.	Sensor actuated taps help reduce use in public buildings.
Tap (kitchen)	12 l/min	<8 l/min	<6 l/min
		A higher flow rate is typically required for kitchen use related to volume	User acceptability would need to be considered. Two-stage or click taps help reduce effective flow.
Bath	200 l capacity (excl. body mass within bath)	<180 l capacity (excl. body mass within bath)	<155 l capacity (excl. body mass within bath)
			User acceptability would need to be considered, ergonomically shaped tubs preferable to short or shallow shapes.
Washing machine	10 l/kg dry load	<8.5 l/kg dry load	<7 l/kg dry load
Dishwasher	1.2 l/place setting	<1.0 l/place setting	<0.7 l/place setting
	Older domestic models may use 20 l/cycle	Equivalent to 12 l/cycle domestic dishwasher	

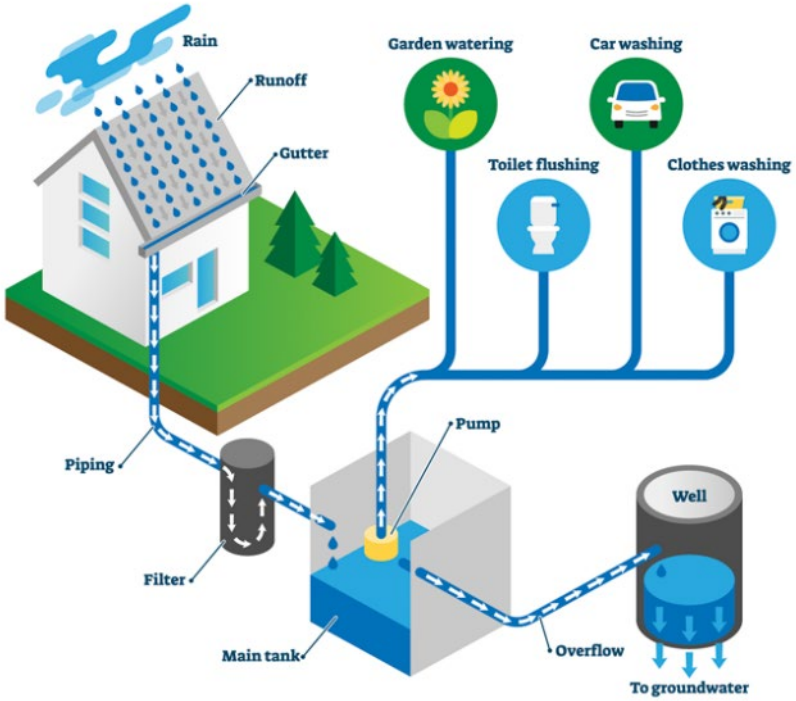
[46] WRAP-2010_Procurement-Requirements-for-Water-Efficiency.pdf

Rainwater Harvesting

4.7.12 Rainwater harvesting involves the collection and storage of rainwater for non-potable uses such as watering gardens, flushing toilets and washing clothes. These can achieve up to a 50% reduction in mains water consumption. Systems can be installed at both individual and site-wide scales:

- **At the individual property level**: water from the rooftop is collected and stored in a tank, subsurface or in the loft space. Water is filtered and treated before being pumped to the point of use. The system maintenance and operation are usually the responsibility of the homeowner (see schematic in **Figure 4.19**).

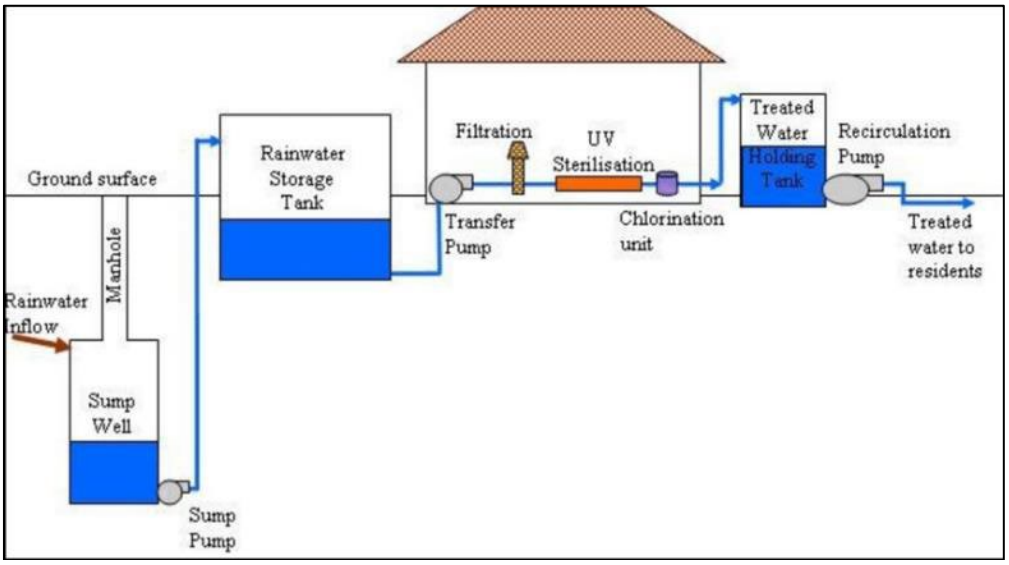
Figure 4.19: Schematic of individual property rainwater harvesting system [47]



- **At the site-wide scale**, water from rooftops is collected and stored in communal facilities which could include subsurface tanks or surface ponds (see schematic in **Figure 4.20**). Water is filtered and treated before being pumped to the point of use in individual properties. The system maintenance and operation are usually the responsibility of a utilities or maintenance company (to the individual property boundary). Generally, these systems only accept clean water from rooftops, and a separate drainage system is necessary for runoff from paved areas and roads, to maintain a high water quality in the recycled water.

[47] https://www.kdpumps.co.uk/london-rainwater-harvesting/

Figure 4.20: Schematic of Communal Rainwater Tanks [48]



4.7.13 Prior to the development of the water mains, rainwater harvesting was a standard feature for most new houses, freeing occupants from having to share the village pump. This was particularly common in hard water areas, where groundwater was less suitable for washing. However, modern rainwater harvesting systems have only been introduced to the UK relatively recently. In 2010, only about 400 systems were being installed in the UK per year. In comparison, in Germany, where water is a comparatively expensive commodity, almost all properties are metered, and rainwater harvesting systems are grant aided, 35% of all new buildings are equipped with rainwater collection systems.

4.7.14 Rainwater harvesting systems are comparatively expensive (**Table 4.14**). Water efficiency fixtures and fittings discussed in the previous section are cheaper, offer short payback periods, are easier to retrofit and maintain, and should be considered before rainwater harvesting. Generally, the cost effectiveness improves with the scale of the project. A study by Ricardo Engineering PLC[49] showed that while all system sizes provided a total net benefit, there was also the potential for a private net cost if water demand was low (**Table 4.15**). Therefore, it was concluded that smaller installations are not privately beneficial for the installer and unlikely to see large scale uptake until promoted by falling prices or government-backed schemes and interventions, or increased price of potable water.

4.7.15 TWUL offers an incentive payment to developers for when any of the following water provision technologies are included in the new development: [50]

- Rainwater harvesting;
- Greywater recycling;
- Other water use technology.

[48] Gurung, Thulo Ram & Sharma, Ashok & Umapathi, Shiv. (2012). Economics of Scale Analysis of Communal Rainwater Tanks

[49] https://www.susdrain.org/files/resources/evidence/Ricardo_Independent-review-of-costs-and-benefits-of-RWH-and-GWR-Final-Report.pdf

[50] https://www.rainwaterharvesting.co.uk/information/incentives-from-thames-water/

Table 4.14: Water standards costs (extra over usual industry practice), with reference to Code for Sustainable Homes Levels [21]

	Apartments	Houses
Code Level 1 and 2	-	-
Code Level 3 and 4 (105 l/p/d)	£6	£9
Code Level 5 and 6 (80 l/p/d)	£900	£2,201 - £2,697
Rainwater only	£887	£2,181 - £2,674

Table 4.15: Whole like (20 years) costs and benefits for rainwater harvesting systems based on collection area of a residential building [49] (

Collection area	Example building types	Whole life costs (£000)	Whole life savings (£000)	Private net benefits (£000)	Societal benefits (£000)	Total net benefit (£000)
Small (<500 m2)	Standalone dwellings, houses, bungalows	£12 to £19	£1 to £19	-£9 to £26	£21 to £77	£10 to £100
Medium (500-2000 m2)	Larger houses or two-semi-detached houses	£25 to £38	£8 to £200	-£17 to £150	£50 to £163	£35 to £340
Large (2000 – 5000 m2)	Row of terraced houses or block of flats	£20 to £35	£7 to £150	-£15 to £120	£35 to £335	£20 to £450
Very large (>5000 m2)	Large scale residential developments	£35 to £60	£70 to £340	-£17 to £280	£30 to £920	£14 to £1,200

4.7.16 Rainwater harvesting systems must comply with the Water Supply (Water Fittings) Regulations 1999 and national building regulations, including British Standards EN 16941-1:2018 (which replaced BS 8515 in 2018). Non-compliance can result in public health hazards. For example, cross-connections between rainwater harvesting systems and potable water supply affecting 87 properties at the Upton eco-housing development in Northampton led to E-coli contamination of potable water. Updated guidance was issued by the Drinking Water Inspectorate to water companies to ensure wider knowledge of the risks.

4.7.17 British Standards require that rainwater harvesting systems are installed with a backup supply in the event of equipment failure or unavailability of water. This means that in practice TWUL would still plan to be able to supply the typical full water demand by mains water, and therefore there is no betterment for resource planning, although environmental benefit through reduced actual usage would occur. Rainwater harvesting systems are most likely to suffer from lack of water availability during drought periods, returning the demand to the potable water system. Therefore the potential benefits of rainwater harvesting schemes in these drought episodes could be limited. Rainwater harvesting systems should therefore be designed to meet a minimum drought frequency standard, although there is currently no national guidance on this.

4.7.18 Rainwater harvesting systems have previously been thought to be more carbon intensive than mains water, due to the economies of scale that the mains water system has for embodied carbon (mostly relating the storage tank and pumps) and operational carbon (energy usage for pumping). However, the Ricardo study showed that installations across all building sizes emit less CO2 when compared to the emissions embedded in mains water over a 20 year lifetime.

4.7.19 The emissions are also small compared with other water related energy use, e.g. heating water for domestic uses, which contributes about 5% of the UK's annual greenhouse gas emissions.

4.7.20 Although this section has focussed on domestic rainwater harvesting systems, there is significant scope to use rainwater for activities such as toilet flushing and irrigation of grounds in many commercial buildings, industrial settings and agricultural businesses. The savings that can be achieved are often higher due to larger roof areas and a greater demand for non-potable water.

Grey Water Recycling

4.7.21 'Grey Water' is defined as wastewater from hand basins, baths and showers. Some definitions also include clothes washing machines in the definition of grey water, however for this study that source has been defined as 'black water' due to the higher degree of pollutant contamination.

4.7.22 The British Standard BS8525-1:2010 (Greywater Systems Code of Practice) advises that, provided it is treated properly, grey water can be used for toilet flushing, garden use and clothes washing machines. Various treatment process technologies are available to generate clean and odourless non-potable water suitable for re-use, and it can be integrated with rainwater harvesting systems. No data are available on the uptake rates of grey water recycling in Swindon or the UK in general; however, rates are generally reported as low. Public attitudes to grey water recycling are less positive than for rainwater harvesting, primarily with regard to water quality.

4.7.23 Grey water recycling systems are more expensive than rainwater systems due to the additional treatment needed. Therefore, these systems are typically not cost-effective at the individual property or small scale development level (**Table 4.16**).

Table 4.16: Whole life (20 years) costs and benefits for greywater recycling systems based on the systems yield (greywater produced) [49]

Yield	Example building types	Costs: CAPEX +OPEX (£000)	Water cost savings (£000)	Private net benefits (£000)	Societal benefits (£000)	Total net benefits (£000)
Low (<500 m^3)	Smaller households, small commercial shops	£45	£5	-£40	£2	**-£37**
Small (500-1500 m^3)	Larger household	£100	£52	-£48	£18	**-£30**
Medium (1500 – 4000 m^3)	Retail and commercial stores, leisure centres, some offices	£120	£108	-£13	£34	**£25**
Large (4000 - 10000 m^3)	Large commercial settings such as shopping centres, multi-unit offices or flats	£170	£190	£21	£67	**£88**
Significant (>10000 m^3)	High rise offices or blocks of flats, hotels, multi-purpose developments	£270	£780	£510	£275	**£787**

4.7.24 The energy requirements of greywater recycling schemes vary depending on the system, installation arrangements and levels of demand. There is some evidence that supply from carbon efficient systems can involve lower energy demands compared to mains water.

4.7.25 Overall, therefore, grey water recycling is a suitable option for larger schemes where the yield is large enough to generate economics of scale. However, smaller installations are not beneficial for the installer and therefore large-scale uptake is unlikely until falling prices or government incentives make the systems financially attractive.

Black Water Recycling

4.7.26 Black water is defined as water that may be contaminated with hazardous material and pollutants, e.g. from toilets, kitchen sinks, dishwashers and clothes washing machines.

4.7.27 Black water can be recycled and re-used for non-potable uses such as watering gardens (excluding edible crops) and flushing toilets. It is also possible, although expensive, to treat black water sufficiently to be suitable for potable uses, although there are significant perception issues and stigma associated with this.

4.7.28 Black water treatment involves the functions of typical sewage treatment - including settlement, bacterial break down, filtration, aeration and chemical treatment. Due to the complexity of treatment, this process is expensive to undertake at the domestic / small development scale, although not impossible. The treatment could be augmented using reed beds which have added biodiversity benefits and are more feasible for larger developments, although location, land-take, smell, and health and safety may still be limiting factors.

Water Offsetting

4.7.29 The remaining water that cannot be satisfied with non-potable sources will need to be offset in order to achieve water neutrality, which is done by investing into schemes that save water in the local region. For example, retrofitting existing buildings with water efficient devices or water reuse systems. However, it's important to remember that the water saved through these types of schemes need to be equal to the residual main usage in order to achieve water neutrality.

4.7.30 Examples of offsetting water demand typically involve cooperation with other organisations, for example the water company, local council, other businesses, or charities. It can include, but is not limited to, funding water efficiency audits, funding the retrofitting of existing homes or businesses, reducing additional leakage in the surrounding area that is not already planned by the water company.

4.7.31 However, offsetting is usually not completed by developers because it is currently not a requirement to reduce water demand of a proposed development to achieve water neutrality; this is defined by Waterwise as "*For every new development, water demand should first be minimised then any remaining water demand offset, so that the total demand on the public water supply in a defined region is the same after development as it was before*".

4.7.32 As a result, offsetting water demand is unlikely to be a suitable solution and therefore has not been considered further within this assessment.

4.7.33 There are currently no known examples of water offsetting within Swindon. Collaboration is required between developers, TWUL and SBC to understand whether and how the scheme can move forward.

Water Efficiency Examples

4.7.34 According to the CfSH, for a home to meet any Level of the Code, it will have to meet minimum standards for certain items, depending on what Level is desired.

4.7.35 For Level 6, this means that:

> The home will have to be designed to **use no more than about 80 l/p/d**. This could be achieved by fitting such items as:
>
> - 6/4 Dual Flush WC;
> - Flow Reducing/Aerating taps throughout;
> - 6-9 l/min shower (note that an average electric shower is about 6-7 l/min);
> - a smaller, shaped bath, still long enough to lie down in, but less water to fill it to a level consistent with personal comfort;
> - 18 l maximum volume dishwasher;
> - 60 l maximum volume washing machine.
>
> To achieve the 80 l/p/d standard, would also mean that about 30% of the water requirement of the home would be provided from non-potable sources, such as rainwater harvesting systems or greywater recycling systems.

4.8 Demand Scenarios Assessment

4.8.1 An analysis of different water consumption scenarios has been undertaken and the water savings from each scenario throughout the Plan period have been calculated. The different water demand scenarios over the Plan period are illustrated in **Figure 4.21**.

4.8.2 The following Per Capita Consumption scenarios have been examined:

- **Scenario 1**: **Average 2021/22 PCC → PCC 134.4 l/p/d**

  Household demand is often described by the volume of water used per person each day and is called Per Capita Consumption (PCC). Unmeasured customer PCC is calculated from TWUL's Domestic Water Use Survey (DWUS); a panel of customers who have voluntarily had meters installed but are charged on an unmeasured basis. Measured customer PCC is calculated by totalling the volume recorded by all customer meters; allowances are then applied for supply pipe leakage, which is subtracted, and meter under-registration, which is added. This total volume of water is then divided by the estimated total number of measured customers to give a measured customer PCC.

  According to the TWUL WRMP24, the average PCC in 2023/24 under the Baseline supply-demand position is 134.4 l/p/d (see **Table 4.17** below).

Table 4.17: PCC in SWOX WRZ, in 2023/24 (source: TWUL WRMP24, Section 3)

SWOX WRZ	Unmeasured PCC	Measured PCC	Average PCC	% Metered
PCC (l/p/d)	138.6	132.3	134.4	67.6%

- **Scenario 2**: **Building Regulations, Approved Document G - Optional requirements → PCC 110 l/p/d**

  This scenario considers the total future demand based on developer's building new homes to meet the optional standards for water efficiency. The key assumption for this scenario is that all new homes should be built to deliver a water use of 110 l/p/d, as per Building Regulation, Approved Document Part G. As described in **Section 4.6**, the TWUL rdWRMP24 preferred programme includes demand management measures which are predicted to reduce average PCC to 110 l/p/d by 2050.

- **Scenario 3**: **Very High Efficiency as per withdrawn CfSH[21] (CSS), Level 5/6 → PCC 80 l/p/d**

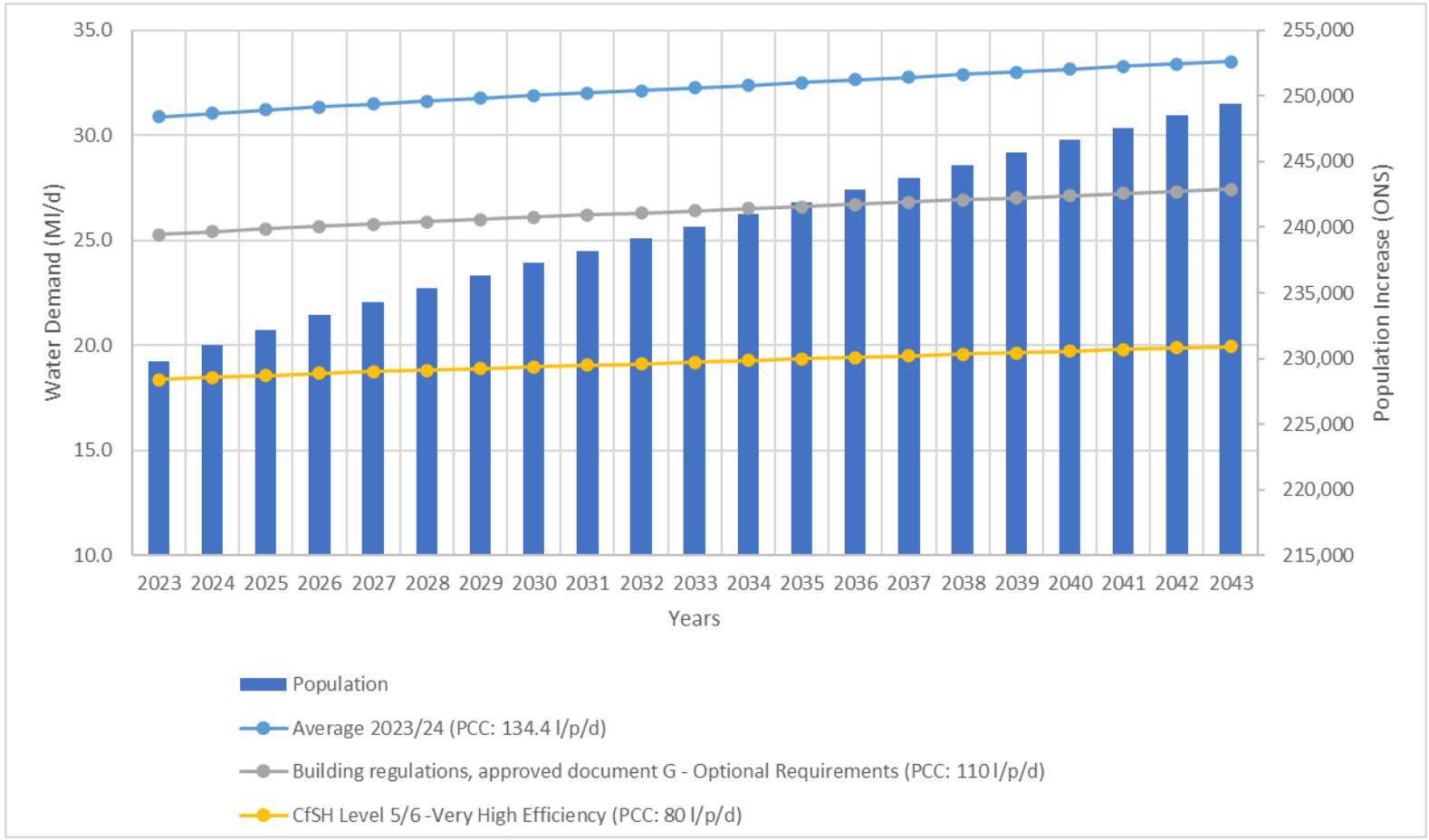
  Under the most conservative scenario, all new homes would conform to and not use more than 80 l/p/d, as per CfSS (Level 5/6).

  In order to achieve the Very High Efficiency water consumption of 80 l/p/d, a combination of water efficient fixtures and fittings, as well as rainwater harvesting or greywater recycling techniques will need to be implemented. This means that:

  - Developers would be required to voluntarily provide homes where water use is reduced below Building Regulations Part G Optional Requirements, through incorporation of water re-use technologies in all the new developments to meet non-potable demands. The current Swindon Local Plan does not impose any specific water usage rate. The New Swindon Local Plan can provide the opportunity to reduce water demand in new developments. It is unknown whether without a policy to drive high specification in new homes, developers would be likely to deliver homes with lower water usage designed in.

  - A significant proportion of existing homes would need to be retrofitted with efficient fixtures and fittings, which would require a significant funding pool and specific project management to ensure the retrofitting programme is implemented.

Figure 4.21: Range of water demand scenarios across the Plan period in Swindon



4.8.3 Comparing the average 2023/24 PCC with the Building Regulations Optional Requirement PCC rate of 110 l/p/d, 6.1 Ml/d could be saved by the end of the Plan period. Comparing the average 2023/24 with the Very High Efficiency Scenario of 80 l/p/d, approximately 13.6 Ml/d could be saved by 2043.

4.9 Delivery Pathway Recommendations

4.9.1 The National Framework for Water Resources aspiration for long term reductions is to reduce water usage to 110 litres per person per day by 2050. ***The new Local Plan should take this into account and encourage all developers to meet the 110 l/p/d target in new developments.***

4.9.2 ***It is currently unclear though whether the Local Plan would be able to successfully impose a domestic household per capita consumption that is lower than the Building Regulations Optional requirement of 110 l/p/d consumption for new developments. In any case, all stakeholders should support ambitious water efficiency targets below this optional requirement level, targeting 80 l/p/d.***

4.9.3 In order to set out a feasible route of how the minimum standard of 110 l/p/d could be delivered, the WCS has considered some key delivery requirements. This has been developed in order to allow SBC to consider potential costs and benefits of developing a water use policy to require developers to build new homes to meet the minimum PCC standard of 110 l/p/d and to consider working with TWUL to develop further options for retrofitting existing properties with efficient fixtures and fittings. **Table 4.18** summarises these delivery requirements along with the responsible stakeholders.

Table 4.18: Water efficiency measures and recommended responsible organisations

Delivery requirements	Responsible stakeholders
Ensure that planning applications are compliant with the relevant policies on water use requirements	SBC Planning
Fitting water efficient devices in accordance with relevant policy	Developers and SBC Building Control
Provide guidance in the installation of water efficient devices through the planning application process	SBC Planning
Ensure meter penetration is continuing as per TWUL rdWRMP24	TWUL
Promote water audits and set targets for the number of businesses that have water audits carried out	SBC Planning
Encourage retrofitting within council owned and privately owned properties	TWUL and SBC Planning
Educate public and raise awareness of water efficiency	TWUL, EA and SBC

4.10 Water Resources and Supply Summary

	○ The TWUL WRMP24 identified that **future water demand and supply will need to be balanced through reduced water usage (demand management), reduced leakage, and the development of new SESROs and water transfers**.

Headline Findings of Baseline Conditions	○ The demand management and supply options in the Short-Term, Medium-Term and Long-Term timescales are: **<u>Short-Term (2025-2030)</u>** **Demand management** ○ TWUL will **continue the progressive metering programme (PMP),** with around 46,000 new household meters being installed in AMP8, finishing the household PMP campaign, achieving a total meter penetration of 80% by the end of AMP8. TWUL will also undertake a significant upgrade programme, replacing old meters with smart meters to ensure that they are able to harvest data about the customers' water use, allowing them to analyse this data to help customers reduce their water use. ○ TWUL will **reduce leakage** by 14 Ml/d during AMP8. In AMP8 a considerable amount of their leakage reduction will be enabled by TWUL's smart meter programme, which allows analyse data to predict where leaks may exist on customer-owned pipes. In addition, TWUL will undertake Advanced District Metered Area (DMA) leakage reduction, mains rehabilitation, and leakage innovation programmes to reduce leakage. ○ TWUL will continue to **promote water efficiency activity** to help customers use water wisely, including the continuation of a reward-based incentive scheme introduced in AMP7 which promotes water efficiency. ○ TWUL will continue to use **media campaigns, temporary use bans and non-essential use bans** according to the current levels of service. **Supply options** ○ In the short-term, TWUL's existing supplies will be sufficient to provide their customers with a 1 in 100-year Level of Service. TWUL will increase the output of the Woods Farm groundwater source in AMP8 to boost resilience. During this period, TWUL will also need to **undertake the design and construction of the Moulsford groundwater source, in order to ensure that its output will be available in 2033**. **<u>Medium-Term (2030-2045)</u>** **Demand management** ○ TWUL will **finish almost all of the metering efforts in AMP9**, continuing to install bulk meters and upgrade meters to ensure that all metered customers are using smart meters. TWUL will **achieve a total meter penetration of 85% (including voids) by 2045**. ○ With enough of TWUL's supply area being covered by smart metering, it will implement a **financial incentive-based tariff scheme from 2035**. This scheme will encourage those who use exceptionally high volumes of water to reduce their usage. ○ TWUL will deliver further leakage reduction over this period, with an increasing proportion of our **leakage reduction needing to be delivered through mains rehabilitation**. ○ TWUL will continue to **promote water efficiency activity** to help customers use water wisely.

Headline Findings of Baseline Conditions	○ TWUL will continue to **use media campaigns, temporary use bans and non-essential use bans** according to their current levels of service. ○ TWUL's plan relies on the introduction of government-led interventions from 2035 onwards, including **both minimum standards on white goods and the introduction of amendments to buildings regulations.** This will be required in order to achieve the government ambition of 110 l/p/d consumption. **Supply options** ○ In order to facilitate achievement of a 1 in 100-year resilience level, **in 2033 TWUL will need to begin using the Moulsford groundwater source.** ○ In 2035 TWUL will need to appraise the **outcome from all of the investigations that it will undertake to determine the future licence reductions that will be necessary at TWUL's existing sources**. At this point TWUL will also need to assess what population growth has occurred and the success of the demand management schemes. ○ **Water is needed from SESRO in SWOX WRZ** in all but the most benign scenarios, with water from SESRO being used in pathways 1-7. In some pathways, a transfer from Henley WRZ is also needed from 2040. In the final WRMP, the appraisal indicates that raw water transfer only is required, but TWUL will monitor the need for new treatment and network assets in the SWOX WRZ according to the success of demand management and licence reductions which may need to be made. In a very adverse scenario, TWUL may require works to expand the capacity of the existing source, Woods Farm**. If the 110 l/p/d target looks as though it will not be achieved, TWUL may need to develop additional treatment assets to treat water from SESRO.** **<u>Long Term (2045-2075)</u>** **Demand management** ○ In the long-term, TWUL will **continue to undertake mains rehabilitation to continue to drive down leakage**. TWUL expect that a greater proportion of the mains rehabilitation efforts will make use of innovative techniques in the long-term, reducing costs. ○ In the longer-term, TWUL's **demand management programme relies on the intervention of government**, as described earlier. When leakage has been reduced to very low levels, and TWUL has undertaken those actions which can influence customers' demand for water, actions will need to be driven by government to alter water use through societal changes and the adoption of minimum standards and buildings regulations changes. ○ TWUL will **continue to use media campaigns, temporary use bans and non-essential use bans** according to its current levels of service. **Supply options** ○ In the long-term, **if the 110 l/p/d target is hit, in many situations it is likely that water available from SESRO will be sufficient to provide SWOX with the water that it needs, along with construction of the Oxford Canal option being required in more adverse scenarios**. If the 110 l/p/d target is missed, then SWOX will require more water from

Headline Findings of Baseline Conditions	SESRO and we may need to construct additional treatment assets or transfer water from TWUL's other zones • **Three water demand scenarios have been assessed for the duration of the Local Plan period**; (1): Average 2023/24 **PCC of 134.4 l/p/d**, (2): Building Regulations, Approved Document G - Optional requirements with **PCC 110 l/p/d** and (3): Very High Efficiency as per withdrawn CfSH, Level 5/6 with **PCC 80 l/p/d**. Comparing the average 2023/24 PCC with the Building Regulations Optional Requirement PCC rate of 110 l/p/d, 6.1 Ml/d could be saved by the end of the Plan period. **Comparing the average 2023/24 with the Very High Efficiency Scenario of 80 l/p/d, approximately 13.6 Ml/d could be saved by 2043.** • **The National Framework for Water Resources aspiration for long term reductions is to reduce water usage to 110 litres per person per day by 2050.** The new Local Plan should take this into account and encourage all developers to meet the 110 l/p/d target in new developments. • It is currently unclear though whether the Local Plan would be able to successfully impose a domestic household per capita consumption that is lower than the Building Regulations Optional requirement of 110 l/p/d consumption for new developments. In any case, **all stakeholders should support ambitious water efficiency targets below this optional requirement level, targeting 80 l/p/d.**
Further recommendations	• In order to set out a feasible route of how the minimum standard of 110 l/p/d could be delivered, the WCS has considered some key delivery requirements, which have been set in **Section 4.10**. This has been developed in order to allow SBC to consider potential costs and benefits of developing a water use policy to require developers to build new homes to meet the minimum PCC standard of 110 l/p/d and to consider working with TWUL to develop further options for retrofitting existing properties with efficient fixtures and fittings.

5 Wastewater Collection and Treatment

The purpose of this Chapter is to:

- Review current wastewater collection and treatment infrastructure, using available information.
- Identify existing plans for improvement, including planned allowances for population growth.

There are many links between wastewater treatment and water quality. These are introduced here and explored further in **Chapter 6**.

5.1 Managing Wastewater Collection and Treatment

5.1.1 The UK's sewerage undertakers are responsible for building, maintaining and improving main sewers, pumping stations and wastewater treatment facilities that service around 96% of the UK's population[51]. This chapter focuses on these strategic facilities, which in the Borough of Swindon are owned and operated by TWUL.

5.1.2 The remaining 4% of the population, represented by the smallest of communities and individual properties in rural areas remote from main sewers, are generally served by privately owned, small-package treatment plants catering for small groups of houses, or septic tanks, cesspits and other in-situ treatment systems generally serving individual properties. These systems have not been considered further in this chapter. Planning Policy Guidance states that the assumption for new development is that its wastewater is connected directly to the public sewer.

5.1.3 If any of the allocated development sites are located in areas not served by the main sewer network, it is recommended further assessment is undertaken in a detailed WCS to consider feasible options for wastewater management.

5.1.4 TWUL is responsible for the public sewer system in the Borough of Swindon, with the exception of some highway drains which may be the responsibility of Local Authorities or the Highways Agency. Property owners are responsible for drains which carry wastewater up until the boundary of their property where they connect to public sewers. Responsibility for maintaining private sewers outside the boundaries of private property was transferred to sewerage companies in 2011.

5.1.5 TWUL is also responsible for building, operating and maintaining wastewater treatment facilities; referred to, variously, Sewage Treatment Works (STWs). The existing STWs and the related Sewer Drainage Area Catchments in the Borough of Swindon are shown in **Figure 5.1** and **Figure 5.2**, respectively.

[51] Waste water treatment in the United Kingdom - 2012 (publishing.service.gov.uk)

Figure 5.1: Existing Sewage Treatment Works in the Borough of Swindon

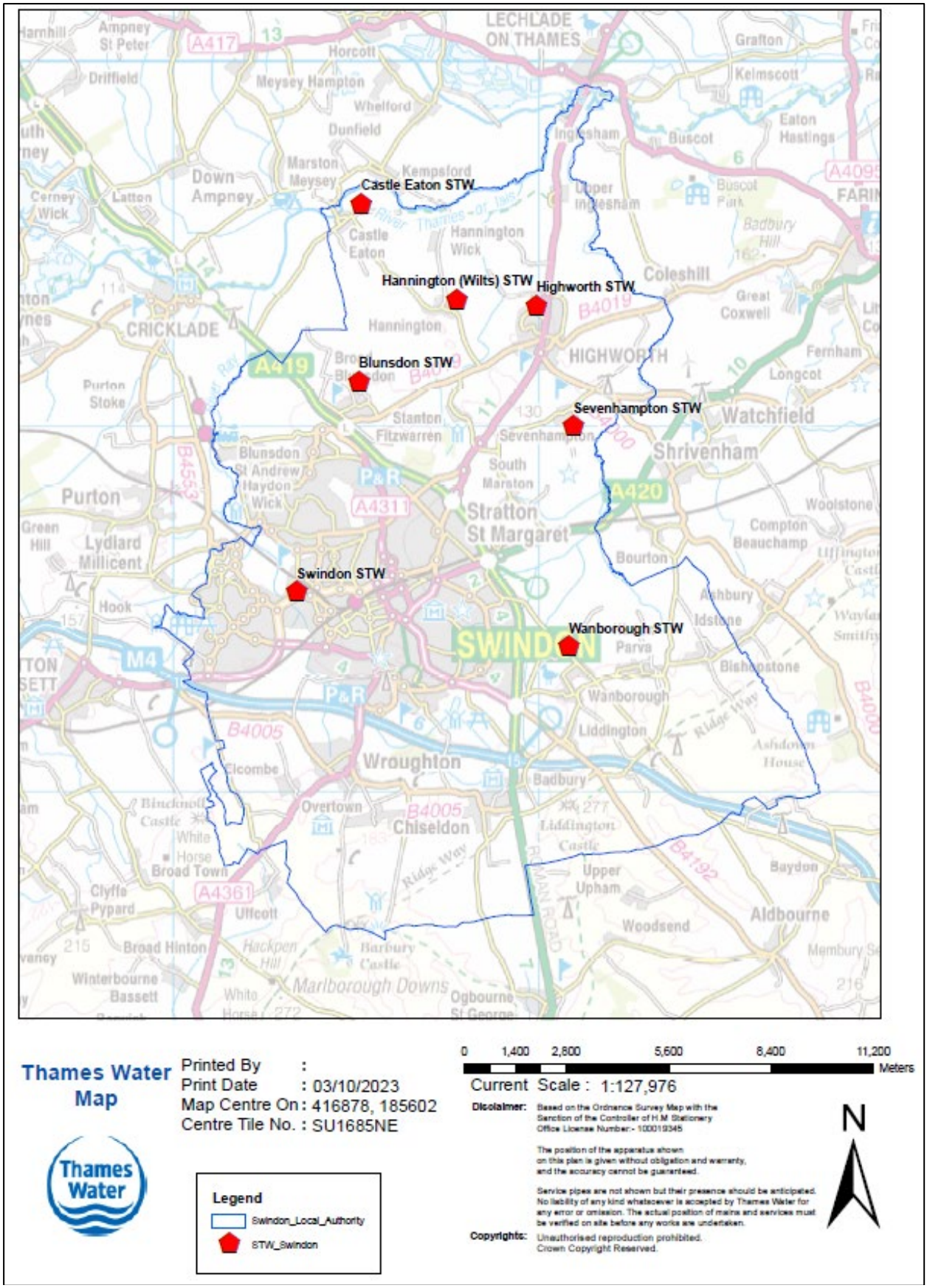
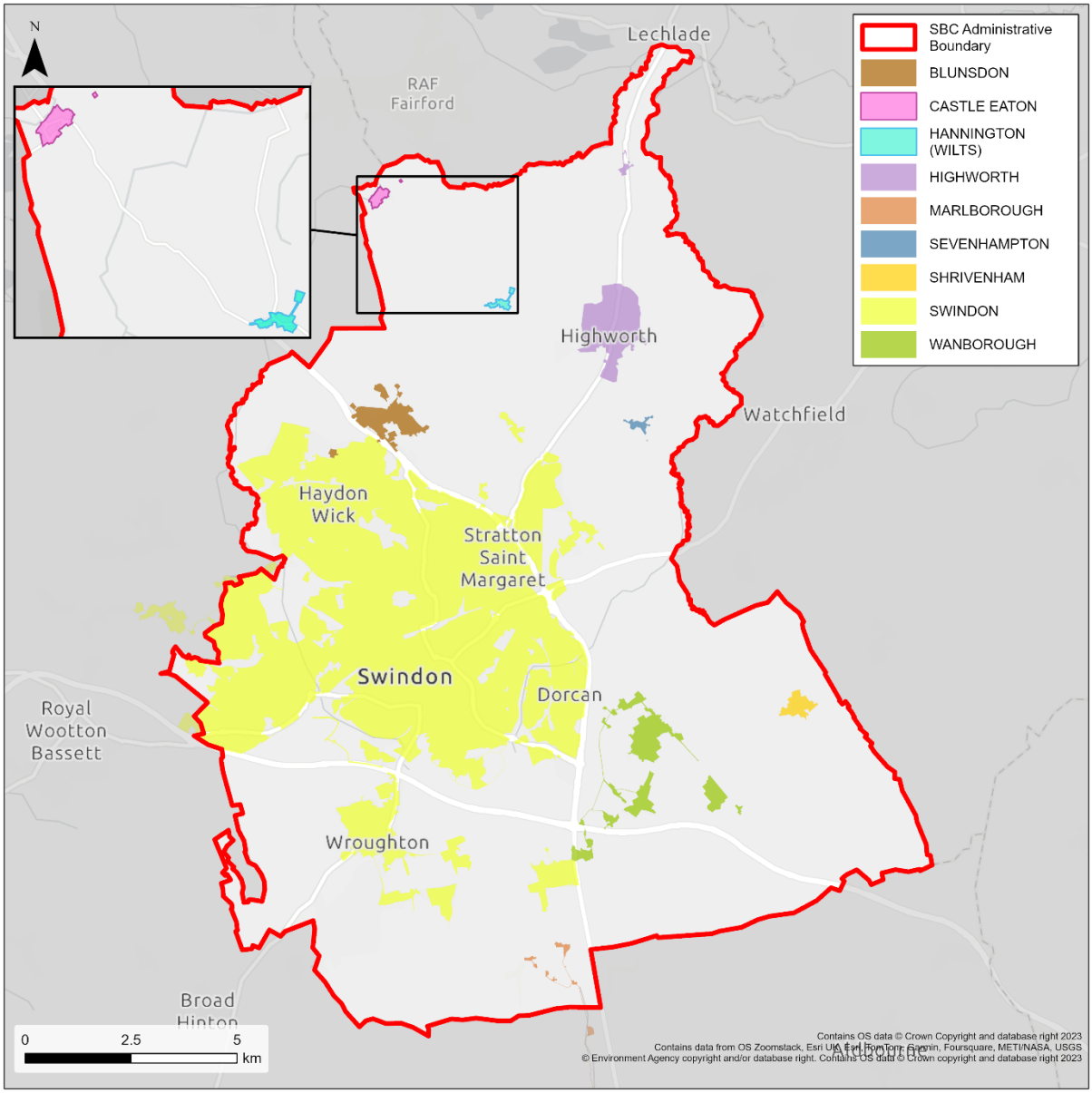


Figure 5.2: Sewer Drainage Area Catchments in the Borough of Swindon



5.1.6 The previous Swindon WCS report, published in 2017, stated that all the strategic development locations, which were being considered by the Local Plan within the Swindon urban area, were all connected to the Swindon STW. The report noted that there were other public STWs within the Borough, but these were not subject to development at a scale that required any analysis at that time.

5.1.7 There are currently 7 STWs that are serving the Borough:

- **Swindon STW.**
- **Blunsdon STW;**
- **Castle Eaton STW;**
- **Hannington (Wilts) STW;**

- **Wanborough STW**
- **Highworth STW;** and,
- **Sevenhampton STW**

5.1.8 The EA is responsible for regulating wastewater treatment works, by issuing permits and assessing the quality of treated effluent against compliance limits. In particular, the EU Urban Waste Water Treatment Directive, transposed into UK law, prescribes minimum standards for wastewater collection and treatment in urban areas with a population equivalent[52] of over 2,000, with more advanced treatment required in places with a population equivalent over 10,000 in sensitive areas:

- **For "less sensitive areas",** a minimum of primary treatment must be provided to settle out larger suspended matter. The UK currently has no "less sensitive area" designations.
- **For "normal areas",** secondary treatment is required to breakdown organic matter under controlled conditions in treatment plants.
- **For "sensitive areas",** tertiary treatment is required to address specific pollutants using different treatment processes. Sensitive areas include water bodies that are currently or at risk of becoming eutrophic, abstraction sources that currently or at risk of having high nitrate levels, and other directives requirements (e.g. the Bathing Water Directive). These areas are mapped in **Chapter 6** and show part of the River Ray, part of the River Thames and the full length of Westrop Brook being designated as "sensitive areas" for eutrophication (**Figure 6.5**).

5.1.9 TWUL use long term plans to manage their waste water treatment facilities. Their most recent long-term 'Drainage and Wastewater Management Plan' (DWMP) was published in 2023. As outlined in **Section 2**, the preferred plan options for Oxfordshire, Swindon, Wiltshire, Gloucestershire and Warwickshire indicates that over the next 25 years, TWUL will focus on surface water management and network improvements. Challenges, solutions and targets in relation to the STWs located within the Borough are presented in **Section 5.4**.

5.2 Wastewater Treatment Capacity Assessment

Existing Wastewater Treatment Capacity

5.2.1 TWUL has provided permitted discharges information of the STWs, shown in **Table 5.1**. Permitted discharges are based on the Dry Weather Flow (DWF)[53]. Compliance against the permitted DWF is assessed by comparing it to the measured non-parametric 80% exceeded flow.

5.2.2 According to the EA guidance[54], the non-parametric 20-percentile value of a time series of measured total daily volume (TDV) data provides a good estimate of DWF. The 20-percentile figure is that value exceeded by 80% of the recorded daily values. It's also known as the Q80.

5.2.3 TWUL has also provided the 15-minute final effluent total daily volume data for the period 2020 to 2022.

[52] "Population equivalent" includes the wastewater generated by both domestic and economic activities, and is calculated from the biochemical oxygen demand (1 population unit is equal to 60 grams of BOD per 24 hours.

[53] Dry Weather Flow is the average daily flow to a Sewage Treatment Works during a period without rain.

[54] Calculating dry weather flow (DWF) at waste water treatment works - GOV.UK (www.gov.uk)

5.2.4 The current DWFs for each STW are presented in **Table 5.1** below.

> **Position Statement 5.1 (May 2025)**
> The 15-mins final effluent data for Highworth STW, provided by TWUL, contain lots of zero values and empty cells for consecutive weeks, which would suggest a faulty instrument. The data have been processed to remove these values. However, very low flow values (0.6 to 0.7 l/s) are still present. Highworth STW receives both gravity and pumped flow, so it would not be expected to have long periods that the STW would run dry. Clarification has been asked from TWUL on this matter.
> It should be noted however, that the DWF current and post-growth flows shown in Table 5.1 might not be representative.

5.2.5 Also, in May 2024 TWUL has shared the timeframes of the Monitoring Certification Scheme (MCERTS)[55] for each of the STWs presented in **Table 5.1**.

- Swindon STW - no new MCERTS since 2007
- Blunsdon STW - no new MCERTS since 2006
- Castle Eaton STW – no MCERTS requirement
- Hannington (Wilts) STW - no MCERTS requirement
- Wanborough STW – no new MCERTS since 2005
- Highworth STW – no new MCERTS since 2009
- Sevenhampton STW - no MCERTS requirement

5.2.6 TWUL has advised that for the Castle Eaton, Hannington (Wilts) and Sevenhampton STWs, there are no final effluent monitoring data available and, therefore, it is not possible to determine whether currently these STWs exceed their DWF permits.

5.2.7 The data in **Table 5.1** shows that the following STWs do not exceed their current permitted DWF capacity:

  - Swindon STW,
  - Blunsdon STW,
  - Wanborough STW and
  - Highworth STW.

5.2.8 Both Swindon STW and Blunsdon STW are currently using the majority of their permitted DWF; Swindon STW uses 85% of its DWF permit and Blunsdon STW uses 84% of its DWF permit.

5.2.9 Wanborough STW currently uses approximately half of its DWF permit.

5.2.10 Finally, Highworth STW currently uses a very small percentage of its permit (0.3%); however, as noted in Position Statement No 5.1, the effluent data from Highworth STW is very low,

[55] https://www.gov.uk/government/collections/monitoring-emissions-to-air-land-and-water-mcerts

suggesting a faulty instrument and, therefore, conclusions cannot be drawn with accuracy regarding the STW's current and post-growth capacity.

5.2.11 The previous 2017 WCS report, which focused on Swindon STW, concluded that a number of infrastructure improvements were necessary to provide the hydraulic and wastewater treatment process capacity for development up to 2021. According to the 2017 report, providing that these improvements would be delivered, then Swindon STWs would have adequate process and hydraulic capacity to deal with the growth up to 2021. The same report noted that TWUL were delivering substantial strategic improvements at the time to the main trunk sewer that takes sewage into Swindon STW. These upgrades have been planned to ensure that strategic systems into Swindon STW would have capacity for the development planned in the Local Plan up to 2026.

Future Wastewater Treatment Capacity

5.2.12 An increase in the residential and employment growth will have a corresponding increase in the volume and flow of wastewater generated within the Borough. Therefore, it should be considered whether there is sufficient treatment capacity within the existing STWs to accommodate this growth and what new infrastructure is required to provide for the additional wastewater volumes.

5.2.13 For the STWs, where no final effluent monitoring data is available (Castle Eaton, Hannington (Wilts) and Sevenhampton STWs), it is not possible to determine whether these STWs exceed their DWF permits and subsequently, it is not possible to determine what the DWF post growth will be. None of these STWs are shown to receive any additional wastewater flows post-growth.

5.2.14 The future DFW post-growth in the rest of the STWs (Swindon, Blunsdon, Wanborough and Highworth STWs) should be calculated to determine whether the proposed growth can be accommodated. In order to calculate this, the future growth is required in a GIS-compatible format (shapefiles), so that these shapefiles can be connected to each of the STW catchments. The future growth would be then 'translated' into an additional flow.

Residential Sites Assumptions

5.2.15 The following key assumptions have been used to calculate the post-growth DWF:

- The wastewater generation per new dwelling is based on the occupancy rate 2.22 (refer to **Table 1.1**);
- An infiltration rate of 18% was applied for the region based on the TWUL correspondence that took place in June and July 2025; and
- The average residential wastewater discharge rate is assumed to be 112.9 l/p/d. This value is based on the TWUL correspondence that took place in June and July 2025.

5.2.16 The PCC rates shown in **Table 5.1** have been provided by TWUL and have been extracted from the recent WRMP24. The rates shown are the volumes that TWUL forecast each person will be using moving forwards. A 95% factor has been applied into the forecasts for STW capacity on the basis that not all water supplied is returned to sewers. The **Table 5.1** below shows the PCC rates where the 95% factor has already been applied. The average rate between 2025 and 2043 is 112.9 l/p/d.

Table 5.1: 95% of WRMP24 Final Plan DYAA average PCC – SWOX WRZ (Source: TWUL)

Year	Average PCC	Year	Average PCC	Year	Average PCC	Year	Average PCC
2025	126.07	**2032**	116.09	**2039**	104.6	**2046**	96.9
2026	124.55	**2033**	114.76	**2040**	103.65	**2047**	96.045
2027	123.12	**2034**	113.43	**2041**	102.41	**2048**	95.095
2028	121.79	**2035**	111.53	**2042**	101.18	**2049**	94.145
2029	120.56	**2036**	109.82	**2043**	99.94	**2050**	93.955
2030	119.13	**2037**	108.11	**2044**	98.61		
2031	117.71	**2038**	106.4	**2045**	97.755		

5.2.17 There has also been a limitation in the post-growth DWF calculations for the residential sites. As highlighted in **Section 1.7** of the report, the dataset provided on 28th April 2025 shows a total figure of 25,796 dwellings, which is the actual number of dwellings projected. These are 405 dwellings more compared to the dataset provided on 7th April 2025. As agreed with SBC, the shapefiles from the dataset provided on 7th April 2025 have been used to allocate the residential yield into the STW catchments and the excess of 405 dwellings has been added into the Swindon STW catchments, to match the actual figure of 25,796 dwellings.

Non-residential Sites Assumptions

- For the 'Employment Land Audit' dataset, a Plot Ratio of 0.4 has been applied to convert the provided Gross Development Areas to Gross Building Floorspace, as per the Swindon Employment Land Review (2017)[56].

Position Statement 5.2 (May 2025)
On 9th May 2025, SBC informed Stantec that following discussions with SBC's Consultants who have undertaken the updated Employment Land Review 2024, that the office space does not align with the industry standard. However, as this is not resolved yet, SBC agreed to apply the Plot Ratio of 0.4 across all the non-residential developments, as this was identified in the Employment Land Review (2017).

The Draft Employment Land Review 2024 uses the following assumptions:

- *'Office: 60% of the plot is taken up by office floorspace*
- *Industrial and Warehousing: 40% of the plot is taken by commercial floorspace'.*

The above Plot Ratios will be updated in the Detailed WCS that will follow.

[56] Swindon Employment Land Review Final Report March 2017 | Swindon Borough Council

- For development sites that included residential uses, it has been assumed that the residential development covers only 25% of the total site area.
- For the Panettoni Development, the Gross Floorspace for each Use Class, has been scaled down to match the total maximum 672,000sqm floorspace indicated in the Planning Application Description (refer to **Table 1.5**).
- A 20% reduction factor has been applied to convert Gross to Net floorspace, based on the Homes and Communities Agency Employment Density Guide (2015)[57] guidelines.
- The Employment Densities for the different employment Use Classes and Sub-Categories are also based on the Homes and Communities Agency Employment Density Guide (2015) guidelines.
- The average generated wastewater rates for the different Employment Use Classes and Sub-Categories are based on the British Water Code of Practice, Flows and Load Guidelines.

5.2.18 The post-growth DWFs and the post-growth capacity for each STW are presented in **Table 5.2** below.

[57] Employment Density Guide 3rd Edition

Table 5.2: STWs current and post-growth capacity

STWs	Current position				Post-growth												
					Residential sites	Non-residential sites											
	Current permitted DWF (m^3/d)	Current DWF, calculated as Q80 (m^3/d)	Current Headroom capacity (m^3/d)	Current Permit used (%)	Number of dwellings projected	Employment Land Audit Gross Development Areas (sqm)	Employment Land Audit Gross Buidling Floorspace (sqm)	Employment Land Audit Gross Buidling Floorspace, exlc. Residential uses (sqm)	Panattoni Site Maximum Gross Floorspace (sqm) – as taken from the Planning Application desription (refer to Section 1.7 of this report)	Panattoni Site Maximum Gross Floorspace (sqm) - scaled down to match the maximum total Gross Floorspace of 672,00sqm according to the Planning Application description (refer to Section 1.7 of this report)	DWF from residential sites (m^3/d)	DWF from non-residential sites (m^3/d)	Infiltration component (assumed 18% for Swindon)	Sum of additonal DWF from both residential and non-residentail sites, incl. infiltration (m^3/d)	DWF post-growth (m^3/d)	Headroom capacity post-growth (m^3/d)	Future Permit used (%)
Swindon	48,275	41,254	7,021	85%	24,349	11,360,000	4,544,000	4,474,000	772,800	671,563	6,102	3,461	1,098	10662	51,916	-3,641	108%
Blunsdon	487	409.6	77	84%	570	50,000	20,000	20000	0	-	143	13	26	181	591	-104	121%
Castle Eaton	48	TWUL confirmed that STW does not have any final effluent monitoring data	Not calculated	Not calculated	0	0	-	-	0	-	-	-	-	0	Not calculated	Not calculated	Not calculated
Hannington (Wilts)	N/A	TWUL confirmed that STW does not have any final effluent monitoring data	Not calculated	Not calculated	9	0	-	-	0	-	2	-	0.41	3	Not calculated	Not calculated	Not calculated
Wanborough	722	403.0	319.0	56%	437	10,000	4,000	4000	0	0	110	1	20	131	534	188	74%
Highworth	1,900	5.9	1894.1	0.31%	431	100,000	40,000	40000	0	0	108	40	19	167	173	1,727	9%
Sevenhampton	23	TWUL confirmed that STW does not have any final effluent monitoring data, as the DWF permit is below 50 m3/d.	Not calculated	Not calculated	0	0	-	-	0	-	-	-	-	0	Not calculated	Not calculated	Not calculated

Position Statement 5.3 (May 2025)
The DWF permits and effluent datasets for all the STWs used to identify the post-growth capacity in Table 5.1 have been provided by TWUL in May 2024 and October 2023. It has been agreed with SBC that the updated datasets (if any) will be requested by TWUL prior to the Detailed WCS.

5.2.19 **Table 5.2** shows that all two out of the four assessed STWs do have capacity post-growth. More specifically:

- Highworth STW shows that post-growth it would use approximately 9% of its DWF permit. As previously noted though, the effluent data received from TWUL, contain very low values, and therefore, the current, as well as the post-growth DWF and post-growth capacity, might be underestimated.

- The percentage of post-growth DWF capacity used in Wanborough STW, is approximately 74%. This implies that potentially Wanborough STW could accept more flows (and subsequently more development).

5.2.20 On the other hand, **Table 5.2** shows that Swindon STW and Blunsdon STW both exceed their capacity post-growth.

- Swindon STW reaches 108% of its capacity post-growth. This would imply that it would not be feasible to allocate all of the proposed development in the Swindon STW catchment, since the flow headroom would be exceeded.

- Similarly, Blunsdon STW reaches 121% of its capacity post-growth, implying that it would not be feasible to allocate all of the proposed development in the Blunsdon STW catchment, as the flow headroom would be exceeded.

5.2.21 It needs to be pointed out that the above conclusions are depending on the limitations also presented above, i.e.

- The DWF permits and the effluent data for all the assessed STWs have been provided by TWUL in May 2024 and October 2023 and might be out of date. As a result, the results regarding the STWs current and post-growth capacity might not represent an accurate position. It has been agreed with SBC that the updated datasets (if any) will be requested by TWUL prior to the Detailed WCS.

- The location of the 405 dwellings that have been assumed that will be allocated into the Swindon STW catchment, has not been provided at the time of writing this report.

- The Plot Ratio in the Office Use Class has been currently assumed to be 40%. However, the emerging Employment Land Review (2024) has indicated that the ratio might increase to 60%, meaning that the floorspace occupied by the building would be higher. In that case, the employment numbers and, subsequently, the generated wastewater flows would be also higher.

5.2.22 For the STWs showing an exceedance of their the maximum permitted DWF post-growth (Swindon STW and Blunsdon STW), additional headroom could be potentially made available through an application by TWUL for a new or revised discharge permit from the EA. Additionally, SBC should liaise with TWUL to assess alternative ways of discharging wastewater, as potentially wastewater could be re-directed to STWs with adequate treatment capacity.

5.2.23 It is also recommended that SBC should continue to update TWUL on future development and changes to growth allocation to ensure that plans for STW upgrades in response to permit change requirement or flow capacity constraints take into account the most up to date planning

position, to ensure that capacity has not been used up by other developments within the STW catchment.

5.2.24 Prior to development, both SBC and TWUL should be satisfied that the development can be accommodated either within the capacity limits of the STWs or by sufficient additional capacity being made available. Additionally, it should be ensured that water quality requirements of the WFD will not be compromised. If necessary, a Grampian condition might have to be applied prohibiting development until the provision of the necessary infrastructure has taken place.

5.2.25 As part of the coming Detailed WCS, it is also suggested that an assessment of the actual wastewater generated across the Local Plan period should be undertaken in order to identify the year that the STW capacity for Swindon STW and Blunsdon STW would be exceeded, so that development could be planned accordingly. Furthermore, water quality modelling is recommended to be undertaken as part of the Detailed WCS, in order to assess the future permit quality limits that may be required.

5.2.26 TWUL have addressed the questions of capacity for growth in their wastewater networks in their DWMP, published in 2023. The key outcomes are presented in **Section 5.4.**

5.3 Load Standstill

5.3.1 It is inevitable that new development will result in an increase in wastewater created and a resulting increase in treated effluent discharges. Where the DWF is anticipated to increase above the permitted value, the EA will reassess the site and its DWF permit, along with the other permit consents relating to pollutant concentrations in the treated effluent. The EA reviews and amends water company permit conditions on a five-year cycle to identify environmental improvements to be delivered in the next company Asset Management Plan.

5.3.2 Load standstill is a useful concept to be considered when reviewing wastewater discharge consents for planning purposes. A load standstill approach ensures that as effluent volumes increase, the total pollutant load discharged does not increase. This is achieved by decreasing the concentration of pollutants in the effluent discharge in proportion to the increase in flow. There are technically achievable limits (TAL) below which it is not possible to reduce concentrations using currently available technologies. These are:

- 1 mg/l for Ammonia (95 percentile),
- 5 mg/l for Biochemical Oxygen Demand (BOD) (95 percentile) and
- 0.5 for Total Phosphorous (annual average).

5.3.3 The current permit quality standards for Ammonia, BOD and Phosphate are presented in **Table 5.3.**

Table 5.3: Current permit quality standards for Ammonia, BOD and Phosphate

STWs	Current Permits (mg/l)		
	Biochemical Oxygen Demand (BOD)	Ammonia	Phosphate
Swindon	11	1	1
Blunsdon	10	8	Not provided
Castle Eaton	30	Not provided	Not provided
Hannington (Wilts)	Pending determination		
Wanborough	25	5	0.5
Highworth	12	5	Not provided
Sevenhampton	30	Not provided	Not provided

5.3.4 Pollutant consents may also need to be revised to reflect the potential impacts of climate change on low flows in rivers. Current climate projections indicate a decrease in summer rainfall that may result in a decrease in typical low river flows during these months. The reduction in dilution of effluent discharges due to lower river flows may trigger additional reductions in discharge concentration consents.

5.3.5 The Load Standstill assessment is based on a mass balance assessment of water quality. The current and future load for each determinant is calculated using the observed and future flows multiplied by the permit level for each determinant. The future load is then compared with the consented load to assess whether it is likely to exceed its permit.

5.3.6 As indicated in **Table 5.2**, two of the STWs (Swindon STW and Blunsdon STW) exceed their current DWF permits post-growth, under the assumptions made. Therefore, the final effluent limits might have to be adjusted and consequently, there may be a need to seek a permit variation. The Load Standstill approach will be discussed further in the Detailed WCS stage.

5.4 Wastewater Infrastructure Updates

Swindon STW

5.4.1 In March 2023, the Cabinet Member of Climate Change, Finance and Commercialisation and Director of Strategic Development and Growth published the ‘Council in Motion - Capacity of Swindon’s Sewers to handle New Development’ report.

5.4.2 The abovementioned report noted that during 2021, there were two permitted storm overflows in the Swindon STW, as shown in **Table 5.4**.

Table 5.4: Permitted Storm Overflows (Source: Council Motion – Capacity of Swindon's Sewers to handle New Development)

Overflow Location	Counted spills using 12-24h count method (2021)	Total Duration (hrs) all spills prior to processing through 12-24h count method (2021)
Swindon STW	22	231.66
Broome Hall Tanks-TEMP.2451	3	13.11

5.4.3 TWUL has committed to achieving at least a 50% reduction in the total annual duration of untreated discharges by 2030 and - within that - an 80% reduction in sensitive catchments, against a 2020 baseline.

5.4.4 According to the same report, TWUL has confirmed that the Swindon STW is appropriately sized to accept forecasted growth within its permitted DWF limits. However, during our April 2024 and March 2025 communication with SBC officers, it was noted that it is currently unknown whether the above statement is true, as the forecasted growth has been increased since then.

5.4.5 However, the 'Council in Motion' report noted that the main challenges would arise from spills that related to unwanted flows; these could be surface water, groundwater and inundation during wet weather. TWUL has a sludge growth project in design at the Swindon STW, which is due to be delivered in the 2025-2030 period.

5.4.6 According to TWUL[58], in response to repeat bursts, they has brought forward work to replace a major sewage pipe at Haydon End, also known as a rising main, with the £19.1 million construction beginning in August 2023. The company has since laid the full 3.5km of its new sewerage rising main ready for the winter, protecting local environment and wildlife.

5.4.7 Haydon End Sewage Pumping Station and Rising Main were built in 1995-96 to transfer sewage to the inlet works at the western end of Swindon STW. The area and population the pipe serves have grown significantly in the years since. In the last two years, the pipe has experienced several bursts with increasing frequency and due to the scattered nature of the bursts a full-length replacement of the pipe was required. The replacement Rising Main is expected to bring wider resilience to the area and surrounding environment.

5.4.8 As explained in **Section 2.19**, TWUL have developed a DWMP[59] with customers and stakeholders, published in May 2023. The DWMP is a long-term costed plan, focused on partnership working, which sets out the future risk and pressures facing TWUL's drainage and wastewater systems. It identifies the actions required to ensure that TWUL can continue delivering its services reliably and sustainably, along with positive outcomes for TWUL's customers, communities and the environment.

5.4.9 TWUL has also published the Catchment Strategic Plan (as part of its DWMP), which is a long-term 25 year Strategic Plan for Oxfordshire, Swindon, Wiltshire, Gloucestershire and Warwickshire.

5.4.10 The TWUL Catchment Strategic Plan identifies that in the short term (2025-2030), TWUL will provide sewer network improvements to meet growth and climate change drivers. In the short term, TWUL will also invest in the Swindon STW to ensure 100% permit compliance. The

[58] Thames Water completes major Swindon infrastructure upgrades

[59] Our DWMP | Drainage and wastewater management | Thames Water

Catchment Strategic Plan identifies the same objectives for the medium term (2030-2035) and the long term (2035-2050). TWUL's objectives for the Swindon STW, as these are presented in the Catchment Strategic Plan, as summarised in **Table 5.5**.

Table 5.5: Swindon STW targets during the 25-year Plan[59]

Short Term (2025 - 2030)	Medium Term (2030 - 2035)	Long Term (2035 - 2050)
Provide sewer network improvements to meet growth and climate change drivers	Continue to provide sewer network improvements to meet growth and climate change drivers	Continue to provide sewer network improvements
Invest in the Swindon STW to ensure compliance	Continue to invest in the Swindon STW to ensure compliance	Continue to invest in the Swindon STW to ensure compliance

Blunsdon STW

5.4.11 TWUL[60] notes that an upgrade is planned for Blunsdon STW. This scheme will ensure a higher quality of treated effluent, reducing phosphorus levels entering the river to below an average level of 0.4mg/l*. TWUL plan to complete this work in spring 2027.

5.4.12 TWUL expects Blunsdon STW to meet all government targets for storm overflows by 2045-2050.

Castle Eaton STW

5.4.13 No information on any upgrades on the Castle Eaton STW is currently available.

Hannington (Wilts) STW

5.4.14 TWUL expects Hannington (Wilts) STW to meet all government targets for storm overflows by 2045-2050.

Wanborough STW

5.4.15 The TWUL Catchment Strategic Plan identifies that, amongst other goals, TWUL is seeking to:

- Reduce storm discharges in Wanborough STW, where overflows are present to < 10 in an average yar by 2050 and
- Achieve 100% STW permit compliance in the STW.

5.4.16 According to the TWUL's Catchment Strategic Plan, the TWUL's objective for Wanborough STW for both the medium term and long term is to provide sewer network improvements to meet growth and climate change drivers.

5.4.17 Additionally, TWUL[60] notes that an upgrade is planned for Wanborough STW. This will improve its ability to treat volumes of incoming sewage, reducing the need for untreated discharges in

[60] Investment plans for storm discharge sites | Thames Water

wet weather. The scheme is due to complete in 2025. TWUL also expects Wanborough STW to meet all government targets for storm overflows by 2040-2045.

Highworth STW

5.4.18 The TWUL Catchment Strategic Plan identifies that, amongst other goals, TWUL is seeking to:

- Provide network improvements and
- Invest in the Highworth STW to achieve 100% compliance.

5.4.19 According to the TWUL's Catchment Strategic Plan, the TWUL's objective for Highworth STW for Short-Term is to invest in the Highworth STW to ensure compliance. For the Long-Term, TWUL's objective is to provide sewer network improvements, as well as to continue to invest in the STW to ensure compliance.

5.4.20 Additionally, TWUL[60] notes that an upgrade is planned for Highworth STW. This will improve the STW's ability to treat the volumes of incoming sewage, reducing the need for untreated discharges in wet weather. The scheme is due to completed in 2026. TWUL also expects Highworth STW to meet all government targets for storm overflows by 2030-2035.

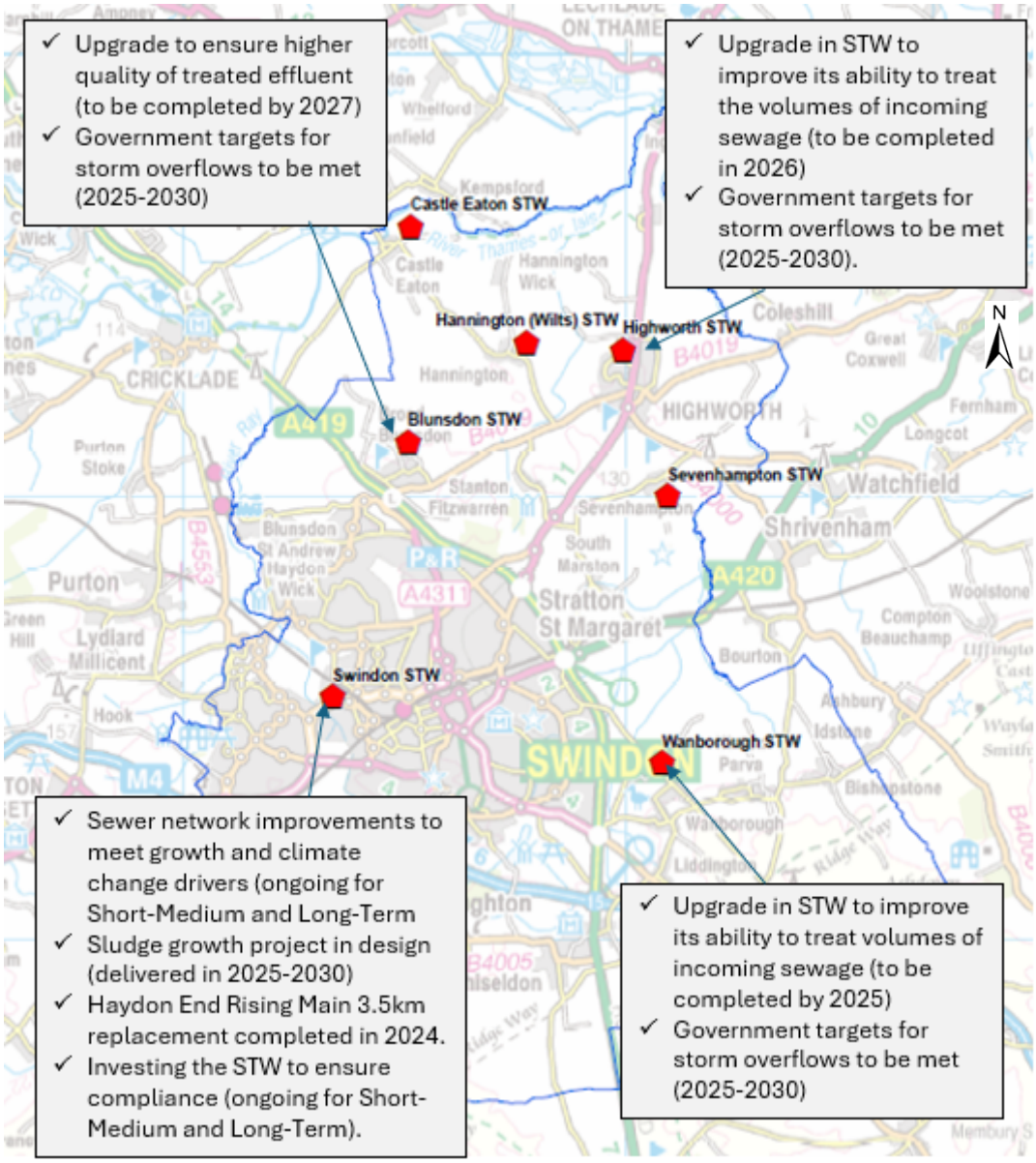
Sevenhampton STW

5.4.21 No information on any upgrades on the Sevenhampton STW is currently available.

Summary of Wastewater Infrastructure Updates

5.4.22 A summary of the key wastewater infrastructure updates is presented in **Figure 5.3**.

Figure 5.3: Summary of Wastewater Infrastructure Updates



5.5 New Wastewater Treatment Infrastructure

5.5.1 Where existing wastewater treatment works do not have sufficient capacity for additional development, or where connection to treatment works is not feasible, it may be possible to construct new treatment works to support new development. These could be constructed by TWUL on the mains sewer system, or by private operators for properties not connected to the mains sewer (e.g. septic tanks, cesspits and small sewage treatment plants).

5.5.2 New treatment works must be approved by the local planning authority, building regulations, and the EA (depending on size, location and discharge point). The risk of flooding and odour impacts must also be taken into account when planning new treatment works. The EA would be responsible for setting environmental permits on discharge volume and quality to prevent any detrimental impacts on receiving watercourses.

5.5.3 New treatment works could utilise new green / natural treatment options such as constructed wetlands, with additional biodiversity, low energy and low carbon benefits. The feasibility of

these will be dependent on location and site constraints. An example of such a site is at Ingoldisthorpe[61] in West Norfolk.

Figure 5.4: Ingoldishthorpe Wetland in Norfolk (Source: BBC[62], Anglian Water)

Ingoldisthorpe Wetland in Norfolk was created by Anglian Water as part of a test project

5.5.4 There may also be opportunities for new treatment works to re-use treated effluent for other purposes, such as irrigation. Treated effluent could be used for potable supplies, subject to quality standards and infrastructure. This has been considered in **Chapter 4** in this report.

5.5.5 Wastewater infrastructure can also be linked to energy generation, through biogas, and the residual heat in the treated effluent can also be re-used. For example, in Norwich and Bury St Edmunds, heat from wastewater treatment plants run by Anglian Water has been used to heat innovative greenhouse developments for hydroponics vertical growing systems.

5.6 Wastewater Collection and Treatment Summary

	• **Current capacity assessment:** ○ **Swindon, Blunsdon, Wanborough and Highworth STWs do not exceed their current permitted DWF capacity**. Both Swindon STW and Blunsdon STW are currently using the majority of their permitted DWFs; Swindon STW uses 85% of its DWF permit and Blunsdon STW uses 84% of its DWF permit. ○ **Wanborough STW currently uses approximately half of its DWF permit.** ○ Highworth STW currently uses a very small percentage of its permit (0.3%); however, the effluent data from Highworth STW are very low, suggesting a faulty instrument and therefore, conclusions cannot be drawn with accuracy regarding the STW's current and post-growth capacity. ○ **Castle Eaton, Hannington (Wilts) and Sevenhampton STWs do not have any effluent monitoring data available**, and

[61] Wetlands (anglianwater.co.uk)

[62] https://www.bbc.com/news/uk-england-suffolk-61805982

Headline Findings of Baseline Conditions	therefore, it is not possible to determine whether these STWs exceed their current DWF permits. • **Future capacity assessment:** ○ **Both Swindon STW and Blunsdon STW reach 108% and 121% of their capacity, respectively, post-growth.** This would imply that it **would not be feasible to allocate all of the proposed development in the Swindon STW and in the Blunsdon STW, since the flow headroom would be exceeded.** ○ **Post-growth, Wanborough STW uses approximately 74% of its DWF permit**. This implies that potentially it could accept more flows (and subsequently more development). ○ **Highworth STW shows that post-growth it would use approximately 9% of its DWF permit**. However, the effluent data received from TWUL, contain very low values, and therefore, the current, as well as the post-growth DWF and post-growth capacity, might be underestimated. • **Capacity assessment limitations:** • The DWF permits and the effluent data for all the assessed STWs have been provided by TWUL in May 2024 and October 2023 and might be out of date. As a result, the results regarding the STWs current and post-growth capacity might not represent an accurate position. It has been agreed with SBC that the updated datasets (if any) will be requested by TWUL prior to the Detailed WCS. • The location of the 405 dwellings that have been assumed that will be allocated into the Swindon STW catchment, has not been provided at the time of writing this report. • The Plot Ratio in the Office Use Class has been currently assumed to be 40%. However, the emerging Employment Land Review (2024) has indicated that the ratio might increase to 60%, meaning that the floorspace occupied by the building would be higher. In that case, the employment numbers and, subsequently, the generated wastewater flows would be also higher. • TWUL DWMP and its accompanying Catchment Strategic Plan for Oxfordshire, Swindon, Wiltshire, Gloucestershire and Warwickshire, indicate that throughout the period 2025-2050 (which covers the new Local Plan period), TWUL will: ○ **Provide and continue to provide sewer network improvements in Swindon STW** to meet growth and climate change drivers and ○ **Invest and continue to invest in the Swindon STW** to ensure compliance. • Additionally, in response to repeat bursts, TWUL has brought forward work to replace a major sewage pipe at Haydon End. The replacement was completed in 2024.

Headline Findings of Baseline Conditions	• An **upgrade is planned for Blunsdon STW** due to be completed in 2027, which will ensure a higher quality of treated effluent going to the river. • An **upgrade is planned also planned for Wanborough STW**, which will improve its ability to treat volumes of incoming sewage, reducing the need for untreated discharges in wet weather. The TWUL Catchment Strategic Plan also indicates that for the Medium (2030-2035) and Long-Term (2035-2050), i.e. throughout a timeline that covers the new Local Plan period, TWUL is seeking to provide sewer network improvements to meet growth and climate change drivers. • Additionally, an **upgrade is planned for Highworth STW**, which aims to improve the STW's ability to treat the volumes of incoming sewage, reducing the need for untreated discharges in wet weather. The scheme is due to complete in 2026. The TWUL Catchment Strategic Plan also indicates that for the Short-Term, TWUL is seeking to ensure 100% compliance and that for the Long-Term, TWUL will continue to invest in the STW to ensure compliance.
Further Recommendations	• For the STWs showing an exceedance of their maximum permitted DWF post-growth (Swindon STW and Blunsdon STW), additional headroom could be potentially made available through an application by TWUL for a new or revised discharge permit from the Environment Agency. Additionally, SBC should liaise with TWUL to assess alternative ways of discharging wastewater, as potentially wastewater could be directed to STWs with adequate treatment capacity. It is also recommended that SBC should continue to update TWUL on future development and changes to growth allocation to ensure that plans for STW upgrades in response to permit change requirement or flow capacity constraints take into account the most up to date planning position, to ensure that capacity has not been used up by other developments within the STW catchment. **Prior to development, both SBC and TWUL should be satisfied that the development can be accommodated either within the capacity limits of the STWs or by sufficient additional capacity being made available**. **Additionally, it should be ensured that water quality requirements of the WFD will not be compromised**. **If necessary, a Grampian condition might have to be applied prohibiting development until the provision of the necessary infrastructure has taken place**. • As part of the Detailed WCS, it is suggested that an **assessment of the actual wastewater generated across the Local Plan period** should be undertaken in order to i**dentify the exact time that the STW capacity for Swindon STW and Blunsdon STW would be exceeded, so that development could be planned accordingly**. Furthermore, **water quality modelling** is also recommended to be undertaken as part of the **Detailed WCS**, in order to assess the future permit quality limits that may be required. • **New development could be supported by new green/natural treatment options**, such as constructed wetlands, at existing or new STWs, with additional low energy and low carbon benefits. The

	feasibility of these will be dependent on location and site constraints. • **Treated effluent could be used for irrigation**, allowing potable water to be prioritised in abstractions. **Treated effluent could also be used for potable supplies subject to quality standards and infrastructure**. However, re-use of effluent would require assessment to ensure that watercourses currently receiving treated flow are not detrimentally impacted by reduced river flows below sustainable levels, and public health is not impacted (in the context of using treated effluent in the flood chain). • Dependent on specific site location, **timing of development may need to take into account any necessary STW upgrade works**.

6 Water Quality

6.1 Overview

6.1.1 This section will:

- Review current water quality and WFD status, using available information.
- Identify existing sources of pollution that may affect water quality, including land use, land management activities, soil erodibility and point discharges.
- Consider opportunities to improve water quality through the Local Plan.

6.1.2 The quality of potable (drinking) water is managed by the Drinking Water Inspectorate, under legislation including the Drinking Water Directive (1998). This Section is concerned solely with environmental water quality i.e. the water quality of rivers, lakes, groundwater and other naturally occurring water bodies.

6.1.3 The scope of this work is focussed on water quality and does not include wider considerations of ecology and the environment, such as biodiversity and protected sites, that are covered in other studies.

6.2 Managing Water Quality

6.2.1 The EA is responsible for monitoring and managing water quality in England. To prevent detrimental effects and maintain environmental standards, the EA controls point discharges to water bodies through its Environmental Permitting System.

6.2.2 The management of water quality is covered by a range of strategies and plans, which have been reviewed for this study is defined below:

- **The EA River Basin Management Plans (RBMPs):** These set the legally binding locally specific environmental objectives that underpin water regulation (such as permitting) and planning activities. They provide a stable planning base for economic development. The Swindon region lies in the Thames RBMP[36].
- **The EA Water Industry National Environment Programme (WINEP)[37]:** WINEP is a programme of actions that water companies will undertake to improve the environment. The actions included in a water company's WINEP reflect the company's obligations arising from environmental legislation such as Urban Wastewater Treatment Regulations, Water Environment (WFD) Regulations, Bathing Waters Regulations, and Conservation of Habitats and Species Regulations. The WINEP may also contain non-statutory actions.

6.2.3 Geographical designations are used to identify sensitive areas where certain activities are prohibited, in order to protect water quality. These are defined below.

- **Drinking Water Safeguard Zones (Surface Water)** are catchment areas that influence the water quality for their respective Drinking Water Protected Area. They are identified where the protected area has been assigned as being "at risk" of failing the drinking water protection objectives of the Water Environment (England and Wales) – WFD – Regulations 2017. Drinking Water Groundwater Safeguard Zones are established around public water supplies where additional pollution control measures are needed. **Figure 6.1** and **Figure 6.2** show the Drinking Water Safeguard Zones (surface water and groundwater, respectively) within the Borough.

Figure 6.1: Drinking Water Safeguard Zones (Surface water)

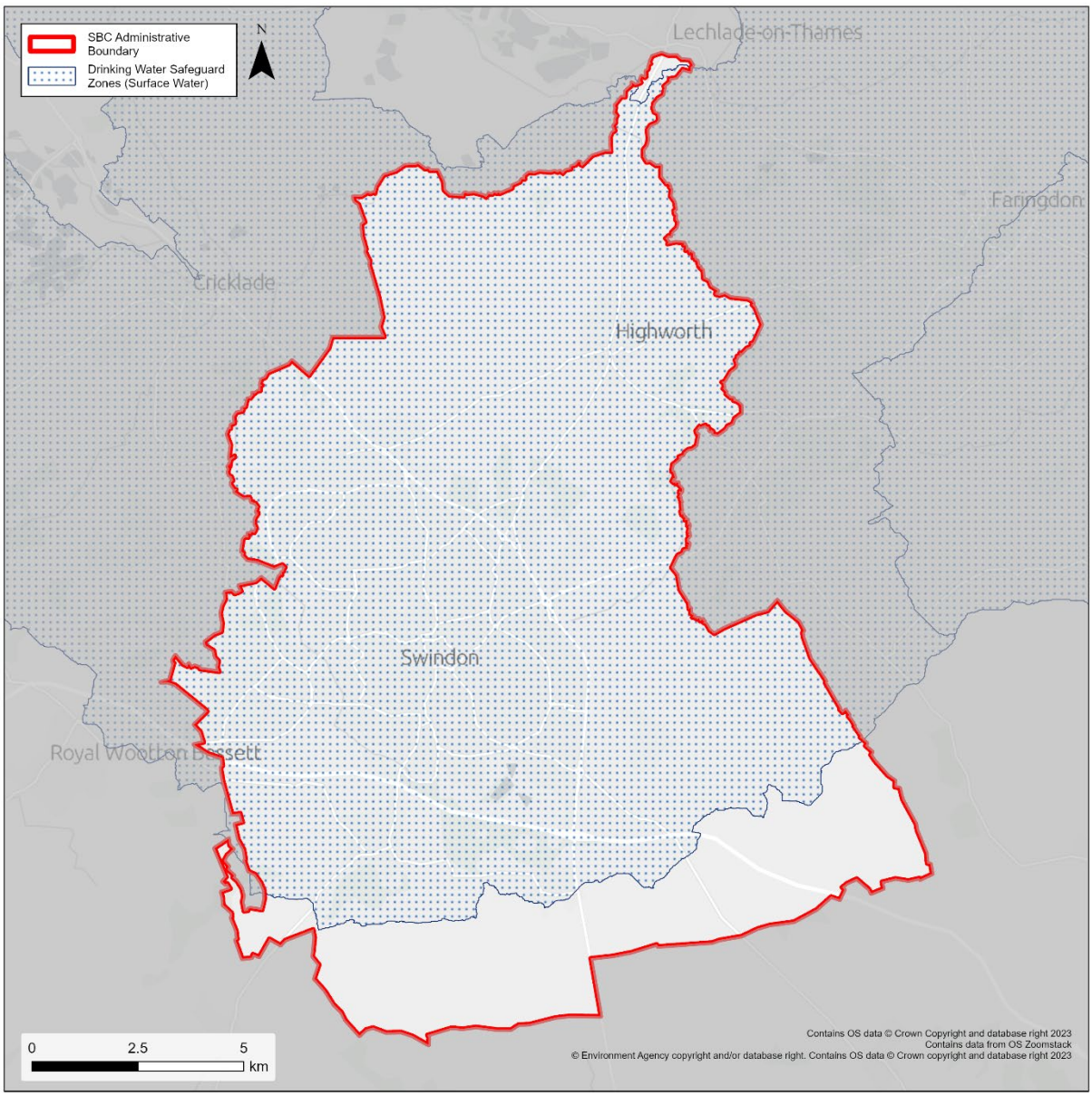
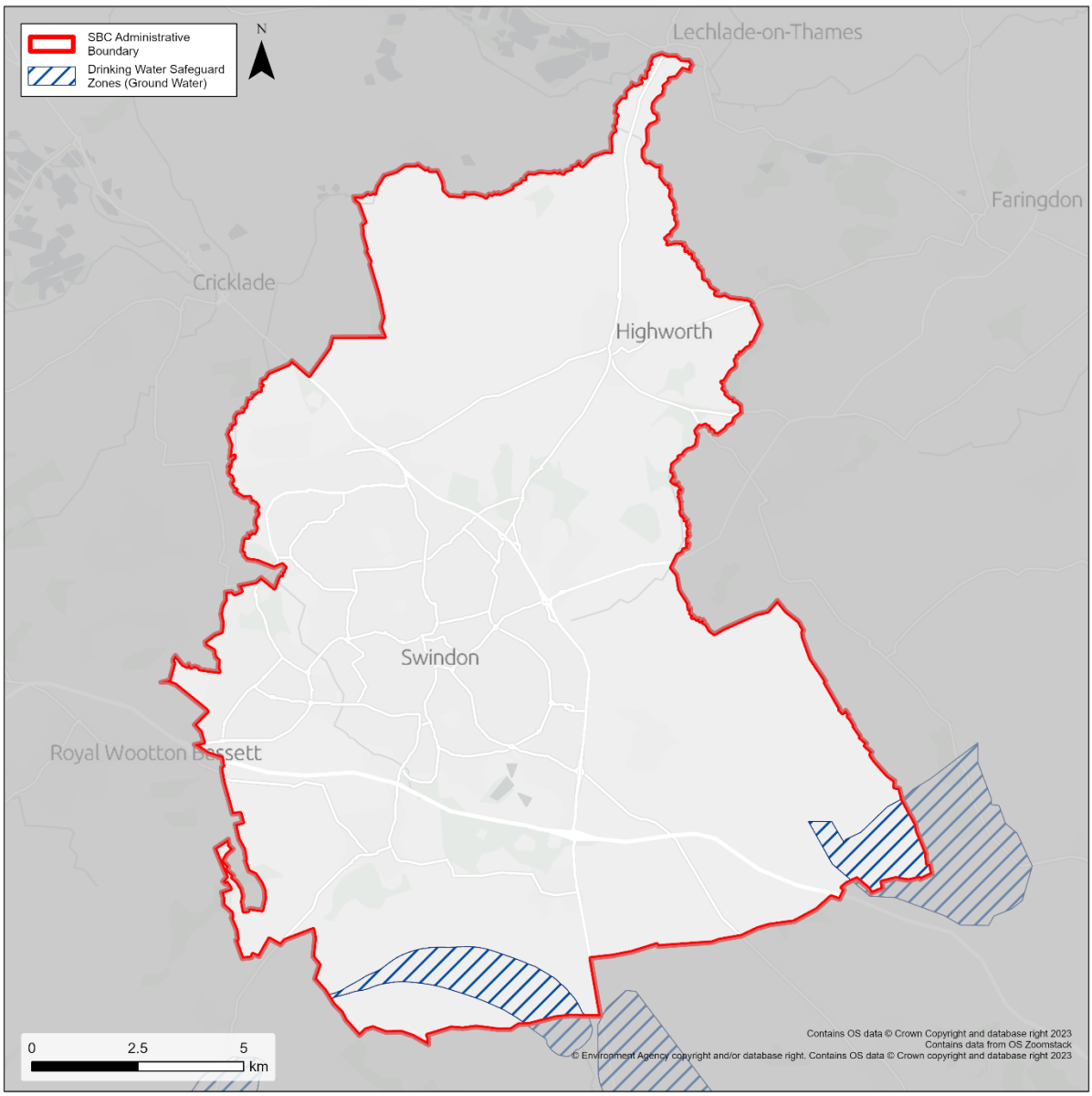


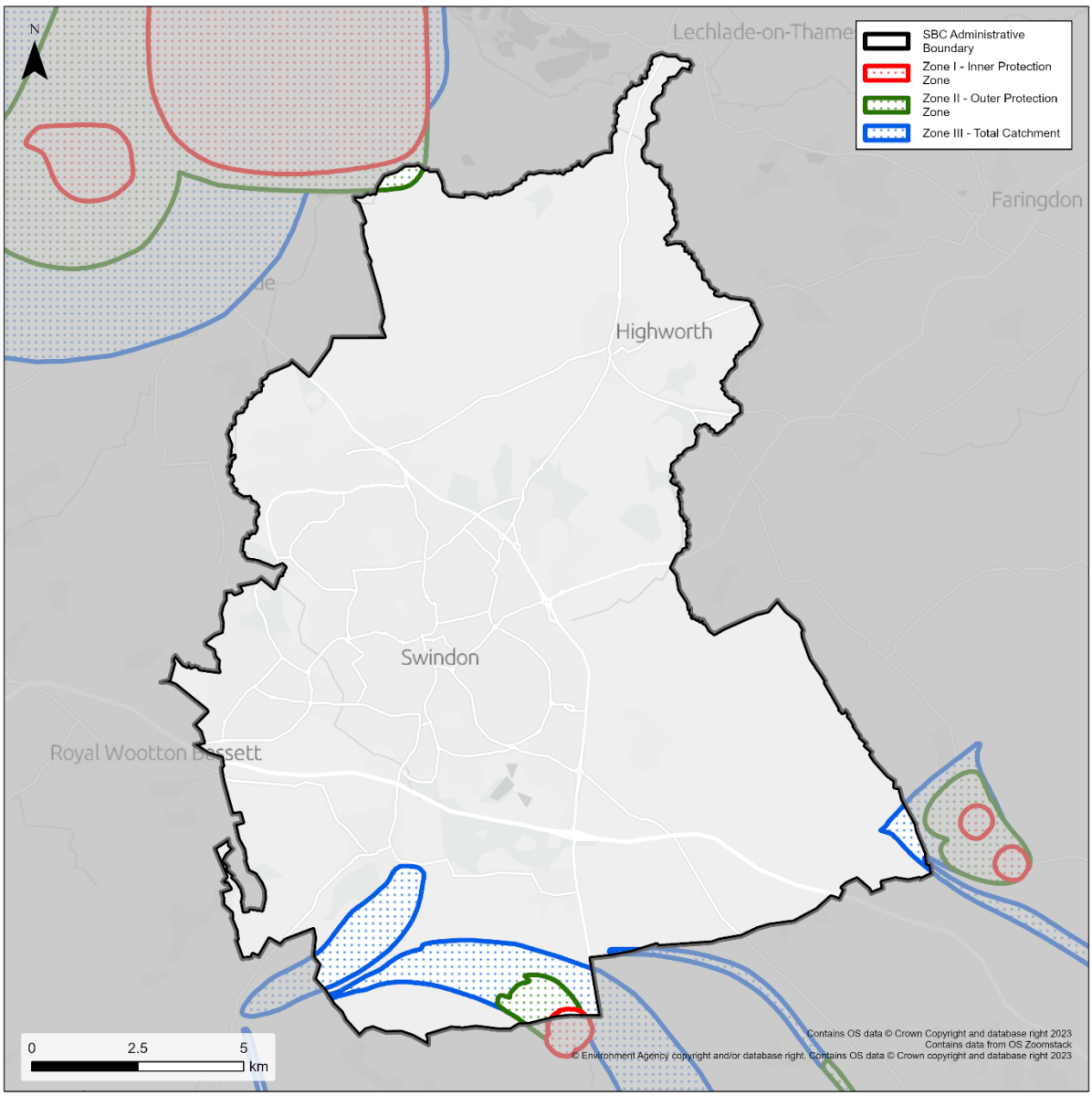
Figure 6.2: Drinking Water Safeguard Zones (Groundwater)



- **Drinking Water Protected Areas (Surface Water)** are defined by the Water Environment -WFD- (England & Wales) Regulations 2017 (or WFD Regulations) as locations where raw water is abstracted for human consumption providing, on average, more than 10 cubic metres per day, or serving more than 50 persons, or is intended for such future use. There are no Drinking Water Protected Areas (Surface water) within Swindon.

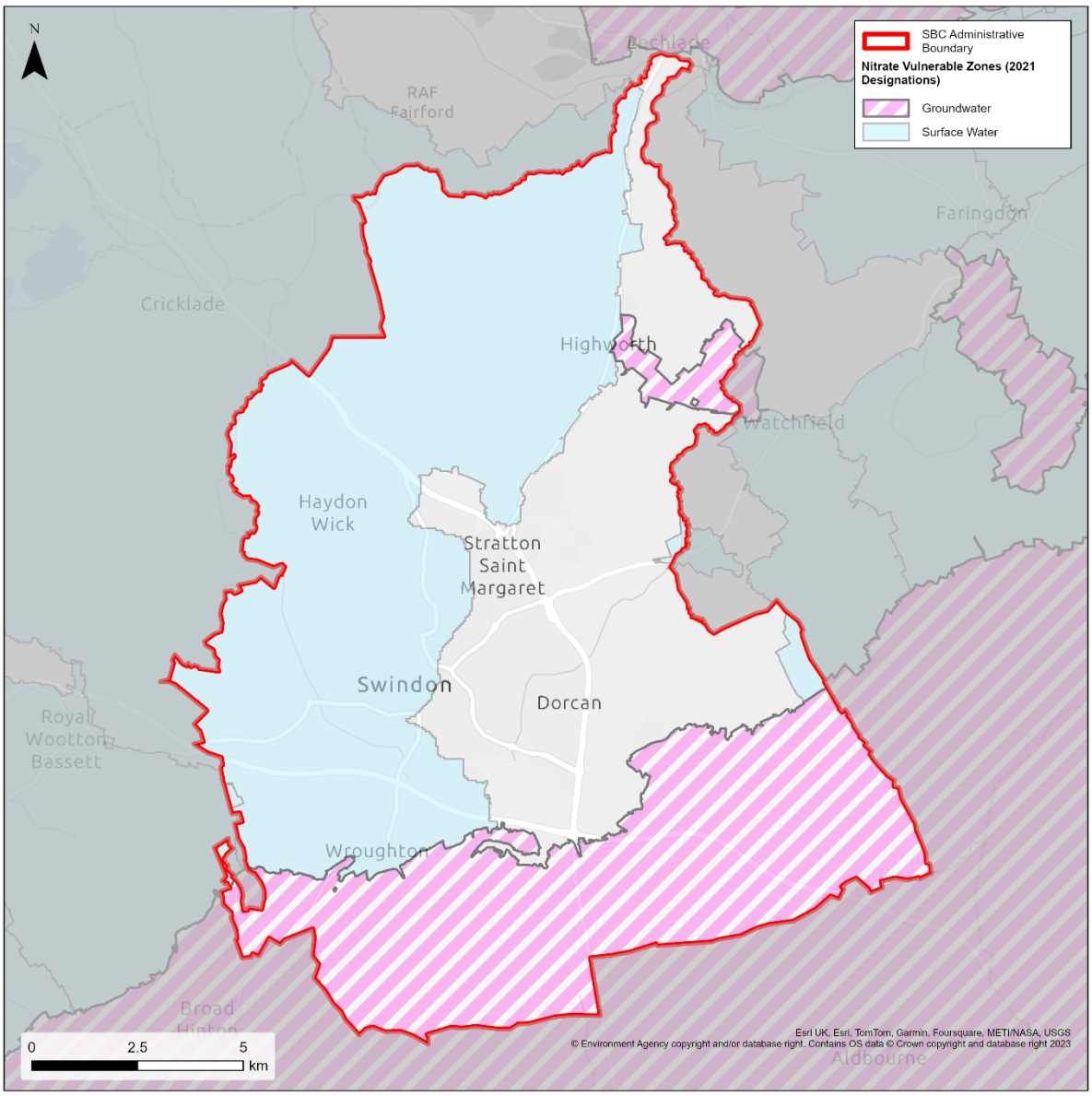
- **Source Protection Zones (SPZs)** are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction. Three zones are defined, based on the travel time of water to the abstraction site, with reference to decay criteria for toxic chemicals, water-borne disease and pollutants. **Figure 6.3** shows the Source Protection Zones designated areas in Swindon.

Figure 6.3: Source Protection Zones



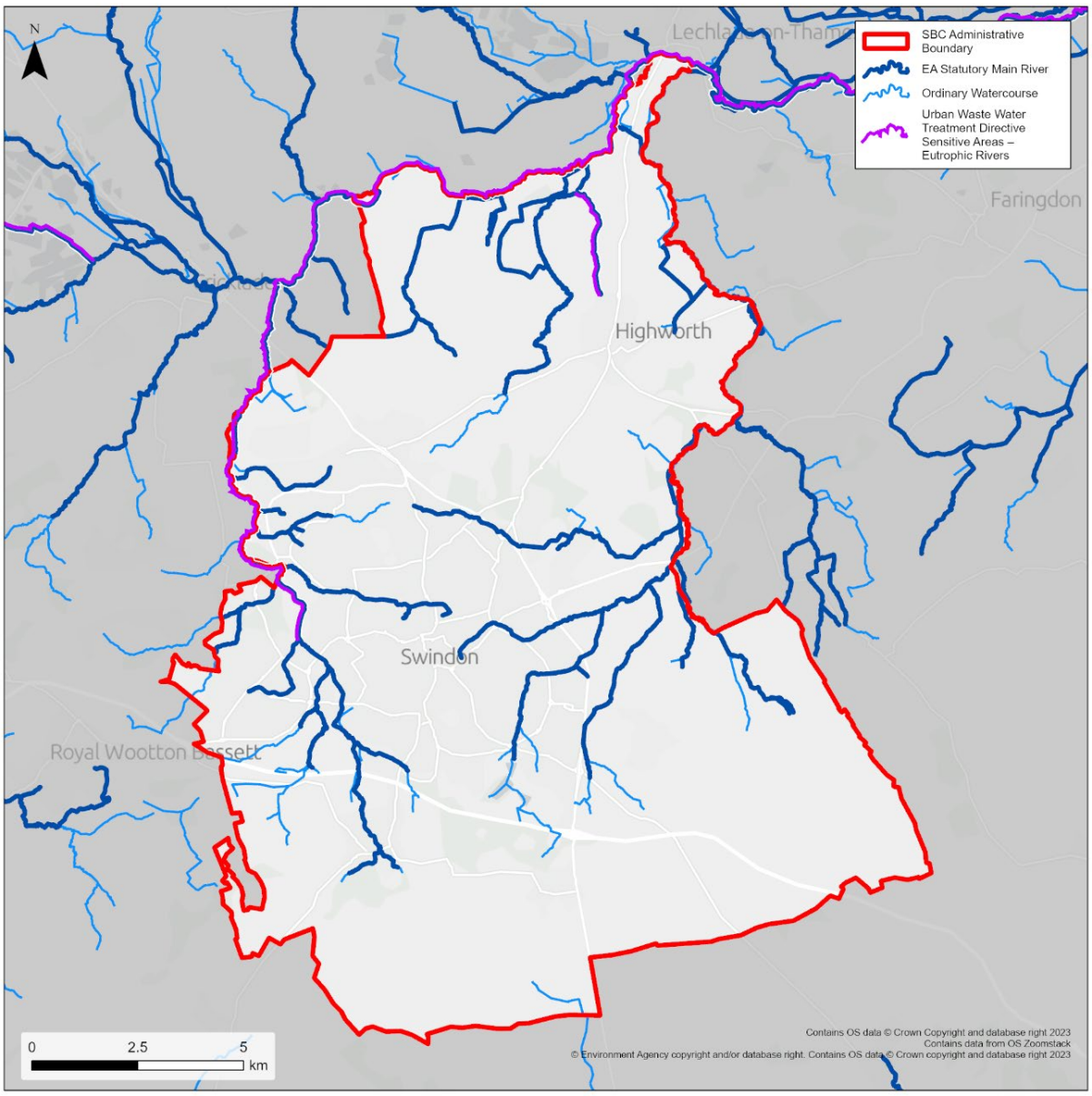
- **Nitrate Vulnerable Zones (NVZs)** are defined as areas designated as being at risk from agricultural nitrate pollution. These areas aim to limit nitrate pollution from agriculture to protect drinking water supplies and prevent eutrophication of surface waters. These areas cover over 58% of England. There is a legal requirement to comply with standards in these zones. **Figure 6.4** shows the designated Nitrate Vulnerable Zones within Swindon.

Figure 6.4: Nitrate Vulnerable Zones



- **Urban Waste Water Treatment Directive sensitive areas** aim to identify water bodies affected by eutrophication or elevated nitrate concentrations, due to the adverse effects of urban waste water discharges and waste water discharges from certain industrial sectors. **Figure 6.5** shows the designated Urban Wastewater Treatment Directive Sensitive Areas in Swindon.

Figure 6.5: Urban Wastewater Treatment Directive Sensitive Areas – Eutrophic Rivers



6.3 Existing Water Quality

Water Framework Directive Status

6.3.1 The WFD status of a water body is determined from a range of quality elements:

- For **surface water bodies**, biological and physico-chemical elements are assessed.
- For **groundwater bodies**, quantitative and chemical elements are assessed.

6.3.2 To achieve 'Good' status or potential, every element assessed must be at 'Good' status or better. Definitions of the status classes are provided in **Table 6.1** for ecological elements of the surface water bodies.

Table 6.1: Water Framework Directive (WFD) Status Definitions for Surface Water Bodies[63].

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

Existing Water Quality - Surface Water Bodies

6.3.3 The 'Current' (2022) status classifications for surface waterbodies in Swindon are shown in **Table 6.2** and **Figure 6.6**. **Table 6.2** also presents a comparison of the 2019 Overall Ecological Status with the 2022 Ecological Status.

6.3.4 There is no change in the status classification in any of the surface waterbodies presented, apart from:

- *Status Deterioration*: River Cole (Acorn Bridge to Bower Bridge), where the Ecological status deteriorated from 'Moderate' to 'Poor'. The reason for this deterioration is the 'Poor' status of the Macrophytes and Phytobenthos Combined, as well as the 'Poor' status of Phosphate, which is attributed to poor livestock management, sewage discharge and transport drainage.

- *Status Improvement*: River Ray (Wiltshire) – Source to Lydiard Brook, where the Ecological status improved from Poor to Moderate.

6.3.5 The relevant objectives illustrated in **Table 6.2** and are further discussed in **Section 6.5** in this report.

6.3.6 For the Current status, there are five waterbodies, whose status is shown as 'Poor'. These are:

- **Coln (from Coln Rogers) and Thames (Coln to Leach)**, due to poor biological quality elements (fish). Reasons for not achieving good status include physical modification (land drainage, barriers-ecological discontinuity and arable land use).

- **Liden Brook, Swindon**, due to poor biological quality elements (Macrophytes and Phytobethos combined). Reasons for not achieving good status include diffuse source

[63] How to use Catchment Data Explorer | Catchment Data Explorer | Catchment Data Explorer

(poor nutrient management), point source (sewage discharge) and physical modification (land drainage).

- **Lenta Brook, East of Swindon** (2019 classification), due to poor biological quality elements (Macrophytes and Phytobethos combined). Reasons for not achieving good status include diffuse source (poor soil management) and physical modification.

- **Cole (source to Lenta Brook)**, due to poor biological quality elements (Macrophytes and Phytobethos combined) and poor Phosphate status. Reasons for not achieving good status include diffuse source (poor livestock management and transport drainage) and physical modification (urbanisation – urban development).

- **Cole (Acorn Bridge to Bower Bridge)**, due to poor biological quality elements (Macrophytes and Phytobethos combined) and poor Phosphate status. Reasons for not achieving good status include diffuse source (poor livestock management and transport drainage) and point source (sewage discharge).

6.3.7 The Current Chemical Status and Future Objectives for all the surface water bodies that are presented in **Table 6.2**, are all classified as 'Fail' and 'Good' in 2063, respectively. The reason behind the Current status of all surface water bodies being classified as 'Fail' is that for the 2019 assessment of chemical status, the EA has changed some methods and increased its evidence base. Due to these changes, all water bodies now fail chemical status, and this assessment is not comparable to previous year's assessments.

Table 6.2: Ecological and Physico-chemical Status and Objectives for Surface waterbodies[7]

Surface Waterbody	ID	2019 Status	Current Status (2022)			Objectives			
		Overall Ecological status	Overall Ecological status	Biological quality elements	Physico-chemical quality elements	Ecological status	Biological quality elements	Physico-chemical quality elements	Reasons for alternative objectives
Coln (from Coln Rogers) and Thames (Coln to Leach)	GB106039029992	Poor	Poor	Poor	Good	Good (2027 – Low confidence)	Good	Good (2015)	Disproportionately expensive: Disproportionate burdens
Liden Brook, Swindon	GB106039022860	Poor	Poor	Poor	Moderate	Moderate (2015)	Moderate (2015)	Moderate (2015)	Technically infeasible: No known technical solution is available
Lenta Brook, East of Swindon	GB106039022870	Poor	Not assessed in 2022	Poor (refers to 2019)	Good (refers to 2019)	Good (2027 – Low confidence)	Good (2027 – Low confidence)	Good (2015)	Disproportionately expensive: Disproportionate burdens
Cole (source to Lenta Brook)	GB106039022890	Poor	Poor	Poor	Moderate	Good (2039)	Good (2039)	Good (2027 – Low confidence)	Disproportionately expensive: Disproportionate burdens; Natural conditions: Ecological recovery time
South Marston Brook	GB106039022910	Moderate	Not assessed in 2022	Moderate (refers to 2019)	Moderate (refers to 2019)	Good (2027 – Low confidence)	Good (2027 – Low confidence)	Good (2027 – Low confidence)	Disproportionately expensive: Disproportionate burdens
Cole (Acorn Bridge to Bower Bridge)	GB106039022930	Moderate	Poor	Poor	Moderate	Moderate (2015)	Good (2039)	Moderate (2015)	Natural conditions: Ecological recovery time; Technically infeasible: No known technical solution is available
Thames (Churn to Coln)	GB106039022990	Moderate	Moderate	Moderate	Moderate	Moderate (2015)	Moderate (2015)	Moderate (2015)	Disproportionately expensive: Unfavourable balance of costs and benefits
Lydiard Brook	GB106039023310	Moderate	Moderate	Moderate	Moderate	Good (2027 – Low confidence)	Good (2027 – Low confidence)	Good (2027 – Low confidence)	Disproportionately expensive: Disproportionate burdens
Ray (Wiltshire) source to Lydiard Brook	GB106039023320	Poor	Moderate	Good	Moderate	Good (2039)	Good (2039)	Good (2015)	Disproportionately expensive: Disproportionate burdens; Natural conditions: Ecological recovery time
Ray (Wiltshire) (Lydiard Brook to Thames)	GB106039023330	Moderate	Moderate	Moderate	High	Moderate (2015)	Moderate (2015)	Moderate (2015)	Disproportionately expensive: Disproportionate burdens; Technically infeasible: No known technical solution is available
Haydon Wick Brook	GB106039023331	Moderate	Moderate	Moderate	High	Good (2027 – Low confidence)	Good (2027 – Low confidence)	Good (2027 – Low confidence)	Disproportionately expensive: Disproportionate burdens; Technically infeasible: Practical technical constraints prevent implementation of the measure by an earlier deadline
Upper Kennet to Marlborough	GB106039023171	Moderate	Moderate	Moderate	High	Good (2039)	Good (2039)	Good (2039)	Natural conditions: Ecological recovery time

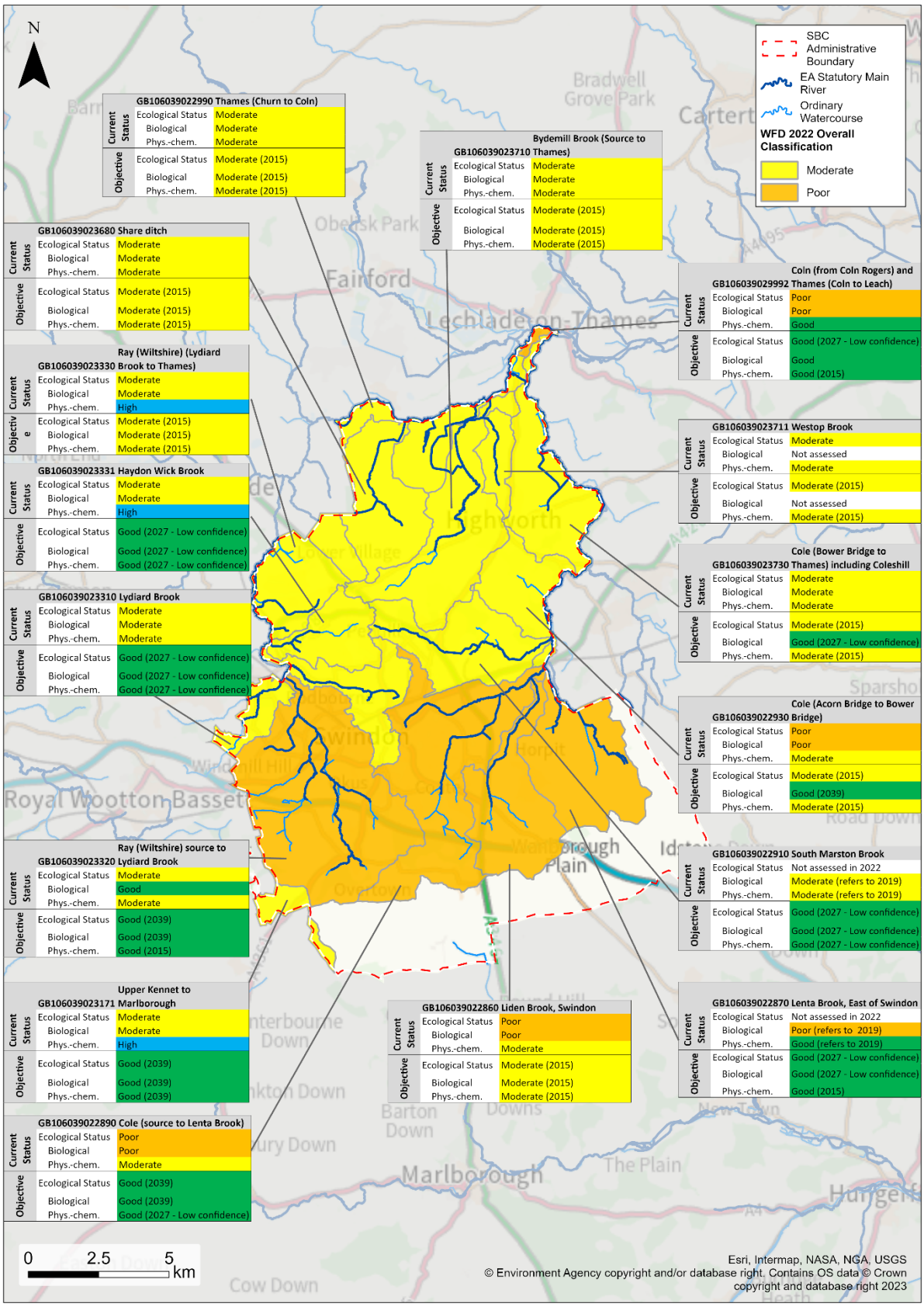
Surface Waterbody	ID	2019 Status	Current Status (2022)			Objectives			
		Overall Ecological status	Overall Ecological status	Biological quality elements	Physico-chemical quality elements	Ecological status	Biological quality elements	Physico-chemical quality elements	Reasons for alternative objectives
Westop Brook	GB106039023711	Moderate	Moderate	Not assessed	Moderate	Moderate (2015)	Not assessed	Moderate (2015)	Disproportionately expensive: Disproportionate burdens; Technically infeasible: No known technical solution is available
Share Ditch	GB106039023680	Moderate	Moderate	Moderate	Moderate	Moderate (2015)	Moderate (2015)	Moderate (2015)	Disproportionately expensive: Disproportionate burdens; Technically infeasible: No known technical solution is available
Bydemill Brook (Source to Thames)	GB106039023710	Moderate	Moderate	Moderate	Moderate	Moderate (2015)	Moderate (2015)	Moderate (2015)	Disproportionately expensive: Disproportionate burdens; Technically infeasible: No known technical solution is available
Cole (Bower Bridge to Thames) including Coleshill	GB106039023730	Moderate	Moderate	Moderate	Moderate	Moderate (2015)	Good (2027 – Low confidence)	Moderate (2015)	Disproportionately expensive: Disproportionate burdens; Technically infeasible: No known technical solution is available

Table 6.3: Surface water bodies Cycle 3 WFD classifications and ecological sub-classifications

Surface waterbody	Year	Overall classification (current year, Cycle 3)	Biological quality elements				Physico-chemical quality elements				Hydro-morphological supporting elements
			Overall classification	Fish	Invertebrates	Macrophytes and Phytobenthos combined	Overall classification	Ammonia	Biochemical Oxygen Demand (BOD)	Phosphate	
Coln (from Coln Rogers) and Thames (Coln to Leach)	2022	Poor	Poor	Poor	High	Moderate	Good	High	High	Good	Supports good
Liden Brook, Swindon	2022	Poor	Poor	-	Good	Poor	Moderate	Good	-	Bad	Supports good
Lenta Brook, East of Swindon	2019	Poor	Poor	-	High	Poor	Good	High	-	Good	Supports good
Cole (source to Lenta Brook)	2022	Poor	Poor	-	Moderate	Poor	Moderate	High	-	Poor	Supports good
Cole (Acorn Bridge to Bower Bridge)	2022	Poor	Poor	-	High	Poor	Moderate	High	-	Poor	Supports good

Note - Only those items assessed as having a 'Poor' WFD status have been shown in the above table.

Figure 6.6: Ecological and Physico-chemical Status and Objectives for Surface Waterbodies[7]



Existing Water Quality - Groundwater Bodies

6.3.8 The current status and the objectives for groundwater bodies in Swindon are shown in **Table 6.4** and **Figure 6.7**. For groundwater bodies, objectives are set for the ecological and chemical status.

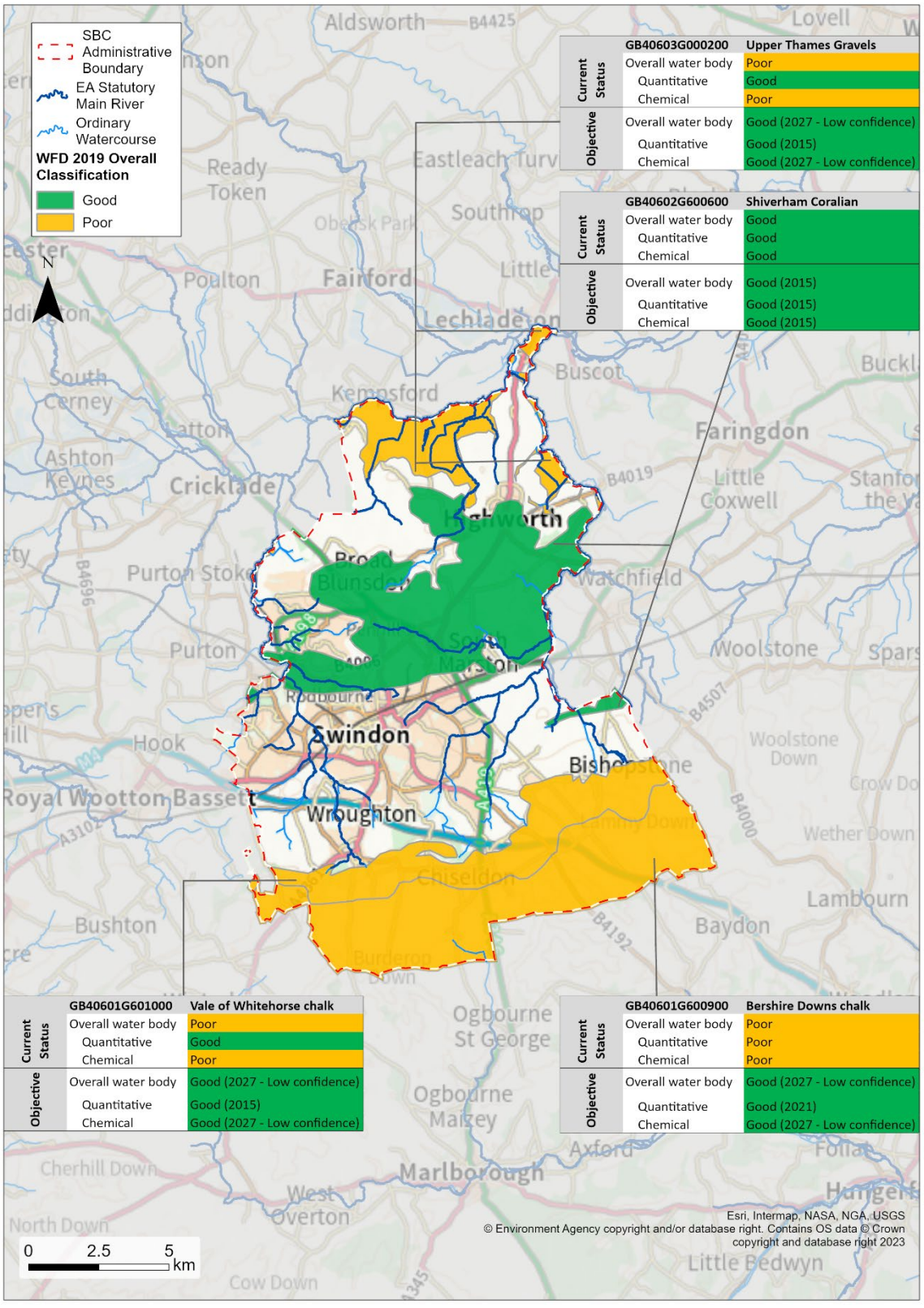
6.3.9 In Swindon, for year 2019 (current year available), 3 out of 4 groundwater bodies are classified as having 'Poor' Overall Ecological status. These include:

- **Upper Thames Gravels**, due to its poor Chemical element. The reasons for not achieving good status include diffuse source (poor nutrient management) and point source (private sewage treatment).
- **Vale of Whitehorse Chalk**, due to its poor Chemical element. The reasons for not achieving good status include diffuse source (poor nutrient management) and point source (landfill leaching).
- **Berkshire Downs Chalk**, due to its poor Chemical and Quantitative elements. The reasons for not achieving good status include diffuse source (poor nutrient management), point source (private sewage treatment) and flow (groundwater abstraction).

Table 6.4: Ecological and Physico-chemical Status and Objective for Groundwater Bodies[7]

Groundwater body	ID	Current status				Objective			
		Year	Overall water body	Quantitative	Chemical	Overall water body	Quantitative	Chemical	Reasons
Upper Thames Gravels	GB40603G000200	2019	Poor	Good	Poor	Good (2027 -Low confidence)	Good (2015)	Good (2027 - Low confidence)	Disproportionately expensive: Disproportionate burdens
Shrivenham Coralian,	GB40602G600600	2019	Good	Good	Good	Good (2015)	Good (2015)	Good (2015)	N/A
Vale of Whitehorse chalk	GB40601G601000	2019	Poor	Good	Poor	Good (2027 -Low confidence)	Good (2015)	Good (2027 - Low confidence)	Disproportionately expensive: Disproportionate burdens
Berkshire Downs chalk	GB40601G600900	2019	Poor	Poor	Poor	Good (2027 -Low confidence)	Good (2021)	Good (2027 - Low confidence)	Disproportionately expensive: Disproportionate burdens; Disproportionately expensive: Unfavourable balance of costs and benefit

Figure 6.7: Ecological and Physico-Chemical Status and Objective for Groundwater Bodies[7]



6.4 Water Quality Management Objectives and Measures

6.4.1 Objectives and measures for managing water quality in Swindon are set out in the Thames RBMP (2022). Updates to these are available via the EA's Catchment Data Explorer[64]. The environmental objectives of the WFD are:

- To prevent deterioration of the status of surface waters and groundwater.
- To achieve the objectives and standards for protected areas.
- To aim to achieve good status for all water bodies, or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status.
- To reverse any significant and sustained upward trends in pollutant concentrations in groundwater.
- To cease discharges, emissions and losses of priority hazardous substances into surface waters.
- To progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.

6.4.2 Environmental objectives were set for each water body in the 2022 Thames RBMP. These objectives are legally binding and all public bodies must have regard to these objectives when making decisions that could affect the quality of the water environment. In certain specific circumstances, exemptions from some of the objectives may be applied.

6.4.3 The objectives (i.e. the planned status of each waterbody that must be achieved or maintained) for the water bodies in the Swindon area were updated following the Cycle 3 2022 classifications and are listed in **Table 6.2** and **Table 6.4**

Surface Water Bodies Objectives

6.4.4 For surface water bodies, the objectives consist of two pieces of information: the status and the date by which that status is planned to be achieved.

6.4.5 The status part of an objective is based on a prediction of the future status that would be achieved if technically feasible measures are implemented and, when implemented, would produce more benefits than they cost. The objective also takes into account the requirement to prevent deterioration and achieving protected area objectives.

6.4.6 The date part of an objective is the year by which the future status is predicted to be achieved. The date is determined by considering whether the measures needed to achieve the planned status are currently affordable, and once implemented, the time taken for the ecology or the groundwater to recover.

6.4.7 The water body objectives are:

- **'x' status by 2015:** 2015 status matches the predicted future status or potential. Here the predicted future status has already been achieved and no further improvement in status is expected. The main environmental objective is to prevent deterioration in status between 2015 and 2021.

[64] https://environment.data.gov.uk/catchment-planning

- **'x' status by 2021:** there is confidence that as a result of the programme of measures, the water body will improve from its 2015 status or potential to achieve the predicted future status by 2021. The 'by 2015' date has been used to clearly distinguish water bodies and elements where the reported 2015 status matches the predicted future status (and so no further improvement is expected), from water bodies and elements where an improvement from the reported 2015 status is required to achieve the predicted future status by 2021.

- **'x' status by 2027:** the deadline for achieving the status or potential has been extended to 2027. Where the time extension is due to ecological or groundwater recovery time, there is confidence that the measures needed to achieve the improvement in status are already in place or will be in place by 2021. Where the time extension is due to practical constraints delaying implementation of the measures, there is confidence the process of implementing the measures will begin before 2021. For the remaining objectives with a 2027 date, there is currently not enough confidence that the improvement in status can be achieved by an earlier date.

- **'x' status by 2040 / 2050 / 2060:** the deadlines for achieving the planned status or potential have only been extended beyond 2027 where either ecological recovery time or groundwater recovery time will delay the achieving of the planned status. In these cases there is confidence that the measures needed to achieve the improvement in status are already in place or will be in place by 2021.

6.4.8 Where the status is less than good, this means that a less stringent objective has been set.

6.4.9 As shown in **Table 6.2**, 8 out of 16 surface water bodies should meet their 'Good' standard either by 2027 or by 2039. The reasons behind the 'Good' status objective being delayed to 2027, are disproportionate costs and burdens. When the overall Ecological objective has been set to 'Good' by 2039, then (in addition to the disproportionate cost and burdens), then either ecological recovery time or groundwater recovery time is the reason behind the delay the achievement of the planned status.

6.4.10 The rest half of the surface water bodies are expected to either move from 'Poor' to 'Moderate' status or remain in a 'Moderate' status due to disproportionate costs and burdens and the lack of technical solutions being available.

6.4.11 For the 5 no. water bodies, whose current status is shown as 'Poor', their objectives are:

- **Coln (from Coln Rogers) and Thames (Coln to Leach)**: Its overall Ecological objective has been set to 'Good' by 2027. The reasons behind the 'Good' status objective being delayed to 2027, are classified as 'Disproportionately expensive: Disproportionate burdens'.

- **Liden Brook, Swindon**: Its overall Ecological objective has been set to 'Moderate' by 2015. The main environmental objective is to prevent deterioration in status between 2015 and 2021.

- **Lenta Brook, East of Swindon:** Its overall Ecological objective has been set to 'Good' by 2027. The reasons behind the 'Good' status objective being delayed to 2027, are classified as 'Disproportionately expensive: Disproportionate burdens'.

- **Cole (source to Lenta Brook)**: Its overall Ecological objective has been set to 'Good' by 2039. The deadlines for achieving the planned status or potential have only been extended beyond 2027 where either ecological recovery time or groundwater recovery time will delay the achieving of the planned status.

- **Cole (Acorn Bridge to Bower Bridge)**: Its overall Ecological objective has been set to 'Moderate' by 2015. The main environmental objective is to prevent deterioration in status between 2015 and 2021.

Groundwater Bodies Objectives

6.4.12 As shown in **Table 6.4**, 3 out of 4 groundwater bodies should meet their 'Good' standard by 2027. The reasons behind the 'Good' status objective being delayed to 2027 are disproportionate costs and burdens.

6.4.13 For the groundwater bodies, whose 2019 Overall waterbody status is classified as 'Poor', their objectives are:

- **Upper Thames Gravels**: Its Overall Ecological objective has been set to 'Good' by 2027. The reasons behind the 'Good' status objective being delayed to 2027, are classified as '*Disproportionately expensive: Disproportionate burdens'*.
- **Vale of Whitehorse Chalk**: Its Overall Ecological objective has been set to 'Good' by 2027. The reasons behind the 'Good' status objective being delayed to 2027, are classified as '*Disproportionately expensive: Disproportionate burdens'*.
- **Berkshire Downs Chalk**: Its Overall Ecological objective has been set to 'Good' by 2027. The reasons behind the 'Good' status objective being delayed to 2027, are classified as *'Disproportionately expensive: Disproportionate burdens; Disproportionately expensive: Unfavourable balance of costs and benefit'.*

Measures to Implement Objectives

6.4.14 Measures to implement objectives include:

- **Water company investment programmes:** WINEP[37] is a programme of investigations and actions for environmental improvement schemes that allow water companies to meet European Directives, national targets and statutory obligations. The most recent WINEP programme data for Swindon is listed in **Table 6.5** and includes a number of new limits to phosphorus in treated effluent.
- **National Highways environment fund[65].** This fund invests in environmental improvements including reducing pollution from major highways run-off, for example by retrofitting Sustainable Drainage Systems (SuDS). No information is currently available on recent or future schemes in Swindon.
- **Flood risk management investment programme.** The EA's Flood and Coastal Erosion Risk Management (FCERM) scheme invests in capital works to reduce the risk of flooding and erosion. Some of these schemes may also contribute towards improving the status of water bodies. There are no known recent or future schemes in Swindon.

[65] https://nationalhighways.co.uk/media/lh2ll0ao/designated-funds-plan-2020-2025.pdf

Table 6.5: WINEP statutory obligations and regulatory actions for TWUL relating to actions and investigations for water quality

Action Type	Location	Waterbody	Description
Investigation	Swindon STW	Ray (Wiltshire) source to Lydiard Brook	Flow to Full Treatment (FFT) Monitoring
Long Term monitoring			Event Duration Monitoring (EDM)
Investigation	Blunsdon STW	Share Ditch	FFT Monitoring
Action to improve			Permit limit change for Iron
Long Term monitoring			EDM
No available data	Castle Eaton STW	-	No available data
No available data	Hannington (Wilts) STW	-	No available data
Long Term monitoring	Wanborough STW	Liden Brook, Swindon	FFT Monitoring
Long Term monitoring			EDM
Investigation	Highworth STW	Westrop Brook	FFT Monitoring
Long Term monitoring			EDM
No available data	Sevenhampton STW	-	No available data

6.5 Impacts of Development on Water Quality

6.5.1 The information reviewed above indicates that the vast majority of surface water and groundwater bodies in Swindon are currently failing to meet 'Good' water quality standards; their overall quality is either classified as 'Moderate' or 'Poor'. ***To meet legislative requirements, it will be necessary for the new Local Plan to demonstrate that it will not contribute to any deterioration in WFD status, and where possible, that it will support measures to implement objectives for each waterbody.***

6.5.2 Development can detrimentally impact water quality by:

- **Increasing the volume in wastewater requiring treatment and discharge to surface waters**. This can increase the levels of phosphorus, ammonia and organic matter in receiving watercourses.
- **Increasing pollutants in surface water runoff from development surfaces**, including roads and pavements. Rainwater draining from development roads and pavements can carry many pollutants, including metals, vehicle emissions, slat, grid, oil, microplastics and household chemicals.
- **Decreasing typical flows in watercourses due to increased abstraction for water supply**, leading to increased concentration of pollutants.

6.5.3 These impacts and possible mitigation options are considered further below in this Section. Well-designed developments can provide opportunities for betterment, by removing land from intensive agricultural usage and providing green-blue infrastructure to control urban sources of pollution.

Increases in volume of wastewater due to additional growth and development

6.5.4 Wastewater can contain nutrients, such as phosphorus and nitrates, harmful chemicals, including ammonia and metals, and other harmful substances, including viruses and bacteria. Increased volumes of wastewater, without mitigation, can lead to increases in both concentration and total loading of pollutants entering watercourses from treated effluent, and an increased frequency and /or duration of sewer storm overflows.

6.5.5 The concentration and total load of pollutants in treated effluent is managed through permits. For the purposes of this, where there is existing headroom between current discharges and the permitted level, development could lead to a detrimental impact on water quality as there would be no requirement to mitigate the increase in pollutants if it remained below the permitted level. The EA is responsible for setting and reviewing permitted levels. A load standstill approach can be applied to approximate permit revisions which prevent increases in pollutants due to increased wastewater (see **Section 5.3**).

6.5.6 When wastewater volumes increase there is less capacity to carry stormwater in combined sewers which may result in increased frequency and volume of storm overflows spills. The effect can be heightened if paved areas increase (e.g. paving of gardens) and/or climate change increases the frequency of heavy rainfall. The combined effect of these influences is hard to predict without use of sewer network hydraulic models. As described in **Section 5.4**, TWUL in its DWMP, published in 2023, aims to mitigate these effects and further reduce the occurrence of storm overflows, by improving the sewer network.

Increases in Surface Water Runoff Pollutants

6.5.7 Development can lead to a decrease in the quality of surface water run-off, due to the introduction of pollutants from roads, pavements and other surfaces, and due to mis-use of the

surface water drainage network (e.g. misconnections and illegal disposal of chemicals). Microplastics are a pollutant of increasing concern which travel to the oceans via surface runoff and rivers.

6.5.8 In new developments, SuDS should be used to provide treatment to water quality, as well as reducing flood risk downstream. Where SuDS include blue-green infrastructure (ponds, swales green roofs, buffer strips etc.) they also deliver valuable wider benefits in terms of improved biodiversity and protection from summer temperature extremes.

6.5.9 In existing developments, reducing pollution can be complex, with the cost of measures often high and ownership of the problem unclear. Regeneration schemes should be used to incorporate blue infrastructure and SuDS that rectify any misconnections, reduce burdens on combined sewer systems, and provide water quality improvements for surface water drainage. Local Plan Policies and the LLFA should support these schemes.

Increased Concentration in Low Flows

6.5.10 Increased abstraction of water for water supply for new developments could lead to lower typical flows in rivers, which would decrease the dilution of treated effluent and other pollutant sources. As discussed in **Chapter 4**, it will be necessary for increased water demands to be managed by other means, such as demand management and leakage reduction. Longer term solutions include new SESRO and transfers that may allow significant decreases in abstraction rates that support improved environmental objectives.

6.5.11 Dilution effects due to increased abstraction could be compounded by the impacts of climate change, which may include[66]:

- A reduction in low flows, leading to higher nutrient concentrations due to reduced dilution effects.
- Longer water residence times, increasing the potential for eutrophication.
- Increased water temperatures and stratification.

6.5.12 For the purposes of this WCS, the principle of load standstill (see **Section 5.3**) can be applied to wastewater treatment works permits, taking into account the impacts of climate change, to prevent detrimental impacts on pollutant loading in watercourses due to increases in treated effluent discharges.

6.6 Water Quality Summary

Headline Findings of Baseline Conditions	• There are 16 surface water bodies in Swindon assessed through WFD, with the most recent WFD status classifications available from 2022. **Water quality in surface water bodies is predominantly 'Moderate' (11 surface waterbodies), with 5 waterbodies classified as 'Poor'.** There has been only one deterioration since the previous Cycle assessment in 2019, where the Overall Ecological status of the River Cole (Acorn Bridge to Bower Bridge), has been deteriorated from 'Moderate' (in 2019) to 'Poor' (in 2022).

66 https://www.researchgate.net/publication/272503126_The_implications_of_climate_change_for_the_water_environment_in_England

Headline Findings of Baseline Conditions	• The **5 surface water bodies considered as having 'Poor' Overall Ecological status** are: ○ **Coln (from Coln Rogers) and Thames (Coln to Leach)**, due to poor biological quality elements (fish). Reasons for not achieving good status include physical modification (land drainage, barriers-ecological discontinuity and arable land use). ○ **Liden Brook, Swindon**, due to poor biological quality elements (Macrophytes and Phytobethos combined). Reasons for not achieving good status include diffuse source (poor nutrient management), point source (sewage discharge) and physical modification (land drainage). ○ **Lenta Brook, East of Swindon** (2019 classification), due to poor biological quality elements (Macrophytes and Phytobethos combined). Reasons for not achieving good status include diffuse source (poor soil management) and physical modification. ○ **Cole (source to Lenta Brook)**, due to poor biological quality elements (Macrophytes and Phytobethos combined) and poor Phosphate status. Reasons for not achieving good status include diffuse source (poor livestock management and transport drainage) and physical modification (urbanisation – urban development). ○ **Cole (Acorn Bridge to Bower Bridge)**, due to poor biological quality elements (Macrophytes and Phytobethos combined) and poor Phosphate status. Reasons for not achieving good status include diffuse source (poor livestock management and transport drainage) and point source (sewage discharge). • There are 4 groundwater bodies intersecting in the Borough, with the most recent WFD status classifications available from 2019. **The overall status in 3 of these waterbodies is classified as 'Poor' and 1 is classified as 'Good'. The 3 groundwater bodies classified as 'Poor'** are: ○ **Upper Thames Gravels,** due to its poor Chemical element. The reasons for not achieving good status include diffuse source (poor nutrient management) and point source (private sewage treatment). ○ **Vale of Whitehorse Chalk,** due to its poor Chemical element. The reasons for not achieving good status include diffuse source (poor nutrient management) and point source (landfill leaching). ○ **Berkshire Downs Chalk,** due to its poor Chemical and Quantitative elements. The reasons for not achieving good status include diffuse source (poor nutrient management), point source (private sewage treatment) and flow (groundwater abstraction).

	• The majority of the Borough is not located within an SPZ; there are only a few parts of the Borough at the south, located within SPZs 2 and 3.
Further recommendations	• **The upgrades in the Swindon, Blunsdon, Wanborough and Highworth STWs, which are identified in the TWUL DWMP, could allow improvements to the quality of all the water bodies that are currently not meeting the 'Good' standards**, due to point source pollution from sewage treatment. • **Well-designed green / blue infrastructure would contribute to improved water quality** and habitat both within sites and downstream, as well as providing wider benefits for people, wildlife, landscape, and mitigating the potential impacts of climate change. • Although point source pollution managed through permits should not increase, **there is a risk of increase of diffuse and point source pollution from other sources increasing due to development, for example highways runoff**. Positive countermeasures will be necessary to offset impacts. • The improvements to storm overflows, which have been identified in the TWUL DWMP, may be necessary to offset growth driven more frequent operation. The **timing of upgrades will be important to avoid any deterioration in water quality as a result of development**.

7 Flood Risk

7.1.1 The baseline conditions and further recommendations, which have been explored in more detail in the separate Level 1 SFRA, are summarised below.

Headline Findings of Baseline Conditions	• Areas of the Borough are potentially at risk of fluvial flooding as well as other sources of flooding, such as surface water, sewers and ground water. The Borough is not at risk from tidal sources of flooding. The three main sources of fluvial flood risk throughout the Borough include: the River Thames, the River Ray and the River Cole. There are some locations where flood risk could represent a significant constraint to further development. These are identified in the Level 1 SFRA, and the Sequential and Exception Tests should be applied to direct development to areas of lowest flood risk where appropriate.
	• Swindon has been impacted by fluvial flood events throughout history due to the close proximity of the River Ray, River Cole and River Thames.
	• Known surface water risk areas and fluvial flood zones are constraints to development, depending on specific site location. Known flood extents will be mapped in the SFRA.
	• The southern areas of Swindon are situated within the South Downs Chalk aquifer, which is typically susceptible to flooding and may pose a constraint on development in some areas.
	• There are 3 main reservoirs located within Swindon Borough; Coate Water Reservoir, Peatmoor Lagoon and Stanton Park Reservoir, as such some areas in Swindon are at risk of flooding in a reservoir breach but the likelihood of such an event is very low.
	• A number of ordinary watercourses within the Borough have been culverted over for significant lengths. These culverts run the risk of becoming blocked, increasing the risk of flooding from water exceeding its banks.
	• The impacts of climate change on groundwater flood risk are uncertain. The potential for higher peaks in groundwater level increase under many of the climate change scenarios, however results are not uniform and instead show a wide range of outcomes. As a result, it is not possible to provide absolute climate change allowances for groundwater risk at present.
	• The varying impervious nature of the Borough means that the catchment will have varying runoff responses and as a result fluvial systems will respond at varying rates to heavy rainfall events.
	• The EA have identified issues with two areas of modelling within the Borough:
	  ○ Haydon Brook 2014 model: In relation to the new National Flood Risk Assessment (NaFRA2) project. The EA plan to publish these improvements to their mapping products in August 2024.
	  ○ River Cole and Dorcan Brook (stream) Covingham and Nythe model: The EA confirm the best available model for this area is the River Cole 2007 model, but further modelling of these rivers has been undertaken to accompany strategic new developments in the area. However, the new modelling has not yet been signed off to be shared externally.

Further recommendations	• Development throughout Swindon has provided an opportunity to restore and construct stretches of the previously abandoned Wichelstowe Canal. • There is potential for 'soft engineered' SuDS schemes to deliver multi-functional benefits to enhance biodiversity, control (or reduce) the surface water run-off rate, prevent surface water pollution and provide amenity benefits. • For developments in the vicinity of a main watercourse, the EA seeks to include a 'buffer zone' between the top of the river bank and the development. This creates an opportunity to benefit the river corridor by preventing encroachment onto the river as well as providing benefits to the biodiversity and the LLFA are encouraged to provide likewise for ordinary watercourses. • The EA also promotes policy planners and developers to open up and naturalise culverted sections of the watercourse where feasible. Therefore, development within the Borough could see rivers being restored to a more natural river environment.

8 Integrated Water Management

8.1 Overview

8.1.1 The purpose of this Chapter is to:

- Review how water can be managed in an integrated way.
- Consider future opportunities for integrated water management.

8.2 Managing Water in an Integrated Way

8.2.1 Integrated water management refers to a holistic approach to water management, including the wider effects of water-related impacts on the natural environment, including biodiversity, landscape, soils and agriculture, access to green infrastructure and associated health and well-being and mitigating the potential impacts of climate change including working towards carbon neutrality.

8.2.2 Integrated water management fully aligns with the SBC priorities on social value, which aim to:

- **Deliver sustainable growth:** through high quality affordable homes, alongside infrastructure to support the Borough.
- **Make Swindon greener and more sustainable:** SBC will help residents reduce their environmental impact and as a Council, SBC will aim to achieve net zero emissions by 2030.

8.2.3 CIRIA produced guidance in 2019[67] to support planning for water though the delivery of integrated water management. The report identifies the following as critical success factors for achieving good integrated water management outcomes:

- A robust and accessible evidence basis, showing which approaches are appropriate, and identifying possibilities at an early stage.
- Local policy which is clear and understandable, with supporting strategies form the LLFA and water companies.
- Early engagement with the water companies, developers and the LLFA, the local community, the catchment partnership and other stakeholders.
- Working in partnership with stakeholders.
- Good whole life project management, including a strong champion, long-term maintenance arrangements, co-ordination of budgets and funding, and enforcement of planning conditions.

8.2.4 Integrated water management is sometimes perceived by planners, developers and engineers to be expensive and difficult to do. The case studies included in the guidance show that, at the development site scale, there is a clear advantage in terms of cost effectiveness and better outcomes over traditional approaches.

8.2.5 The Swindon Local Plan 2026 identifies that in order for the '**Policy IN2: Water Supply and Wastewater'** (refer to **Section 2.6** of this study) to be viable, future wastewater treatment and

[67] https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductcode=C787F&Category=FREEPUBS

water supply, related to the provision of new development should, apart from adhering to the application of the outlined policy, also apply an integrated approach to its delivery, i.e:

- Align the proposals with other related strategies and plans identified in the evidence base documents;
- Work closely with the EA and TWUL to continue to assess, understand and monitor requirements.
- Apply Developer contributions and/or the Community Infrastructure Levy
- Adhere to the development management process and
- Implement the Infrastructure Delivery Plan.

8.2.6 Note the above policy will be updated as part of the new Local Plan; however, much of the same principles will apply in terms of delivery mechanisms.

8.3 Integrated Water Management Examples

DEFRA's Environmental Land Management

8.3.1 In June 2023, DEFRA published its update of the Environmental Land Management (ELM) scheme[68]. Under this agricultural funding scheme, farmers will be paid for work that enhances the environment, such as river management to mitigate flooding, or creating and restoring habitats for wildlife. DEFRA has increased its Catchment Sensitive Farming offer, which supports farmers to protect water, air and soil through tailored advice, support and grants, to cover the whole country. This offer gives farmers advice about regulatory compliance and grants and payments to help improve water quality. DEFRA has also increased funding for the EA to strengthen its capacity to enforce water quality regulations. The EA is trialling new approaches to tackle breaches and pollution in a more targeted and effective way.

8.3.2 It is currently unknown whether there are farmland areas in the Borough that are benefiting from the scheme.

Swindon Forest Meadows Project

8.3.3 Wiltshire Wildlife Trust are liaising with SBC to deliver the Swindon Forest Meadows Project. The Swindon Forest Meadows project aims to create, restore, enhance and better manage habitats throughout Swindon Borough, and will enhance the management and wildlife of existing habitats, including the reintroduction of wildflowers and more traditional management of the meadows. This will benefit a range of species, including pollinators such as bees.

8.3.4 The project will link in with existing health and wellbeing groups in Swindon to encourage their members to get involved in a wide range of activities, from the sowing and planting of wildflowers through to the biological monitoring of sites for wildlife such as butterflies and moths.

[68] https://www.gov.uk/government/publications/environmental-land-management-update-how-government-will-pay-for-land-based-environment-and-climate-goods-and-services/environmental-land-management-elm-update-how-government-will-pay-for-land-based-environment-and-climate-goods-and-services

Figure 8.1: Swindon Forest Meadows Project (Source: SBC)

8.3.5 The project covers many sites within the Borough. Many are found along the corridor of the River Ray, but the project will also link to other areas including Seven Fields, Wroughton, Highworth, Rodbourne Cheney, and the five Wiltshire Wildlife Trust reserves.

8.4 Future Opportunities

8.4.1 There are many opportunities for an integrated approach to water management to be adopted at the landscape and site scale. This section reviews a number of possible initiatives and their potential application in the new Local Plan (this list is not exhaustive):

- Water re-use (rainwater harvesting and wastewater recycling
- Surface water storage
- Separation of combined sewer systems
- Retrofitting SuDS

Water Re-use

8.4.2 The TWUL WRMP24 showed that there are significant water supply constraints within the SWOX WRZ. Reducing the demand for new potable water by re-using collected rainwater or treated wastewater for non-potable applications should therefore be a high priority for the new Local Plan.

8.4.3 Rainwater harvesting and greywater recycling have been further discussed in **Section 4.8**.

8.4.4 There are currently no known plans for large scale direct re-use of wastewater for potable applications in Swindon. Although technologies such as reverse osmosis can allow wastewater to be treated to potable standards in a closed loop system, the public acceptability of these schemes is low. If developers or water companies were to pursue this option, public perceptions would need to be changed through education and awareness campaigns to promote the benefits of re-use and the drinking water quality standards.

Surface Water Storage

8.4.5 Reservoirs can provide many integrated water management benefits including water supply (potable, non-potable), flood mitigation, irrigation, recreation, hydropower and ecology. TWUL has identified that water is needed from SESRO in SWOX WRZ in the medium term plan (2030-2045).

Separation of Combined Sewer Systems

8.4.6 Although all newer developments have separate foul and surface water drainage systems, some older towns have combined systems. These place an additional burden on the wastewater treatment process, and have an increased risk of flooding and pollution. In particular, combined sewer overflows discharge untreated wastewater directly into waterbodies during periods of heavy rainfall, to prevent sewage backing up and flooding streets or homes. These can cause significant pollution problems.

8.4.7 The TWUL Catchment Plan for Wastewater Services for Swindon (2018)[69] identified that the Borough's sewerage network consists of:

- Foul sewers – taking water from showers, toilets, sinks and appliances;
- Combined sewers – taking the same domestic flows as foul sewers, and also collecting rainwater that falls on properties, roads and other paved areas and
- Surface water sewers – collecting rainwater that falls on properties, roads and other paved areas and draining it into local rivers.

8.4.8 Separation of combined sewer systems and removal of sewer overflows can have beneficial impacts on water quality and flood risk, and reduce the treatment demand on water recycling centres. However, in many locations, the costs of the infrastructure works in heavily urbanised areas are disproportionately expensive and not economically justifiable.

8.4.9 ***It is therefore recommended that the new Local Plan supports measures to reduce the quantity of storm water entering combined sewers through working with TWUL to mandate the use of SuDS and separate sewerage in new development areas and support retrofit SuDS elsewhere***.

Retrofitting SuDS

8.4.10 Diffuse urban pollution is one of the major obstacles to achieving compliance with the WFD. Although most recent developments have used SuDS to manage and treat urban runoff, older developments discharge runoff directly to surface water sewers or overland into watercourses. The urban runoff increases flood risk and can introduce pollutants from highways, domestic waste water misconnections, illegal disposal of waste, industrial and commercial site contaminants, and leaching of contaminated land. For example, grey water contamination is a recurring problem where domestic appliances have been misconnected to the surface water system, such as washing machines in garages discharging to a gully grate. Often, households are not aware of the problem, although they are legally responsible.

8.4.11 Increasing green spaces and retrofitting SuDS features in urban areas can reduce run-off rates and volumes, and improve water quality. In new developments, the collective benefits of SuDS schemes provide a more cost-effective solution offering numerous benefits compared with traditional schemes. Brownfield developments offer the opportunity to introduce SuDS into

[69] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-reports/2018-catchment-plans/swindon-catchment-plan.pdf

existing urban environments. Further guidance on SuDS for new developments is provided in the accompanying SBC Level 1 SFRA.

8.4.12 Retrofitting SuDS to existing developments is not straightforward due to the space required and costs of rebuilding the drainage infrastructure. However, there are many opportunities to use small-scale SuDS measures in existing developments landscaping. For example, in London, rain gardens have been retrofitted in schools (**Box 8.1**), and alongside roads (**Box 8.2**).

8.4.13 ***It is therefore recommended that the new Local Plan require the use of SuDS in all brownfield developments. Opportunities could also be investigated by SBC and the LLFA, for retrofitting SuDS measures in council-owned sites within existing urban areas. The use of small-scale SuDS measures should be incorporated into council property refurbishment and highways projects wherever possible. SBC should support the water industry in public education campaigns to reduce domestic waste water misconnections and illegal disposal of waste in the surface water network.***

Box 8.1: SuDS for Schools[70]

The charity WWT worked with ten schools in North London at risk of surface water flooding, to retrofit SuDS. These aimed to reduce peak flows and pollution to the nearby Pymmes Brook. The SuDS measures provided new opportunities for outdoor play and learning. Work was funded by TWUL, the EA and the schools, with materials and labour also donated by the local community and businesses. The Mayor of London has produced a 'Reimagining rainwater in schools' report to help other schools include SuDS in their environments.

Royal Primary School, Worcester – three rain slides deliver roof water into a raised pool which overflows into a set channel and rill before flowing to a wildlife pond in green space, all accessible by children. Photo: Bob Bray (Source: WWT)

[70] https://www.london.gov.uk/sites/default/files/reimagining_rainwater_in_schools_v1_.pdf

Box 8.2: The Alma Road SuDS Project[71]

This project in Ponders End, Enfield, was undertaken to reduce the risk of surface water flooding and improve water quality in the downstream watercourses Salmon's Brook and the River Lea. The project led to the creation of rain gardens along Alma Road, linking into an urban regeneration scheme. The gardens cost £50,000 to install and have been adopted and are maintained by the council's Highways Services team. The gardens act as speed-reduction measures after speed bumps were removed. Community engagement was undertaken with local schools, and the project also led to wider take-up of SuDS by the council's transport team in other traffic calming schemes, footway renewals and cycle routes.

Photos credit: Jamie Kukadia, London Borough of Enfield and Katherine Drayson

8.5 Integrated Water Management Summary

Headline Findings of Baseline Conditions	• The **study is supportive of an integrated approach to water management**, which refers to a holistic view to water management, including the wider effects of water-related impacts on the natural environment, including biodiversity, landscape, soils and agriculture, access to green infrastructure and associated health and well-being and mitigating the potential impacts of climate change including working towards carbon neutrality. • **Integrated water management fully aligns with the SBC priorities on social value**, which aim to deliver sustainable growth through high quality affordable homes, alongside infrastructure to support the Borough, as well as make Swindon greener and more sustainable. SBC will help residents reduce their environmental impact and aim to achieve net zero emissions by 2030.

[71] https://www.london.gov.uk/programmes-strategies/environment-and-climate-change/climate-change/climate-adaptation/surface-water-flooding/alma-road-suds-project

Headline Findings of Baseline Conditions	• There are **many opportunities for an integrated approach to water management to be adopted at the new settlement or urban extensions scale**, for example: o Rainwater harvesting, greywater recycling and re-use of treated WRC effluent. o Reservoir storage o Separation of Combined Sewer Systems o Retrofitting SuDS features, such as bioretention systems, integrated across development sites and catchments to treat surface water runoff and manage flows at all scales, providing multiple benefits to 'green' streetscapes. The SuDS features could also be integrated with water re-use systems to provide non-potable water supply.
Further recommendations	• There are cost implications for development sites and may be feasibility limitations for some schemes in smaller sites / infill locations. Although there are economies of scale available for larger sites, the principles of integrated water management can be applied at smaller sites. **Different solutions may be required for different scales of site**, and opportunities will need to be considered at an early stage in site planning. • To be fully implemented and integrated, **projects will need to be supported inside, as well as outside of the realm of the new Local Plan** and require a wider re-think of water management at the regional scale. • The **effectiveness of some of these measures in addressing adverse environmental impacts will need to be demonstrated and monitored**, if to be relied upon as confirmed mitigation measures rather than additional benefits. The measures and associated monitoring will need to be agreed and delivery secured before development proceeds.

9 Requirements for Further Assessment

9.1.1 As part of the Wastewater Collection and Treatment assessment, it was noted that there are several limitations in the calculation of the future post-growth capacity. This could be addressed in a subsequent version of this WCS, or through a Detailed WCS.

- **The shapefiles and/or the exact location of almost 12% of the proposed residential sites has not been provided in full at the time of writing this report. Therefore, it is unknown how many dwellings should be allocated to each STW catchment.**

  As a result, assumptions have been made on the number of dwellings that each STW catchment would take flows from. It has been then assumed that the dwellings in question will be allocated proportionally to each STW catchment, according to the respective STW DWF permits.

  It should be noted that almost 88% of the total residential growth has been made available in a format that could be mapped and, hence, the allocation of residential growth to STW catchments would be fairly representative.

- **The number of jobs has not been confirmed to date and the shapefiles showing the job locations have not been provided.**

  Similar to the residential sites, for which shapefiles have not been provided, assumptions have been made on the number of jobs that each STW catchment would take flows from. Therefore, it has been assumed that the assumed 9,600 jobs will be allocated proportionally to each STW catchment, according to the respective DWF permits.

  It should be also confirmed whether the proposed development would include trade (e.g. restaurants, cafes etc), as well as the location of these trade sites, as this would increase the wastewater discharge rate and subsequently the post-growth DWF and capacity.

- **The DWF permits and the effluent data for all the assessed STWs have been provided by TWUL in May 2024 and October 2023 and might be out of date.**

  As a result, the results regarding the STWs current and post-growth capacity might not represent an accurate position. It has been agreed with SBC that the updated datasets (if any) will be requested by TWUL prior to the Detailed WCS.

- **The exact location of the 405 dwellings that have been assumed that will be allocated into the Swindon STW catchment, has not been provided at the time of writing this report.**

  The exact location of these 405 should be provided as part of the Detailed WCS.

- **The Plot Ratio in the Office Use Class has been currently assumed to be 40%.**

  However, the emerging Employment Land Review (2024) has indicated that the ratio might increase to 60%, meaning that the floorspace occupied by the building would be higher. In that case, the employment numbers and, subsequently, the generated wastewater flows would be also higher. The Plot Ratios would be updated as part of the Detailed WCS work.

- **For Swindon and Blunsdon STWs, water quality modelling is recommended** to be undertaken as part of the Detailed WCSy, in order to assess the future permit quality limits for that may be required.

- **It is also suggested that an assessment of the actual wastewater generated across the Local Plan period** should be undertaken in order to identify the year that the STW capacity for Swindon STW and Blunsdon STW would be exceeded, so that development could be planned accordingly.