Wokingham Borough Council Water Cycle Study Phase 2

Final report

August 2024

Prepared for:
Wokingham Borough Council

WOKINGHAM BOROUGH COUNCIL

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This report describes work commissioned by Wokingham Borough Council by an instruction dated 10 March 2022. The Client's representative for the contract was Ian Church of Wokingham Borough Council. Jessica Creber and Richard Pardoe of JBA Consulting carried out this work.

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Abbreviations

ALS ..... Abstraction Licensing Strategy

AMP ..... Asset Management Plan

AP ..... Assessment Point

BOD ..... Biochemical Oxygen Demand

BRE ..... Building Research Establishment

BREEAM ..... Building Research Establishment Environmental Assessment Methodology

CAMS ..... Catchment Abstraction Management Strategies

CAPEX ..... Capital Expenditure

CED ..... Common End Date

CFMP ..... Catchment Flood Management Plan

CfSH ..... Code for Sustainable Homes

CSO ..... Combined Sewer Overflow

DCLG ..... Department for Communities and Local Government (replaced by Department for Levelling Up, Housing and Communities (DLUHC))

DWF ..... Dry Weather Flow

DWI ..... Drinking Water Inspectorate

DWMP ..... Drainage and Wastewater Management Plan

EA ..... Environment Agency

EP ..... Environmental Permit

EU ..... European Union

FEH ..... Flood Estimation Handbook

FFT ..... Flow to Full treatment

FWMA ..... Flood and Water Management Act

FZ ..... Flood Zone

GIS ..... Geographic Information Systems

GwR ..... Greywater Recycling

HoF ..... Hands-Off Flow

JBA ..... Jeremy Benn Associates

LLFA ..... Lead Local Flood Authority

LPA ..... Local Planning Authority

l/p/d ..... Litres per person per day

Ml/d ..... Mega litres per day (Million litres per day)

NH4 ..... Ammonia
NMP ..... Nutrient Management Plan
NPPF..... National Planning Policy Framework
OfWAT ..... Water Service Regulation Authority
OPEX ..... Operational Expenditure
OS..... Ordnance Survey
P..... Phosphorus
RAG ..... Red / Amber / Green
RBD..... River Basin District
RBMP..... River Basin Management Plan
ReFH..... Revitalised Flood Hydrograph
RoFSW..... Risk of Flooding from Surface Water
RwH ..... Rainwater Harvesting
SA ..... Sustainability Appraisals
SAC..... Special Area of Conservation
SBP ..... Strategic Business Plan
SfA ..... Sewers for Adoption
SFRA..... Strategic Flood Risk Assessment
SPA..... Special Protection Area
SPZ ..... Source Protection Area
SS ..... Suspended Solids
SSSI..... Site of Special Scientific Interest
SEW..... South East Water
SU ..... Sewerage Undertaker
SuDS..... Sustainable Drainage Systems
SWMP..... Surface Water Management Plan
TW..... Thames Water
UWWTD..... Urban Wastewater Treatment Directive
WBC..... Wokingham Borough Council
WaSC..... Water and Sewerage Company
WCS..... Water Cycle Study
WFD..... Water Framework Directive
WINEP ..... Water Industry National Environment Programme
WRMP..... Water Resource Management Plan

WRZ.....Water Resource Zone

WTW.....Water Treatment Works

WwTW.....Wastewater Treatment Works

Executive Summary

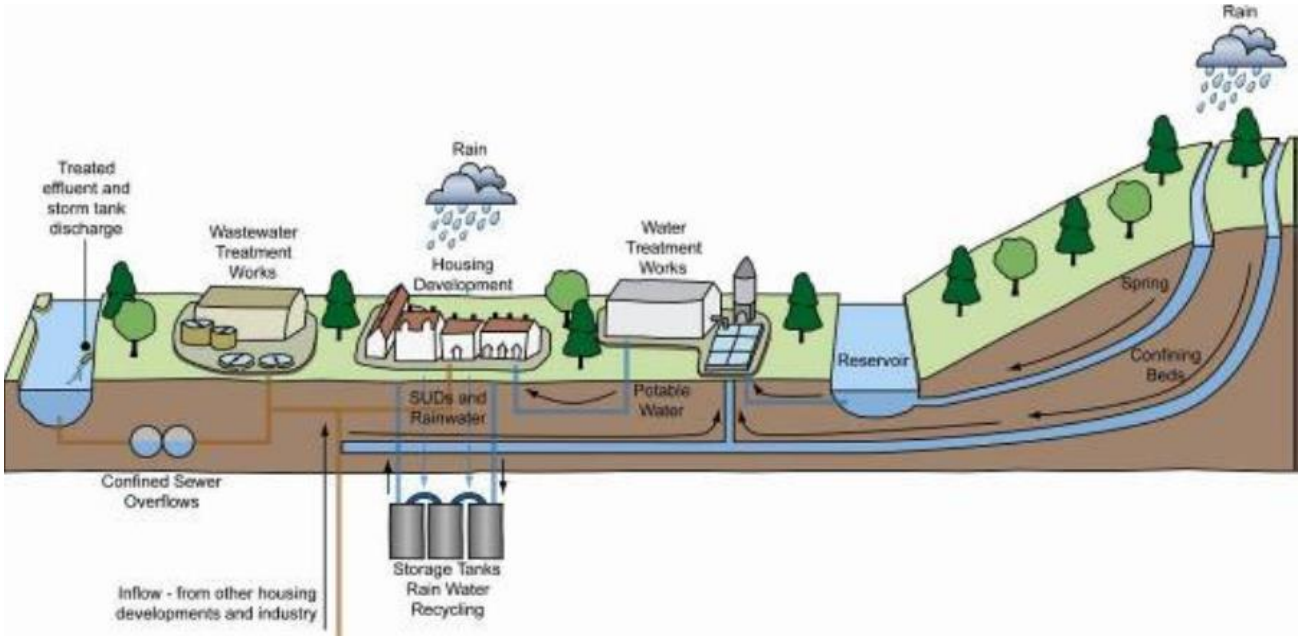
JBA Consulting was commissioned by Wokingham Borough Council (WBC) to undertake a Phase 2 Outline Water Cycle Study (WCS) as part of the evidence base for their Local Plan, currently being updated to plan development to 2040. This builds on the Phase 1 Scoping Study completed in 2019.

New homes and employment land require the provision of clean water, safe disposal of wastewater and protection from flooding. The allocation of development in certain locations may result in the capacity of existing available infrastructure being exceeded, a situation that could potentially cause service failures to water and wastewater customers, adverse impacts to the environment, or high costs for the upgrade of water and wastewater assets being passed on to the bill payers.

In addition to increased demands from housing and employment development, future climate change presents further challenges to the existing water infrastructure network, including increased intensive rainfall events and a higher frequency of drought events. Sustainable planning for water must now take this into account. The water cycle can be seen in the figure below and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

The Phase 2 WCS is being published in July 2024 alongside the Local Plan evidence base, but much of the work was conducted in 2022 based on information available at the time. The latest versions of documents such as the Water Resource Management Plans should be read alongside this report.

The Water Cycle



Source: Environment Agency – Water Cycle Study Guidance

The Water Cycle Study has been carried out in co-operation with South East (SEW) Water, Thames Water (TW), Environment Agency (EA) and the neighbouring Local Planning Authorities (LPAs).

Potential development sites were provided by the councils and Wastewater Treatment Works (WwTW) likely to serve growth in the area were identified using the Environment Agency Consents database. Each development site was then allocated to a WwTW in order to understand the additional wastewater flow resulting from the planned growth. Available information was collated on water policy and legislation, water resources, water quality, and environmental designations within the study area.

Red / Amber /Green (RAG) assessments have been prepared at the site scale for the different aspects of the water cycle. It should be remembered that where a development is scored amber or red in a water supply or wastewater infrastructure assessment, it does not mean that development cannot or should not take place in that location, merely that significant infrastructure may be required to accommodate it. The decision on the suitability of sites is made up of several assessments outside the scope of this report.

Water resources - section 4

South East Water (SEW) and Thames Water (TW) are responsible for supplying Wokingham Borough Council. For the purpose of water resource planning, SEW and TW supply areas are divided into 14 Water Resource Zones (WRZs) which vary greatly in scale and have unique water resource concerns.

It is important that new development does not result in an unsustainable increase in water abstraction. This can be done in a number of ways from reducing the water demand from new houses through to achieving “water neutrality” in a region by offsetting a new developments water demand by improving efficiency in existing buildings. There is sufficient evidence to recommend the optional 110 litres per person per day design standard allowed under Building Regulations. This should be supported by an equivalent non-household water efficiency target. The BREEAM New Construction Standard can be used for this.

Water resources are under significant pressure in the UK, and the direction of travel in water resources planning is to reduce per capita consumption in new build development below the optional building regulations standard of 110 l/p/d. Currently this approach is not adequately supported in building regulations and the NPPF and policies requiring water efficiency standards less than 100l/p/d may only be supported at Local Plan examination in exceptional circumstances, such as a direct link between water abstraction and damage to a Special Area of Conservation. Until this changes, LPAs should encourage developers to go further than building regulations. This is supported by Thames Water’s incentives for water efficient design in new builds outlined in section 4.5 where significant incentives are offered to reduce design

consumption below 110l/p/d. Developers should be encouraged to achieve at least the Tier 2 incentive (Rainwater harvesting and greywater recycling).

Climate change is predicted to increase pressure on water resources, increasing the potential for a supply-demand deficit in the future, and making environmental damage from over abstraction of water resources more likely. Furthermore, the delivery of water and wastewater services and the heating of water in the home require high energy inputs, and therefore contribute directly to emissions of greenhouse gases. Water efficiency therefore reduces energy use and carbon emissions.

Water supply - section 5

An increase in water demand due to growth can exceed the hydraulic capacity of the existing supply infrastructure. In phase 1 TW and SEW did not identify any significant constraints to providing additional water supply infrastructure. In phase 2 they were asked to update the assessment using the latest growth forecast.

TW advised that at 12 of the sites, representing the majority of new dwellings that would be supplied by TW, the scale of development was such that upgrades and /or new water supply infrastructure may be required in order to accommodate growth. the demand was likely to exceed current supply to the area. Flow and pressure modelling may be required to be conducted as part of the planning process.

A similar assessment was sought from SEW but they were unable to provide site level assessment due to resource constraints. As an alternative they reviewed the overall growth trajectory and confirmed that their Water Resources Management Plan (WRMP) "accommodates a level growth that aligns with the projections provided". They advised that as applications are made through the developer enquiry process, they will then carry out the appropriate detailed network modelling assessments.

Wastewater collection - section 6

Thames Water provide wastewater services across all of Wokingham Borough. Sewerage Undertakers have a duty under Section 94 of the Water Industry Act 1991 to provide sewerage services and treat wastewater arising from new domestic development. Except where strategic upgrades are required to serve very large or multiple developments, infrastructure upgrades are usually only implemented following an application for a connection, adoption, or requisition from a developer.

Developments in the area where there is limited wastewater network capacity will increase pressure on the network. Subsequently, this will increase risk of a detrimental impact on existing customers and increasing likelihood of storm overflows (where present). The assessment performed by TW indicated that on larger development sites, modelling of the wastewater network was needed at part of the planning process, and upgrades to the network are likely to be required. These must be in place before occupation of development. No significant constraints to providing network upgrades have been identified.

Overall, there are no network storm overflows in the study area exceeding the threshold of 50 operations per year that would trigger an investigation. It is important that development does not increase the frequency or duration of operation.

There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing residential areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

Wastewater treatment - section 7

Headroom at Wastewater Treatment Works (WwTW) can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity or improvements in treatment processes. Thames Water operate all the WwTWs serving growth across Wokingham Borough.

There are six WwTWs that may serve growth during the plan period in Wokingham Borough. Three of these are expected to exceed their flow permit during the Local Plan period and will require an increase in their permit and / or upgrades to treatment processes in order to serve growth. No significant constraints to providing upgrades have been identified by TW. In addition to hydraulic capacity, it is important to consider water quality considerations.

Whilst the frequency of operation of overflows on storm tanks in the study area is below the threshold for investigation, it is important that development does not increase this frequency. The local plan can contribute to this by encouraging the use of SuDS to divert storm water away from the sewer network, reducing the volume that reaches the WwTW.

Odour - section 8

National Planning Policy Guidance recommends that plan-makers consider whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, due to the risk of odour nuisance.

Eight sites have been identified that are close enough to a WwTW for nuisance odour to be a risk. At these sites, it is recommended that an odour assessment is carried out to investigate them further. This should be undertaken as part of the planning process, paid for by developers.

Water quality - section 9

An increase in the discharge of effluent from Wastewater Treatment Works (WwTW) as a result of development and growth in the area which they serve can lead to a negative impact on the quality of the receiving watercourse. Under the Water Framework Directive (WFD), a watercourse is not allowed to deteriorate from its

current WFD classification (either as an overall watercourse or for individual elements assessed). It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourses.

The Environment Agency's SIMCAT water quality modelling tool was used to provide an assessment of impact of growth on water quality. The models were updated by JBA with the latest effluent flows at WwTWs within the study area, and incorporating recent and planned improvements or permit changes at WwTWs provided by the EA. The modelling results can be used to identify areas at risk of deterioration but should not be used to set permit limits or definitively rule-out growth in particular catchments.

The modelling indicates that growth during the Local Plan period could result in a significant deterioration (10% or over or deterioration in class) in water quality at two WwTWs (Arborfield and Easthampstead Park). In the case of Easthampstead Park, deterioration in phosphate is predicted to be 3% and as this is already within bad class, this is considered to be significant. This can be prevented by a tightening of the environmental permit and / or upgrades to treatment processes.

It was also found that growth alone is unlikely to prevent good ecological status being prevented in the future should improvements in upstream water quality be made.

Where a WwTW is shared with a neighbouring authority, coordination of growth plans in collaboration with Thames Water is essential to ensure that infrastructure is in place prior to development to prevent a breach of the environmental permit.

Flood risk from additional effluent flow - section 10

In catchments with a large, planned growth in population and which discharge effluent to a small watercourse, the increase in the discharged effluent might have a negative effect on the risk of flooding.

At each of the points of discharge for WwTWs serving growth in Wokingham Borough, the additional flow from growth makes up less than 5% of the Q30 flow and less than 5% of the Q100 flow. The impact of increased effluent flows is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

Environmental impact - section 11

Development has the potential to cause an adverse impact on the environment through a number of routes such as worsening of air quality, pollution to the aquatic environment, or disturbance to wildlife. Of relevance in the context of a Water Cycle Study is the impact of development on the aquatic environment. A source-pathway-receptor approach was be taken to investigate the risk and identify where further assessment or action is required.

WwTWs serving growth within Wokingham Borough are point sources of pollution in the study area. Five protected sites (SSSIs) are downstream of the study area. In the

river adjacent to these sites, there is risk of a deterioration in water quality. This could be prevented by improvements in upstream treatment technology.

Development sites within Wokingham Borough could also be sources of diffuse pollution from surface runoff. Runoff from these sites should be managed through implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites.

Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity, as well as opportunities for groundwater recharge to provide a water resources benefit.

Wokingham Borough, as an LLFA, should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors.

Although primarily an urban area, opportunities exist to implement natural flood management techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

1 Introduction

1.1 Terms of reference

JBA Consulting were commissioned by Wokingham Borough Council (WBC) to undertake a Phase 2 Water Cycle Study (WCS) as part of the evidence base for their Local Plan. This builds on the Phase 1 study completed in 2018, updating the assessments where appropriate, and assessing the impact of proposed developments on water infrastructure. Phase 2 also addresses water quality and environmental impacts not investigated in Phase 1.

Unmitigated future development and climate change can adversely affect the environment and water infrastructure capability. A WCS will provide the required evidence, together with an agreed strategy to ensure that planned growth occurs within environmental constraints, with the appropriate infrastructure in place in a timely manner so that planned allocations are deliverable.

1.2 The impact of development on the water cycle

Figure 1.1 below shows the main elements that compromise the Water Cycle and shows how the natural and artificial processes and systems interact to collect, store or transport water in the environment.

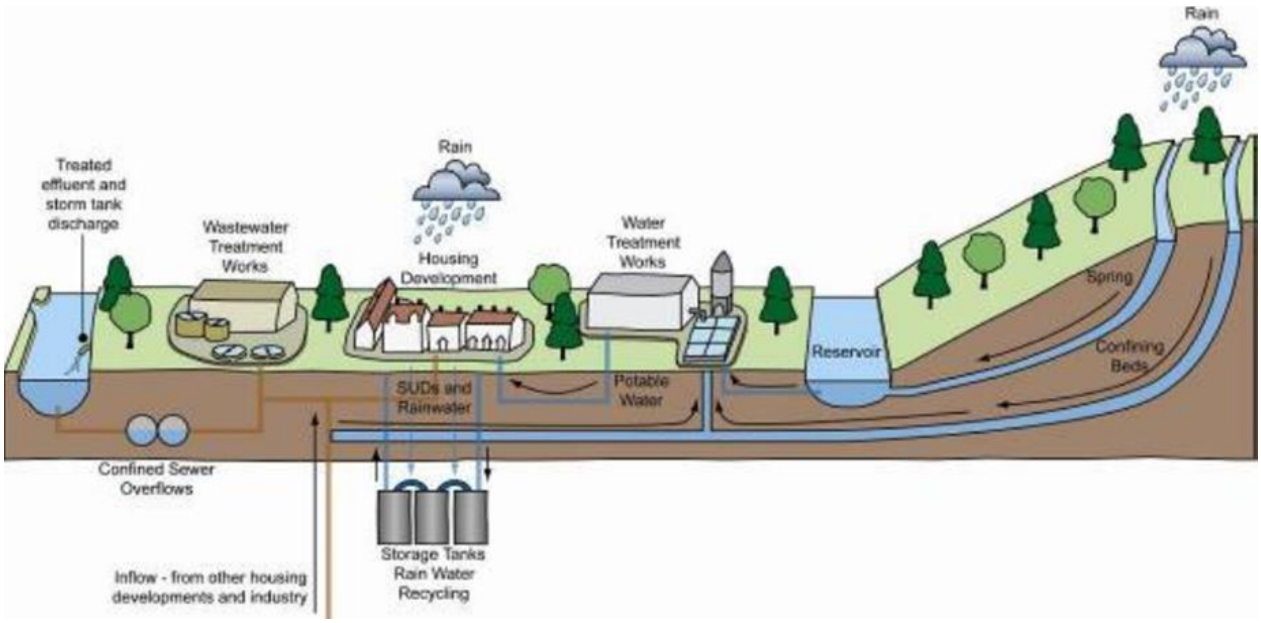


Figure 1.1 The Water Cycle

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. It is possible that allocating large numbers of new homes at some locations may result in the capacity of the existing available infrastructure being exceeded. This situation could potentially lead to service failures to water and wastewater customers, have adverse impacts on the environment or cause the high

cost of upgrading water and wastewater assets being passed on to bill payers. Climate change presents further challenges such as increased intensity and frequency of rainfall and a higher frequency of drought events that can be expected to put greater pressure on the existing infrastructure.

1.3 Study area

The Local Planning Authority (LPA) area of Wokingham Borough Council is shown in Figure 1.2. It covers an area of 179km^2 and has a population of approximately 171,000. Thames Water (TW) and South East Water (SEW) are the water supply companies in the area, with Thames Water being the only provider of wastewater services.

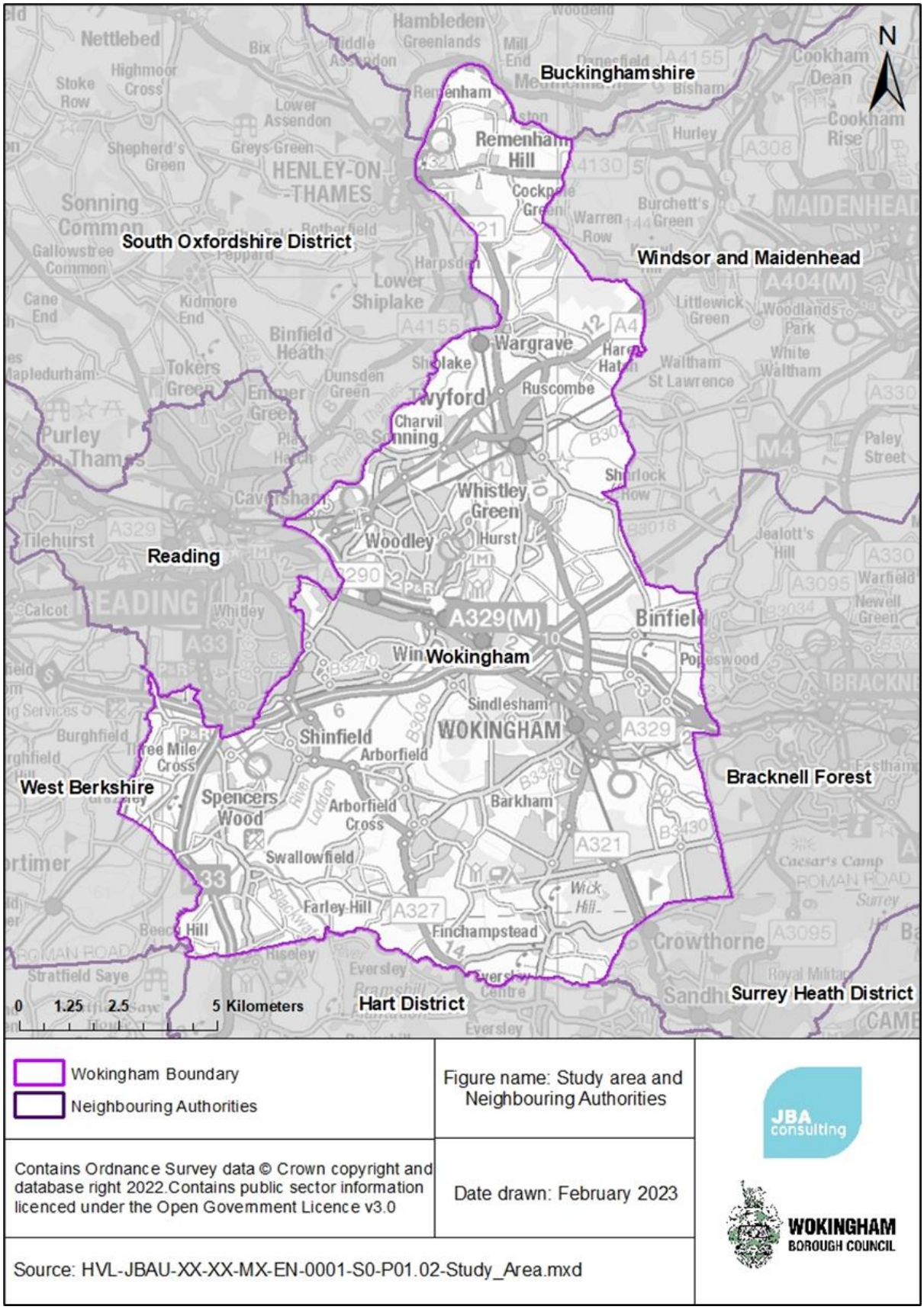


Figure 1.2 Wokingham study area

1.4 Record of Engagement

1.4.1 Introduction

Preparation of a WCS requires significant engagement with stakeholders within the Local Planning Authority area, with water and wastewater utilities, with the Environment Agency and Natural England, and where there may be cross-boundary issues, with neighbouring local authorities. This section forms a record of engagement for the WCS.

1.4.2 Detailed study engagement

An inception meeting was held with WBC to discuss the scope and data collection requirements. This was also attended by Thames Water (TW), South East Water (SEW) and the Environment Agency (EA). Further discussions were held with both TW, SEW and the EA as the project progressed and results emerged. The EA were consulted on the methodology for assessing water quality and provided their water quality model for the area.

Neighbouring authorities that shared wastewater infrastructure with WBC were contacted to obtain an estimate of growth in areas that would be served by those wastewater treatment works (WwTW). This allowed the full quantum of growth to be understood.

2 Future growth in Wokingham Borough

2.1 Overview

The following section summarises the planned development in Wokingham to 2040, including new allocations proposed in the Local Plan Update: Revised Growth Strategy consultation (2021-22) which allows a forecast to be created that can used to predict the volume of water and wastewater required in the future and the resulting pressure on water infrastructure.

This forecast consists of:

- Proposed allocations - sites allocated or planned to be allocated in the local plan (shown in Figure 2.1).
- Strategic Development Locations (SDL).
- Town centre growth.
- Sites with extant planning permission – sites already in the planning system.
- Recent completions – sites completed in the last year that may not yet appear in flow data provided by the water companies.
- Windfall – sites that have not been specifically identified in the local plan. They normally comprise previously developed sites that have unexpectedly become available.
- Neighbouring authority growth – growth served by infrastructure within or shared with the study area.

Information on expected growth during the plan period was provided by WBC and collated into a forecast for housing and employment floor space. Table 2.1 below contains a summary of this forecast.

A higher resolution version of Figure 2.1 can be found in Appendix A.

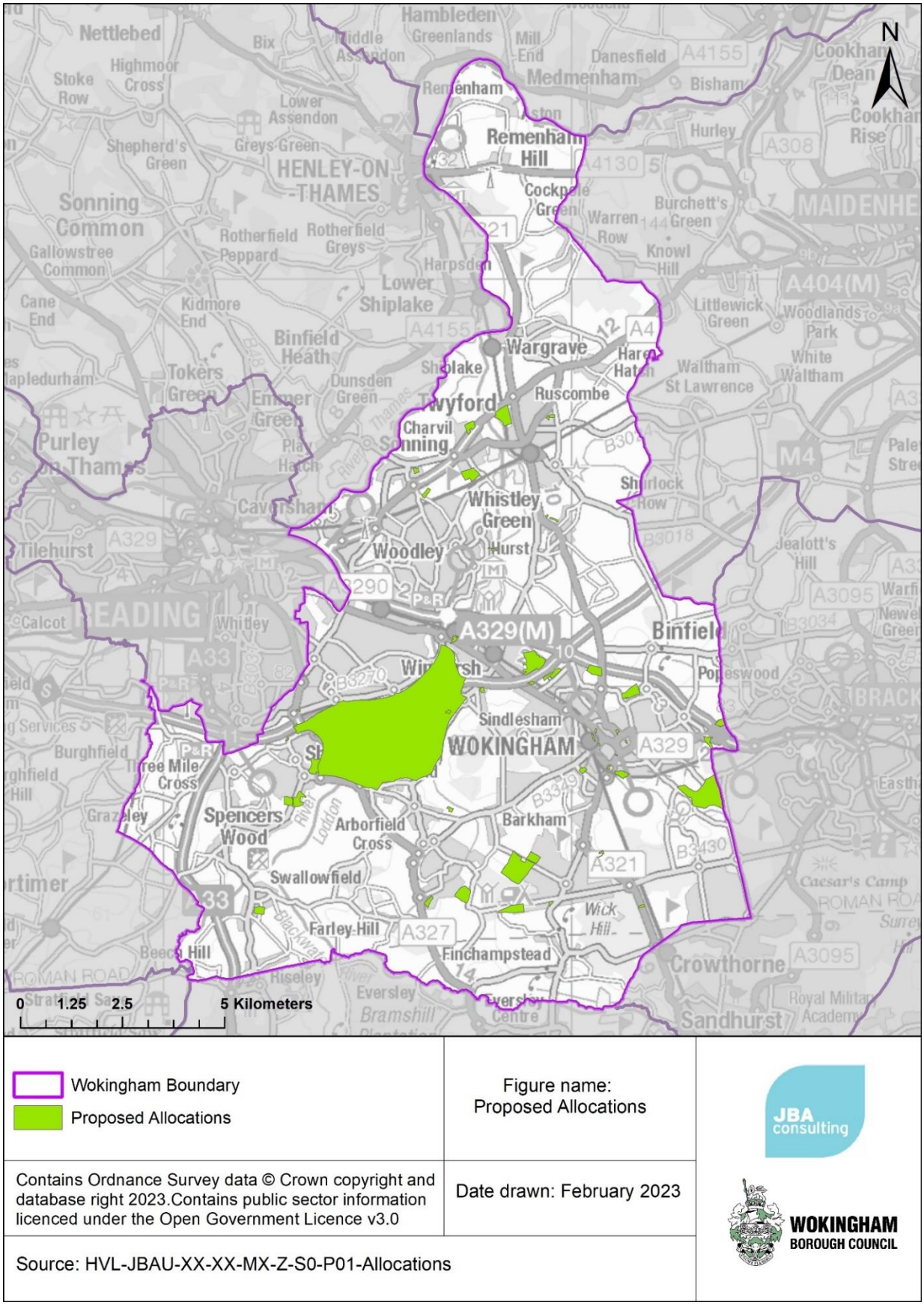


Figure 2.1 Proposed allocations (Revised Growth Strategy) in Wokingham Borough

Table 2.1 Overall growth in Wokingham Borough (2018 to 2040)

Type of Growth	Number of Houses	Employment floorspace (m^2)
Completions (2018 to 2021)	3,968	N/A
Potential allocations / reallocations	2,906 Outstanding	None identified
Commitments	816 Outstanding	52,580*
Town Centre	200	None identified
Strategic Development Locations (SDL)	4,997 Outstanding	None identified
South Wokingham SDL and SDL Extension	2,800 Outstanding	None identified
New strategic site (Hall Farm)	2,200 up to 2040 Potential for a further 2,300 beyond 2040	185,000*
Windfall	1,746	N/A

*Employment floorspace figures may be subject to change because of new employment allocations emerging.

2.2 Growth Outside Wokingham Borough Council

2.2.1 Bracknell Forest Council

JBA Consulting prepared the WCS for Bracknell Forest Council, which has confirmed that the growth forecasts that formed part of the Phase 2 (Outline) Study were appropriate to use in this study. Forecast housing growth for each WwTW shared with Wokingham is summarised in Table 2.2. It should be noted that these figures are the total number of houses within each WwTW catchment should all the sites identified be adopted. It therefore represents a worse-case scenario for wastewater demand.

Table 2.2 Summary of growth in Bracknell Forest served by infrastructure within or shared with Wokingham Borough (up to 2037)

WwTW	Number of Houses	Employment
Easthampstead Park	226	None identified

Source: Bracknell Forest Water Cycle Study (2018)

2.2.2 Reading Borough Council

Reading Borough Council provided details of growth in its area, all of which would be served by Reading WwTW. This is summarised in Table 2.3 below. A link to a Water

Quality Assessment[1] published in 2018 for Reading WwTW was used to estimate the number of houses in this area and Reading Borough Council provided information on employment floorspace. This consisted of a net increase of 112,000m^2 of office floor space and 148,000m^2 of industrial / warehouse floorspace.

Table 2.3 Summary of growth in Reading Borough served by infrastructure within or shared with Wokingham Borough (up to 2036)

WwTW	Number of Houses	Employment
Reading	18,190	1,915 indicative number of employees

2.2.3 South Oxfordshire District Council (SODC)

The SODC Water Cycle Study[2] identified a small number of houses that would be served by infrastructure shared with Wokingham (summarised in Table 2.4).

Table 2.4 Summary of growth in South Oxfordshire served by infrastructure within or shared with Wokingham Borough (up to 2035)

WwTW	Housing units	Employment
Wargrave	200	100 indicative number of employees

2.2.4 Other Neighbouring Authorities

Growth within Buckinghamshire Council and Royal Borough of Windsor and Maidenhead is not likely to be served by WwTW within or shared with Wokingham. For this reason, they were not contacted for information during this study.

1 Water Quality Assessment, Reading Borough Council (2018). Accessed online at: https://images.reading.gov.uk/2019/12/EV029_Water_Quality_Assessment_March_2018.pdf on: 10/11/2022

2 SODC Water Cycle Study, JBA Consulting (2018). Accessed online at: http://www.southoxon.gov.uk/ccm/support/dynamic_serve.jsp?ID=833941142&CODE=B06F1BD3F3F62FFAA9EDE3C0FBF94484 on: 10/11/2022

3 Legislative and Policy framework

3.1 Introduction

The following sections introduce several national, regional and local policies that must be considered by the LPA, water companies and developers during the planning process. Key extracts from these policies relating to water consumption targets and mitigating the impacts on the water from the new development are summarised below.

3.2 National Policy

3.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[3] was published on 27 March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. A comprehensive revision was issued in July 2018. This was further revised in February 2019, July 2021[4], August 2022, and December 2023 but the changes were not significant from the July 2018 version for policy areas relevant to the WCS.

The NPPF provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans. Key paragraphs include:

Paragraph 34:

“Plans should set out the contributions expected from development. This should include setting out the levels and types of affordable housing provision required, along with other infrastructure (such as that needed for education, health, transport, flood and water management, green and digital infrastructure). Such policies should not undermine the deliverability of the plan.”

Paragraph 158:

“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...”

3 National Planning Policy Framework, Department for Communities and Local Government (2012)

4 National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2021). Accessed online at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 on: 10/11/2022

Paragraph 180:

"…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".

In March 2014, the Planning Practice Guidance was issued by the Department for Communities and Local Government, with the intention of providing guidance on the application of the National Planning Policy Framework (NPPF) in England. The Department for Levelling Up, Housing and communities (DLUHC) is in the process of updating the Guidance to consider the necessary 2018 and 2019 updates of the NPPF. Of the sections relevant to this study, only the Water Supply, Wastewater and Water Quality section has been updated.

- Flood Risk and Coastal Change [5]
- Water Supply, Wastewater and Water Quality [6]
- Housing - Optional Technical Standards [7]

3.2.2 Planning Practice Guidance: Flood Risk and Coastal Change

Diagram 1 in the Planning Practice Guidance sets out how flood risk should be considered in the preparation of Local Plans (Figure 3.1 in the guidance). These requirements are addressed principally in the Council's Strategic Flood Risk Assessment.

3.2.3 Planning Practice Guidance: Water Supply, Wastewater and Water Quality

A summary of the specific guidance on how infrastructure, water supply, wastewater and water quality considerations should be accounted for in both plan-making and planning applications is summarised below.

5 Guidance: Flood Risk and Coastal Change, Ministry of Housing, Communities & Local Government (2014). Accessed online at: https://www.gov.uk/guidance/flood-risk-and-coastal-change on: 10/11/2022

6 Planning Practice Guidance: Water supply, wastewater and water quality, Ministry of Housing, Communities & Local Government (2019). Accessed online at: https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality on: 10/11/2022

7 Planning Practice Guidance: Housing - Optional Technical Standards, Ministry of Housing, Communities & Local Government (2014). Accessed online at: https://www.gov.uk/guidance/housing-optional-technical-standards on: 10/11/2022

Infrastructure:

Plan Making:

- Identification of suitable sites for new or enhanced infrastructure.
- Consider whether new development is appropriate near to water and wastewater infrastructure.
- Phasing new development so that water and wastewater infrastructure will be in place when needed.

Planning applications:

Wastewater considerations include:

- First presumption is to provide a system for foul drainage discharging into a public sewer.
- Phasing of development and infrastructure, ensuring no occupation of properties until adequate infrastructure is in place.
- Circumstances where package sewage treatment plants or septic tanks are applicable.

Water Supply:

Planning applications:

- Planning for the necessary water supply would normally be addressed through the Local Plan, exceptions might include:
- Large developments not identified in Local Plans;
- Where a Local Plan requires enhanced water efficiency in new developments.
- This is recommended in all areas of water stress.

Water quality:

Plan Making:

- 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.
- The type or location of new development where an assessment of the potential impacts on water bodies may be required.
- Expectations relating to sustainable drainage systems.

Planning applications:

Water quality is only likely to be a significant planning concern when a proposal would:

- involve physical modifications to a water body,
- indirectly affect water bodies, for example as a result of new development such as the redevelopment of land that may be affected by contamination etc. or through a lack of adequate infrastructure to deal with wastewater; and

- directly or indirectly result in a deterioration in water quality or a breach of environmental legislation as a result of adequate infrastructure in place to accommodate additional development pressures.

Wastewater

Plan Making:

- The sufficiency and capacity of wastewater infrastructure.
- The circumstances where wastewater from new development would not be expected to drain to a public sewer.
- Planning applications:
- If there are concerns arising from a planning application about the capacity of wastewater infrastructure, applicants will be asked to provide evidence of initial liaison with STW with reference to plans to accommodate additional wastewater flows or provide information about how the proposed development will be drained and wastewater dealt with.

Cross-boundary concerns

Plan Making:

- Water supply and water quality concerns often cross local authority boundaries and can be best considered on a catchment basis. Recommends liaison from the outset.
- Planning applications:
- No specific guidance (relevant to some developments).

SEA and Sustainability

Plan Making:

- Water supply and quality are considerations in strategic environmental assessment and sustainability appraisal. Sustainability appraisal objectives could include preventing deterioration of current water body status, taking climate change into account, and seeking opportunities to improve water bodies.
- Planning applications:
- No specific guidance (should be considered in applications).

3.2.4 Planning Practice Guidance: Housing – Optional Technical Standards

This guidance advises planning authorities on how to gather evidence to set optional requirements, including for water efficiency. It states that “all new homes already have to meet the mandatory national standard set out in the Building Regulations (of 125 litres/person/day). Where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day. Planning authorities are advised to consult with the EA and water companies to determine where there is a

clear local need, and also to consider the impact of setting this optional standard on housing viability. A 2014 study[8] into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only an additional £9 for a four-bedroom house (in comparison to the cost of building a house to meet a standard of 125 l/p/d). The evidence for adopting the optional requirements is outlined in section 4.2.1.

3.2.5 Building Regulations and Code for Sustainable Homes

The Building Regulations (2010) Part G[9] as amended in 2015 require that all new dwellings must ensure that the potential water consumption must not exceed 125 litres/person/day, or 110 litres/person/day where required under planning conditions.

3.2.6 BREEAM

The Building Research Establishment (BRE) publish an internationally recognised environmental assessment methodology for assessing, rating and certifying the sustainability of a range of buildings.

New homes are most appropriately covered by the Home Quality Mark[10] and commercial, leisure, educational facilities and mixed-use buildings by the Building Research Establishment Environmental Assessment Methodology (BREEAM) UK New Construction Standard[11].

Using independent, licensed assessors, BREEAM/HQM assesses criteria covering a range of issues in categories that evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology and management processes.

In the Homes Quality Mark, 400 credits are available across 11 categories and lead to a star rating. 18 credits are available for water efficiency and water recycling. A greater number of credits are awarded for homes using water efficient fittings (with the

8 Housing Standards Review: Cost Impacts, Department for Communities and Local Government (2014).
Accessed online at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on: 10/11/2022

9 The Building Regulations (2010) Part G - Sanitation, hot water safety and water efficiency, 2015 edition with 2016 amendments. HM Government (2016). Accessed online at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/504207/BR_PDF_AD_G_2015_with_2016_amendments.pdf on: 10/11/2022

10 Home Quality Mark, BRE, (2018). Accessed online at:
https://www.homequalitymark.com/professionals/standard/ on: 10/11/2022

11 BREEAM UK New Construction, BRE, (2018). Accessed online at: https://www.breeam.com/NC2018/ on: 10/11/2022

highest score achieving 100l/p/d or less), and further credits are awarded for the percentage of water used in toilet flushing that is either sourced from rainwater or from grey water.

The BREEAM New Construction Standard awards credits across nine categories, four of which are related to water: water consumption, water monitoring, leak detection and water efficient equipment. This leads to a percentage score and a rating from “Pass” to “Outstanding”.

The Council has the opportunity to seek BREEAM or HQM status for all new, residential and non-residential buildings.

3.2.7 Sustainable Drainage Systems (SuDS)

From April 2015, Local Planning Authorities (LPA) have been given the responsibility for ensuring that sustainable drainage is implemented on developments of 10 or more homes or other forms of major development through the planning system. Under the new arrangements, the key policy and standards relating to the application of SuDS to new developments are:

- The National Planning Policy Framework, which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.
- The House of Commons written statement[12] setting out governments intentions that LPAs should “ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate” and “clear arrangements in place for ongoing maintenance over the lifetime of the development.” This requirement is also now incorporated in the 2019 update of the NPPF (paragraph 165). In practice, this has been implemented by making Lead Local Flood Authorities (LLFAs) statutory consultees on the drainage arrangements of major developments.
- The Defra non-statutory technical standards for sustainable drainage systems[13]. These set out the government’s high-level requirements for managing peak flows and runoff volumes, flood risk from drainage systems and the structural integrity and construction of SuDS. This very short document is not a design manual and

12 Sustainable drainage systems: Written statement - HCWS161, UK Government (2014). Accessed online at: http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/ on: 24/01/2022

13 Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems, Defra (2015). Accessed online at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards on: 24/01/2022

makes no reference to the other benefits of SuDS, for example water quality, habitat and amenity.

- Wokingham Borough Council are the LLFA and play a key role in ensuring that the proposed drainage schemes for all new developments comply with technical standards and policies in relation to SuDS.
- An updated version of the CIRIA SuDS Manual was published in 2015. The guidance covers the planning, design, construction and maintenance of SuDS for effective implementation within both new and existing developments. The guidance is relevant for a range of roles with the level of technical detail increasing throughout the manual. The guidance does not include detailed information on planning requirements, SuDS approval and adoption processes and standards, as these vary by region and should be checked early in the planning process. The manual can be found by clicking here.
- CIRIA also publish "Guidance on the Construction of SuDS" (C768), which contains detailed guidance on all aspects of SuDS construction, with specific information on each SuDS component available as a downloadable chapter. The downloadable chapter is available by clicking here.
- As of April 2020, the new Design and Construction Guidance (DCG) came into force in England. This contains details of the water sector's approach to the adoption of SuDS, which meet the legal definition of a sewer. The guidance replaces the former, voluntary Sewers for Adoption guidance, as compliance by water companies in England is now mandatory. The guidance is available by clicking here.
- In January 2023, Defra announced its intention to make SuDS mandatory on all major development, and that Schedule 3 of the Flood and Water Management Act will be implemented[14]. The government are considering the details of how this will be implemented, but schedule 3 makes Lead Local Authorities SuDS Approval Bodies (SABs), required to approve SuDS proposals and with the power to adopt SuDS.

3.3 Regional Policy

3.3.1 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMP) are high level policy documents covering large river basin catchments. They aim to set policies for sustainable flood risk management for the whole catchment covering the next 50 to 100 years.

14 New approach to sustainable drainage set to reduce flood risk and clean up rivers. Defra (2023). Accessed online at: https://www.gov.uk/government/news/new-approach-to-sustainable-drainage-set-to-reduce-flood-risk-and-clean-up-rivers#:~:text=Schedule%203%20provides%20a%20framework,the%20lifetime%20of%20the%20development on: 16/03/2023

3.3.2 Surface Water Management Plans (SWMPs)

SWMPs outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area.

3.3.3 Water Resource Management Plans

Water Resource Management Plans (WRMPs) are 25-year strategies that water companies are required to prepare, with updates every five years. In reality, water companies prepare internal updates more regularly. WRMPs are required to assess:

- Future demand (due to population and economic growth).
- Future water availability (including the impact of sustainability reductions).
- Demand management and supply-side measures (e.g., water efficiency and leakage reduction, water transfers and new resource development).
- How the company will address changes to abstraction licences.
- How the impacts of climate change will be mitigated.
- Where necessary, they set out the requirements for developing additional water resources to meet growing demand and describe how the balance between water supply and demand will be balanced over the period 2015 to 2040.
- Using cost-effective demand management, transfer, trading and resource development schemes to meet growth in demand from new development and to restore abstraction to sustainable levels.
- In the medium to long term, ensuring that sufficient water continues to be available for growth and that the supply systems are flexible enough to adapt to climate change.

3.3.4 Regional water resource planning

Water resource planning is taking an increasingly regional focus, recognising the need for collaboration between water companies and sectors in order to address the challenges of climate change, increasing demand for water and protecting the water environment. Five regional groupings having been formed, including the Water Resources East (WRSE) group which covers Wokingham. An advisory group consisting of their regulators (Environment Agency and Ofwat) and Defra regularly attend meetings of WRSE.

WRE are preparing a regional water resource plan for publication in 2023, which in turn will inform the next round of company WRMPs to be published in 2024. As part of this process, they have published an initial water resource position statement which sets out the water resources challenges and opportunities within the region.

3.4 Local Policy

3.4.1 Localism Act

The Localism Act (2011) changed the powers of local government, it re-distributes the balance of decision making from central government back to councils, communities, and individuals. In relation to the planning of sustainable development, provision 110 of the Act places a duty to cooperate on Local Authorities. This duty requires Local Authorities to "engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter"[15].

The Localism Act also provides new rights to allow local communities to come together and shape the development and growth of their area by preparing Neighbourhood Development Plans, or Neighbourhood Development Orders, where the ambition of the neighbourhood is aligned with strategic needs and priorities for the area. This means that local people can decide where new homes and businesses should go and also what they should look like. As neighbourhoods draw up their proposals, Local Planning Authorities are required to provide technical advice and support.

3.5 International Environmental Policy

3.5.1 Ramsar

The Convention on Wetlands of International Importance, more commonly known as the Ramsar convention after the city where it was signed in 1971, aims to protect important wetland sites. Under the treaty, member counties commit to:

- Wise use of all their wetlands.
- Designating sites for the Ramsar list of "Wetlands of International Importance" (Ramsar Sites) and their conservation.
- Cooperating on transboundary wetlands and other shared interests.

"Wise use" of wetlands is defined under the convention as "the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development". A handbook on the wise use of wetlands is available from the Ramsar Convention Secretariat[16].

15 Localism Act 2011: Section 110, UK Government (2011). Accessed online at: http://www.legislation.gov.uk/ukpga/2011/20/section/110/enacted
on: 10/11/2022

16 Wise use of wetlands, Ramsar Convention Secretariat (2010). Accessed online at: https://www.ramsar.org/sites/default/files/documents/library/hbk4-01.pdf
on: 10/11/2022

Ramsar Sites are designated by the National Administrative Authority, responsible for the Ramsar Convention in each country. In the case of the UK this is the Joint Nature Conservation Committee (JNCC).

In general, the designation of UK Ramsar sites is underpinned through prior notification of these areas as Sites of Special Scientific Interest (SSSIs) and as such receive statutory protection under the Wildlife and Countryside Act 1981 (as amended). More recently, Paragraph 176 of the NPPF states that Ramsar sites should be given the same protection in the planning process as sites designated under the EU Habitats Directive.

3.6 European Union Derived Environmental Policy

3.6.1 Urban Wastewater Treatment Regulations (UWWTR)

The Urban Wastewater Treatment Directive UWWTD[17] is an EU Directive that concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of wastewater discharges. More specifically Annex II A(a) sets out the requirements for discharges from urban wastewater treatment plants to sensitive areas which are subject to eutrophication. The Directive was transposed into UK legislation through enactment of the Urban Waste Water Treatment (England and Wales) Regulations 1994 and 'The Urban Waste Water Treatment (England and Wales) (Amendments) Regulations 2003'.

3.6.2 Habitats Regulations

The EU Habitats Directive, transposed into law as the Conservation of Habitats and Species Regulations 2017, aims to protect the wild plants, animals and habitats that make up our diverse natural environment. The directive created a network of protected areas around the European Union of national and international importance called Natura 2000 sites. These include:

- Special Areas of Conservation (SACs) - support rare, endangered or vulnerable natural habitats, plants and animals (other than birds).
- Special Protection Areas (SPAs) - support significant numbers of wild birds and habitats.

Special Protection Areas and Special Areas of Conservation are established under the EC Birds Directive and Habitats Directive respectively. The directive also protects over

17 UWWTD. Accessed online at: https://ec.europa.eu/environment/water/water-urbanwaste/index_en.html On: 14/10/2022.

1,000 animals and plant species and over 200 so called "habitat types" (e.g., special types of forests, meadows, wetlands, etc.), which are of European importance.

3.6.3 Bathing Water Regulations

The Bathing Water Directive was first published in 2006 and has been transposed into English and Welsh law through enactment of the Bathing Water Regulations 2013 (supersedes the Bathing Water Regulations 2008). The aims of the directive are the protection of public health whilst bathing, standardisation of publicly available water quality information and to improve management practices at bathing waters.

The UK has over 600 designated bathing waters defined as areas of inshore waters designated for public swimming, these areas are typically characterised by large numbers of swimmers and visitors per year. Under law the Environment Agency are required to monitor water quality at these sites regularly (usually weekly) throughout the Bathing Water Season. In England the Bathing Water Season is between 15th May and 30th September.

Water quality standards are based on the incidence of potentially harmful bacteria, E. coli and intestinal enterococci and are categorised as ‘excellent’, ‘good’, ‘sufficient’ or ‘poor’ on the basis of bacteria levels. Sites are rated annually and on a short-term basis in response to any temporary pollution incidents. Blue flag designation is an international award given to beaches which meet stringent criteria on having excellent water quality and other facilities such as the provision of environmental information, lifeguards, toilets, and other facilities.

Achieving compliance with the Bathing Water Directive has driven some £2.5bn of investment by UK water companies since the early 1990s to reduce the impact of sewerage systems and treated wastewater discharges. Measures have included storage and surface water management to reduce storm overflow spills, moving or extending effluent outfalls and improving wastewater treatment, including ultra-violet (UV) treatment of final effluent.

By law under the Bathing Water Regulations 2013, the local council must display clear information at Bathing Waters about water quality and sources of pollution throughout the Bathing Season, as well as information on any temporary pollution incidents and how long these are expected to last. If Bathing Water is classed as poor the local council is required to put up an “advice against bathing” symbol, though this does not mean the site is closed to the public.

In contrast to some other European nations, the UK has not previously designated stretches of river as bathing waters, however the first freshwater river bathing water was designated on the River Wharfe in North Yorkshire in 2021, and across England there are numerous campaigns by NGOs and members of the public to designate other stretches of river. It is anticipated that this may lead to a significant expansion of the number of inland bathing waters.

3.7 The Water Framework Regulations

The Water Framework Directive (WFD) was first published in December 2000 and transposed into English and Welsh law in December 2003. It introduced a more rigorous concept of what “good status” should mean than the previous environmental quality measures. The WFD estimated that 95% of water bodies were at risk of failing to meet “good status”.

River Basin Management Plans (RBMP) are required under the WFD and document the baseline classification of each waterbody in the plan area, the objectives, and a programme of measures to achieve those objectives. Wokingham falls within the Thames RBD[18]. Under the WFD the RBMPs, which were originally published in December 2009 were reviewed and updated in December 2015, and more recently in 2022. A primary WFD objective is to ensure ‘no deterioration’ in environmental status, therefore all water bodies must meet the class limits for their status class as declared in the Anglian and Thames River Basin Management Plan. Another equally important objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment and compromise WFD objectives. The WFD objectives as outlined in the updated RBMPs are summarised below:

- Prevent deterioration of the status of surface waters and groundwater.
- Achieve objectives and standards for protected areas.
- 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.
- Reverse any significant and sustained upward trends in pollutant concentrations in groundwater.
- Stop discharges/emissions of priority hazardous substances into surface waters.
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.

Local Planning Authorities (LPAs) must have regard to the Water Framework Directive as implemented in the Environment Agency’s River Basin Management Plans. It is of primary importance when assessing the impact of additional wastewater flows on local river quality.

18 River Thames River Basin Management Plan 2015-2021, Environment Agency, (2016). Accessed online at: https://www.gov.uk/government/publications/thames-river-basin-district-river-basin-management-plan on: 14/10/2022

3.7.1 Protected Area Objectives

The water framework regulations specifies that areas requiring special protection under other EC Directives, and waters used for the abstraction of drinking water, are identified as protected areas. These areas have their own objectives and standards.

Some areas may require special protection under more than one piece of EU-derived legislation or may have additional (surface water and/or groundwater) objectives. In these cases, all the objectives and standards must be met.

The types of protected areas are:

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish);
- bodies of water designated as recreational waters, including Bathing Waters;
- nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Regulations; and
- areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites.

Many WFD protected areas coincide with water bodies; these areas will need to achieve the water body status objectives in addition to the protected area objectives. Where water body boundaries overlap with protected areas the most stringent objective applies; that is the requirements of one EU-derived set of regulations should not undermine the requirements of another. The objectives for Protected Areas relevant to this study are as follows:

Drinking Water Protected Areas

- Ensure that, under the water treatment regime applied, the drinking water produced meets the requirements of the Drinking Water Directive plus any UK requirements to make sure that drinking water is safe to drink; and
- ensure the necessary protection to prevent deterioration in the water quality in the protected area in order to reduce the level of purification treatment required

Economically Significant Species (Freshwater Fish Waters)

- Protect or improve the quality of running or standing freshwater to enable them to support fish belonging to indigenous species offering a natural diversity; or species, the presence of which is judged desirable for water management purposes by the competent authorities of the Member States.

Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

- Reduce water pollution caused or induced by nitrates from agricultural sources; and
- prevent further such pollution.

Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

- Protect the environment from the adverse effects of urban waste water discharges and waste water discharges from certain industrial sectors.

Natura 2000 Protected Areas (water dependent SACs and SPAs)

- The objective for Natura 2000 Protected Areas identified in relation to relevant areas designated under the Habitats Regulations is to:
- Protect and, where necessary, improve the status of the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site's natural habitat types and species of importance.

3.7.2 Groundwater Source Protection Zones

The Environment Agency has a Groundwater Protection Policy to help prevent groundwater pollution. In conjunction with this the Environment Agency have defined groundwater Source Protection Zones (SPZs) to help identify high risk areas and implement pollution prevention measures. The SPZs show the risk of contamination from activities that may cause pollution in the area, the closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest which is occasionally applied.

Zone 1 (Inner protection zone)

This zone is designed to protect against the transmission of toxic chemicals and water-borne disease. It indicates the area in which pollution can travel to the borehole within 50 days from any point within the zone and applies at and below the water table. There is also a minimum 50 metre protection radius around the borehole.

Zone 2 (Outer protection zone)

This zone indicates the area in which pollution takes up to 400 days to travel to the borehole, or 25% of the total catchment area, whichever area is the largest. This is the minimum length of time the Environment Agency think pollutants need to become diluted or reduce in strength by the time they reach the borehole.

Zone 3 (Total catchment)

This is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

Zone of special interest

This is defined on occasions, usually where local conditions mean that industrial sites and other polluters could affect the groundwater source even though they are outside the normal catchment.

The Environment Agency's approach to Groundwater protection sets out a series of position statements that detail how the Environment Agency delivers government policy on groundwater and protects the resources from contamination (Environment Agency, 2018). The position statements that are relevant to this study with regard to discharges to groundwaters, include surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g., lorry parks) and from treated sewage effluent.

3.7.3 Derived European Legislation and Brexit

Much of the legislation behind the regulation of the water environment derives from the UK enactment of European Union (EU) directives. EU legislation which applied to the UK on 31 December 2020 became part of UK law when the UK left the EU.

In September 2022 the UK government introduced the Retained EU Law (Revocation and Reform) Bill. As currently drafted, this bill will result in all retained EU laws (REUL) being either repealed or assimilated into UK law by the end of 2023 and will repeal the principal of the supremacy of EU law. It will also give ministers powers to revoke, restate, replace or update REUL[19]. A dashboard created to list REUL has identified 570 pieces of legislation which fall under the remit of Defra[20].

This bill has the potential to introduce very substantial change to the regulation of water and the environment from the start of 2024. If this does occur, it may be necessary to review parts of this Water Cycle Study.

3.8 UK Environmental Policy

3.8.1 Environment Act 2021

The Environment Act[21] came into UK law in November 2021 with the aim of protecting and enhancing the environment. The Act has objectives to improve air and water

19 HM Government (2022) Retained EU Law (Revocation and Reform) Bill Explanatory Notes Accessed online at: https://publications.parliament.uk/pa/bills/cbill/58-03/0156/en/220156en.pdf on: 10/11/2022.

20 HM Government (2022) Retained EU Law Dashboard. Accessed online at: https://public.tableau.com/app/profile/governmentreporting/viz/UKGovernment-RetainedEULawDashboard/Guidance on 10/11/2022.

21 The Environment Act 2021, UK Government (2021). Accessed online at:

quality, biodiversity, waste reduction and resource efficiency. The implementation of the policies within the Environment Act has begun and legally binding environmental targets are being developed. This will be enforced by the newly created Office for Environmental Protection (OEP)[22].

The Environment Act (Part 5) contains policies concerning improvements to the water environment. These policies have the following aims:

- Effective collaboration between water companies through statutory water management plans.
- Minimise damage water abstraction may cause on environment.
- Modernise the process for modifying water and sewerage company licence conditions.

Further to this, there is specific legislation regarding storm overflows aiming to reduce the discharge of untreated sewage into waterways. This plan includes requirements for water companies to:

- report on the discharges from storm overflows;
- monitor the quality of water potentially affected by discharges;
- progressively reduce the harm caused by storm overflows; and
- report on elimination of discharges from storm overflows.

3.8.2 The Environmental Improvement Plan

The Environmental Improvement Plan (EIP) 2023[23], is a revision of the 25 Year Environment Plan laid out by the government. One of the goals within these plans is to have clean and plentiful water (goal 3) by the end of the plan period (2033). Policies laid out in the EIP to achieve this goal are:

- Incentivise sustainable land use and increase compliance with policies and regulations to reduce agricultural pollution.
- Construct new mine water treatment schemes.
- Modernise WwTW and reduce storm overflow operations.
- Using nature-based solutions to reduce pollution and improve the water environment.

https://www.legislation.gov.uk/ukpga/2021/30/part/5/enacted on: 24/10/2022

22 Office for Environmental Protection website: https://www.theoep.org.uk/office-environmental-protection

23 Environmental Improvement Plan, UK Government, (2023). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1133967/environmental-improvement-plan-2023.pdf on: 16/03/2023

- Facilitate infrastructure projects and protecting resources and improving water efficiency in homes.

In the context of a water cycle study, the above policies support an overall focus on tighter water efficiency standards within new developments.

As part of the EIP report, there is a section on water efficiency in new developments and retrofits. Within this section a new standard is considered of 105 l/p/d with a tighter standard of 100 l/p/d for water stressed areas. This was proposed as part of a road map with the Future Homes Hub. Other actions within this road map are to:

- work across government to integrate water and energy efficiency programmes and retrofit programmes;
- develop clear guidance on water conscious developments; and
- enable innovative water efficiency approaches in buildings.

3.8.3 Conservation of Habitats and Species Regulations 2017 (as amended)

The Conservation of Habitats and Species Regulations 2010 (commonly referred to as the Habitats Regulations) consolidated the Conservation (Natural Habitats, &c.) Regulations 1994, and transposed the EU Habitats Directive in England and Wales. This was further amended in 2017.

The Habitats Regulations define the requirement for a Habitats Regulations Assessment (HRA) to be carried out. The purpose of this is to determine if a plan or project may affect the protected features of a “habitats site”. These include:

- A special area of conservation (SAC).
- A site of Community Importance.
- A site hosting a priority natural habitat type or priority species protected in accordance with Article 5(4) of the Habitats Directive.
- A Special Protection Area (SPA).
- A potential SPA.

All plans and projects (including planning applications) which are not directly connected with, or necessary for the conservation management of a habitat site require consideration of whether the plan or project is likely to have significant effects on that site.

This is referred to as the “Habitats Regulations Assessment screening” and should take into account the potential effects of both the plan/project itself and in combination with other plans or projects.

Part 6 of the conservation of Habitats and Species Regulations 2017 states that where the potential for likely significant effects cannot be excluded, a competent authority must make an appropriate assessment of the implications of the plan or project for that site, in view of the site’s conservation objectives.

The competent authority may agree to the plan or project only after having ruled out adverse effects on the integrity of the habitats site.

If adverse effects cannot be rules out, and where there are no alternative solutions, the plan or project can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured.

The “People over Wind” ECJ ruling (C-323/17) clarifies that when making screening decisions for the purposes of deciding whether an appropriate assessment is required, competent authorities cannot take into account any mitigation measures. This must be part of the appropriate assessment itself.

3.8.4 Wildlife and Countryside Act 1981

Sites of Special Scientific Interest (SSSI) are designated and legally protected under the Wildlife and Countryside Act 1981, Section 28G places a duty to take reasonable steps, consistent with the proper exercise of the authority’s functions, to “further to the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which the site is of special scientific interest.”[24]

The Government’s 25-year Environment Plan[25] has a target of “restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term.” In line with this, and the Wildlife and Countryside Act 1981, Local Authorities should look put forward options that contribute to conservation or restoration of favourable condition, and at the very least must not introduce policies that hinder the restoration of favourable condition by increasing existing issues.

A site is said to be in “favourable condition” when the designated feature(s) within a unit are being adequately conserved and the results from monitoring demonstrate that the feature(s) in the unit are meeting all the mandatory site-specific monitoring targets set out in the favourable condition targets (FCT).

3.8.5 The Natural Environment Rural Communities Act (NERC)

The Natural Environment and Rural Communities Act 2006 (commonly referred to the as the NERC Act), was intended to implement key aspects of the Government’s Rural Strategy published in 2004 and established Natural England as a new independent

24 Wildlife and Countryside Act 1981, HM Government (1981). Accessed online at: http://www.legislation.gov.uk/ukpga/1981/69 on: 10/11/2022

25 A Green Future: Our 25 Year Plan to Improve the Environment, HM Government (2018). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf on: 10/11/2022

body responsible for conserving, enhancing and managing England's natural environment.

Section 40 of the NERC Act places a duty to conserve biodiversity on public authorities, including Local Planning Authorities and water companies. "The public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity."

Section 41 requires the Secretary of State to publish and maintain a list of species and types of habitat which in the Secretary of State's opinion (in consultation with Natural England) are of "principal importance for the purpose of conserving biodiversity."[26]

3.9 Water Industry Policy

3.9.1 The Water Industry in England

Water and sewerage services in England and Wales are provided by eleven Water and Sewerage Companies (WaSCs) and six 'water-only' companies. The central legislation relating to the industry is the Water Industry Act 1991. The companies operate as regulated monopolies within their supply regions, although very large water users and developments are able to obtain water and/or wastewater services from alternative suppliers - known as inset agreements.

The Water Act 2014 aims to reform the water industry to make it more innovative and to increase resilience to droughts and floods. Key measures could influence the future provision of water and wastewater services include:

- Non-domestic customers will be able to switch their water supplier and/or sewerage undertaker (from April 2017);
- new businesses will be able to enter the market to supply these services;
- measures to promote a national water supply network; and
- enabling developers to make connections to water and sewerage systems.

3.9.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies:

- The Water Services Regulation Authority (OfWAT) – economic/ customer service regulation;
- The Environment Agency - environmental regulation; and
- The Drinking Water Inspectorate (DWI) - drinking water quality.

26 Natural Environment and Rural Communities Act 2006, HM Government (2006). Accessed online at: http://www.legislation.gov.uk/ukpga/2006/16/section/40 on: 10/11/2022

Every five years the industry submits a Business Plan to OfWAT for a Price Review (PR). These plans set out the companies' operational expenditure (OPEX) and capital expenditure (CAPEX) required to maintain service standards, enhance service (for example where sewer flooding occurs), to accommodate growth and to meet environmental objectives defined by the Environment Agency. OfWAT assesses and compares the plans with the objective of ensuring what are effectively supply monopolies and operating efficiently. The industry is currently in Asset Management Plan 7 (AMP7) which runs from 2020 to 2025.

When considering investment requirements to accommodate growing demand, water companies are required to ensure a high degree of certainty that additional assets will be required before funding them. Longer term growth is, however, considered by the companies in their internal asset planning processes and in their 25-year Strategic Direction Statements and WRMPs.

3.10 Drainage and Wastewater Management Plans

The UK Water Industry Research (UKWIR) "21st Century Drainage" programme has brought together water companies, governments, regulators, local authorities, academics and environmental groups to consider how planning can help to address the challenges of managing drainage in the future. These challenges include climate change, population growth, urban creep and meeting the Water Framework Directive.

The group recognised that great progress has been made by the water industry in its drainage and wastewater planning over the last few decades, but that, in the future, there needs to be greater transparency and consistency of long-term planning. The Drainage and Wastewater Management Plan (DWMP) framework[27] sets out how the industry intends to approach these goals, with the original objective of the water companies publishing plans by the end of 2022, in order to inform their business plans for the 2024 Price Review.

DWMPs will be prepared for wastewater catchments or groups of catchments and will encompass surface water sewers within those areas which do not drain to a treatment works. The framework defines drainage to include all organisations and all assets which have a role to play in drainage, although, as the plans will be water company led, it does not seek to address broader surface water management within catchments.

27 A framework for the production of Drainage and Wastewater Management Plans, UK Water Industry Research (2018). Accessed online at: https://www.water.org.uk/wp-content/uploads/2018/12/Water-UK-DWMP-Framework-Report-Main-Document.pdf on: 18/11/2022.

LPAs and LLFAs are recognised as key stakeholders and will be invited to join, alongside other stakeholders, the Strategic Planning Groups (SPGs) organised broadly along river basin district catchments.

DWMPs will provide more transparent and consistent information on sewer flooding risks and the capacity of sewerage networks and treatment works, and this should be taken into account in SFRAs, Water Cycle Studies, as well as in site-specific FRAs and Drainage Strategies.

Thames Water are creating their first DWMP this year with consultation closing in September 2022 and final publication in March 2023. Some of the main themes discussed within the draft DWMP are:

- improving the environment via SuDS
- nature based solutions
- asset heath such as protecting infrastructure
- affordable water bills for a growing population.

A focus on sewage treatment works quality compliance is also in the draft, with an objective to model WwTW compliance against current permit quality conditions. In the long term this will help protect the environment and improve water quality. This links to the future goals for storm overflow discharges which are described in section 0.

3.10.1 Developer Contributions and Utility Companies

Developments with planning permission have a right to connect to the public water and sewerage systems, however, there is no guarantee that the capacity exists to serve a development.

Developers may requisition a water supply connection or sewerage system or self-build the assets and offer these for adoption by the water company or sewerage undertaker. Self-build and adoption are usually practiced for assets within the site boundary, whereas requisitions are normally used where an extension of upgrading the infrastructure requires construction on third party land. The cost of requisitions is shared between the water company and developer as defined in the Water Industry Act 1991.

Where a water company is concerned that a new development may impact upon their service to customers or the environment (for example by causing foul sewer flooding or pollution) they may request the LPA to impose a Grampian condition, whereby the planning permission cannot be implemented until a third-party secures the necessary upgrading or contributions.

The above arrangements are third party transactions because the Town and Country Planning Act Section 106 agreements and Community Infrastructure Levy agreements may not be used to obtain funding for water or wastewater infrastructure.

3.10.2 Changes for New Connections

OfWAT, the water industry's economic regulator, published revised rules covering how water and wastewater companies may charge customers for new connections[28].These rules have applied to all companies in England since April 2018. South East Water and Thames Water publish their charging arrangements annually[29,30]. The key changes include:

- More charges will be fixed and published on water company websites. This will provide greater transparency to developers and will also allow alternative connection providers to offer competitive quotations more easily.
- There will be a fixed infrastructure charge for water and one for wastewater.
- The costs of network reinforcement will no longer be charged directly to the developer in their connection charges. Instead, the combined costs of all of the works required on a company's networks, over a five-year rolling period, will be covered by the infrastructure charges paid for all new connections.
- The definition of network reinforcement has changed and will now apply only to works required as a direct consequence of the increased demand due to a development. Where the water company has not been notified of a specific development, for example when developing long-term strategic growth schemes, the expenditure cannot be recovered through infrastructure charges.
- Thames Water offer discounts on new connection charges for developers that commit to water efficiency through water efficient appliances, rainwater harvesting, greywater recycling, and water neutrality[31].

28 Charging rules for new connection services (English undertakers), OfWAT (2017). Accessed online at: https://www.ofwat.gov.uk/publication/charging-rules-new-connection-services-english-undertakers/ on: 14/10/2022

29 Developer Charging Arrangements, South East Water (2022) Accessed online at: https://www.developers.southeastwater.co.uk/help/guidance/our-charges on: 14/10/2022

26 Charging arrangements for new connection services, Thames Water (2021) Accessed online at: https://www.thameswater.co.uk/media-library/home/developers/charges/2021/new-connection-charges-2021-22.pdf on: 14/10/2022

31 Thames Water to reward housing developers who achieve water neutrality, Thames Water (2022). Accessed online at: https://www.thameswater.co.uk/about-us/newsroom/latest-news/2022/feb/rewards-for-developers-who-achieve-water-neutrality on: 14/10/2022

- South East Water require a standard infrastructure charge or reduced infrastructure charge is payable for all first time 25mm (22mm internal) connections for domestic purposes[32].

3.10.3 Design and Construction Guidance (DCG)

The Design and Construction Guidance, part of a new Codes for Adoption covering the adoption of new water[33] and wastewater[34] infrastructure by water companies, contains details of the water sector's approach to the adoption of SuDS, which meet the legal definition of a sewer. This replaces the formerly voluntary Sewers for Adoption The new guidance came into force in April 2020 and compliance by water companies in England is mandatory.

The standards, up to and including Sewers for Adoption Version 7, have included a narrow definition of sewers to mean below-ground systems comprising of gravity sewers and manholes, pumping stations and rising mains. This has essentially excluded the adoption of SuDS by water companies, except for below-ground storage comprising of oversized pipes or chambers.

The new guidance provides a mechanism for water companies to secure the adoption of a wide range of SuDS components which are now compliant with the legal definition of a sewer. There are however several non- adoptable components such as green roofs, pervious pavements, and filter strips. These components may still form part of a drainage design so long as they remain upstream of the adoptable components.

The Design and Construction Guidance states that the drainage layout of a new development should be considered at the earliest stages of design. It is hoped that the new guidance will lead to better managed and more integrated surface water systems which incorporate amenity, biodiversity, and water quality benefits.

32 South East Water- Infrastructure charge and miscellaneous services: https://cdn.southeastwater.co.uk/Publications/Our+charges/infrastructure-charge-and-miscellaneous-services-charges-scheme-2021-22.pdf

33 Water UK Water Sector Guidance – approved documents. Accessed online at https://www.water.org.uk/water-sector-guidance-approved-documents/ on 18/11/2022

34 Water UK Sewerage Sector Guidance – approved documents. Accessed online at: https://www.water.org.uk/sewerage-sector-guidance-approved-documents/ on: 18/11/2022

4 Water Resources

4.1 Introduction

4.1.1 Objectives

The aim of the water resources assessment is to ensure that sufficient water is available in the region to serve the proposed level of growth, and that it can be abstracted without a detrimental impact on the environment, both during the plan period and into the future. The report will characterise the study area, identifying the key surface water and groundwater bodies, and local geology. It will highlight the pressures on water resources in the region, and what constraints are present on abstract and provide evidence for adopting a tighter water efficiency target allowed under building regulations.

4.1.2 Conclusion from Phase 1 Scoping study

The Phase 1 WCS concluded that whilst there is sufficient water resource to supply all the development within Wokingham identified in the call for sites process, constraints exist at the reservoir storage and bulk transfer level in Henley and Kennet Valley WRZs.

Large scale development in Arborfield, Barkham, Farley Hill within Kennet Valley WRZ, and Woodley, Twyford and Wargrave areas in Henley WRZ may require additional storage and/or additional bulk transfer capacity. Growth in these areas should be carefully planned with Thames Water to ensure that sufficient infrastructure is in place prior to developments being occupied.

A water supply surplus is identified in WRZ4 until 2050, and no constraints at the reservoir storage level have been identified by South East Water.

On the basis that there is a water supply surplus predicted across all three water resource zones until 2050 and there is sufficient time to adapt the long-term plan to include emerging trends in population, no further assessment of water resources was recommended in a phase 2 outline study.

4.1.3 Requirement for Phase 2 Outline Study

The scoping study assessed the impact of Wokingham Borough housing need on water resources. Since the Scoping Study, TW and SEW published their 2019 Water Resource Management Plans (WRMP) which was previously at the draft stage. A draft consultation version of the 2024 WRMPs is also now available.

The Phase 2 assessment will therefore consist of:

- a summary of the surface water and geology of the study area;

- groundwater status not included in Phase 1;
- summary of changes in information since the Scoping Study, such as the WRMP; and
- an update or restatement of TW's and SEW's positions.

4.2 Surface Water

Figure 4.1 shows the main watercourses within this study which lie in the River Thames catchment. The River Thames runs along the north-western boundary of Wokingham from Woodley to the village of Aston in the Parish of Remenham. The other main river in the area is the River Loddon which flows from south to north through the area, joining the River Thames slightly west of Wargrave. The River Loddon is fed by several tributaries: Twyford Brook, which joins south of Twyford, Emm Brook which flows through Wokingham, Barkham Brook which joins close to where the Loddon passes under the M4, and the River Blackwater in the south of the area.

The Blackwater forms the southern boundary of Wokingham Borough with the river Whitewater a significant tributary. Foudry Brook crosses the south-west of the area by Grazeley and joins the River Kennet south of Reading, which itself joins the River Thames within Reading.

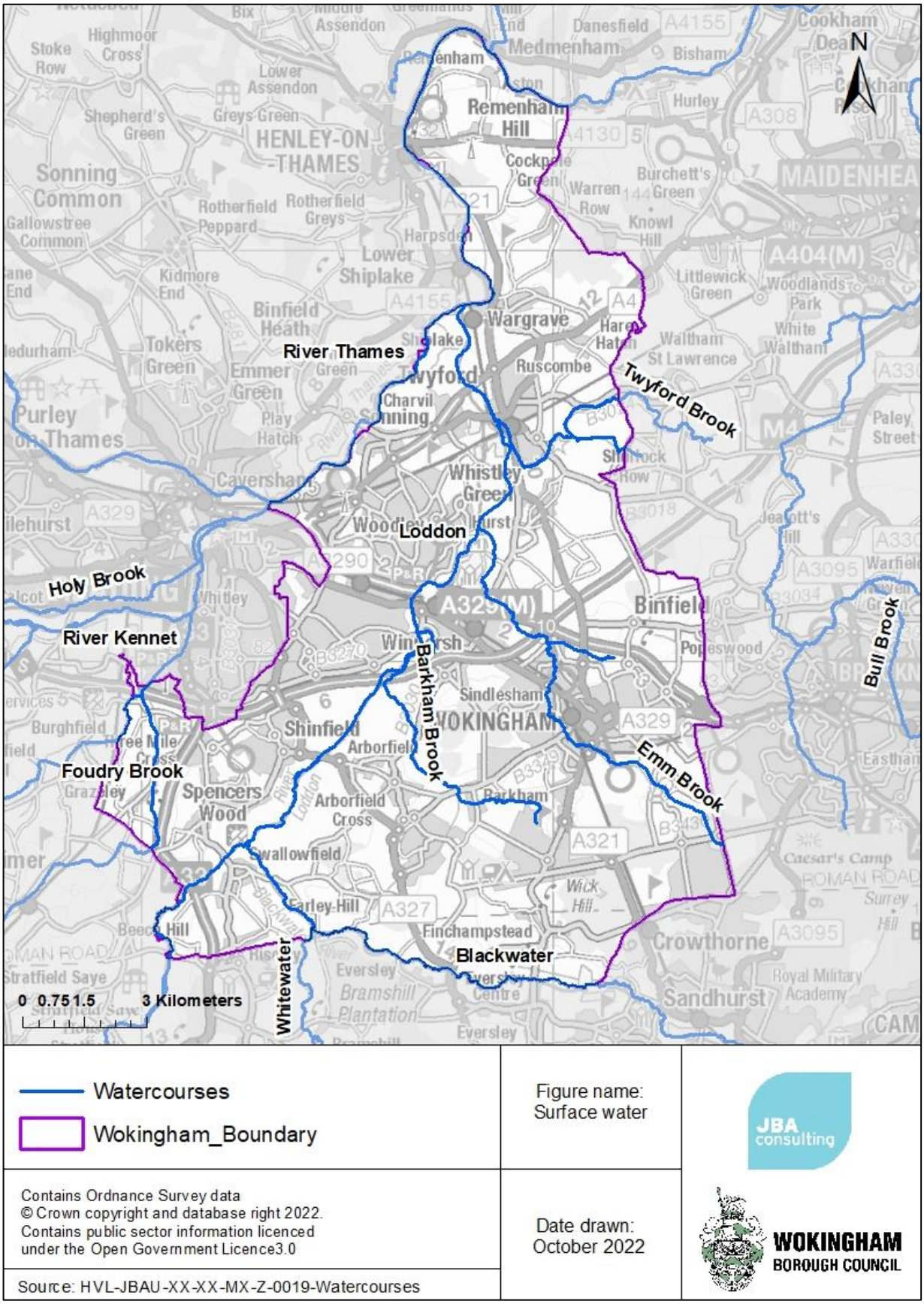


Figure 4.1 Surface waterbodies in Wokingham Borough

4.3 Geology

Wokingham Borough has four distinct geological bands, which are shown in Figure 4.2 below. Within the north, there is a White Chalk sub-group with a narrow band of Lambeth Group Clay, silt, sand, and gravel running east-west south of the Charvil and Twyford. The south-east of the area is underlain by Bracklesham Group and Barton Group (undifferentiated) sand silt, and clay. The rest of Wokingham consists of Thames Group clay, silt, sand, and gravel. A remote area of the Thames Group surrounded by Lambeth group can be found in the north-east of the study area on Bowsey Manor.

Figure 4.3 shows the superficial geology (at surface) depositing clay, silt and sand along the course of the river Loddon and the River Thames within the wider are of the sand and gravel. Localised deposits of Diamiction (clay with flints) are noticeable in the north of the study area.

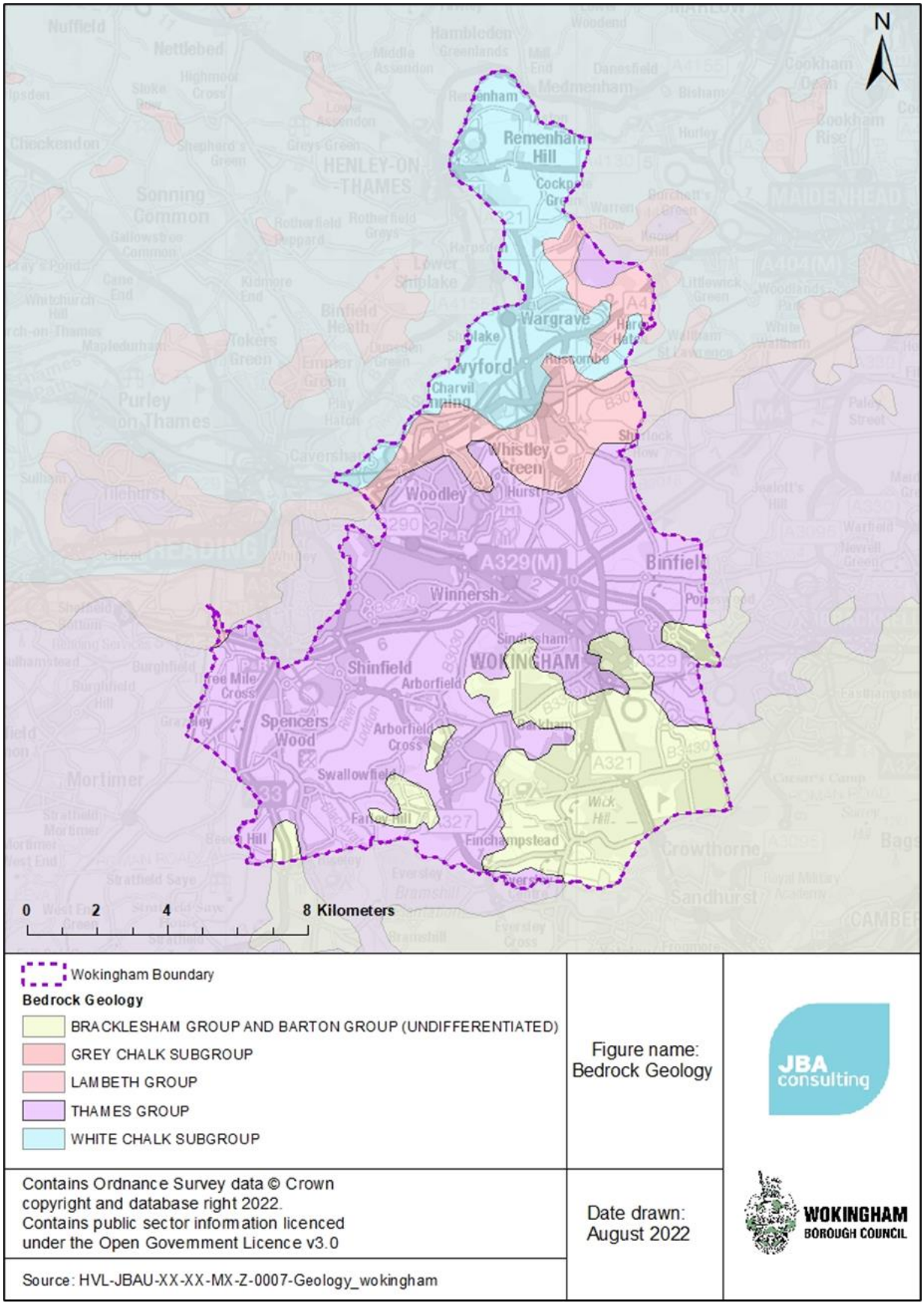


Figure 4.2 Bedrock geology of Wokingham Borough

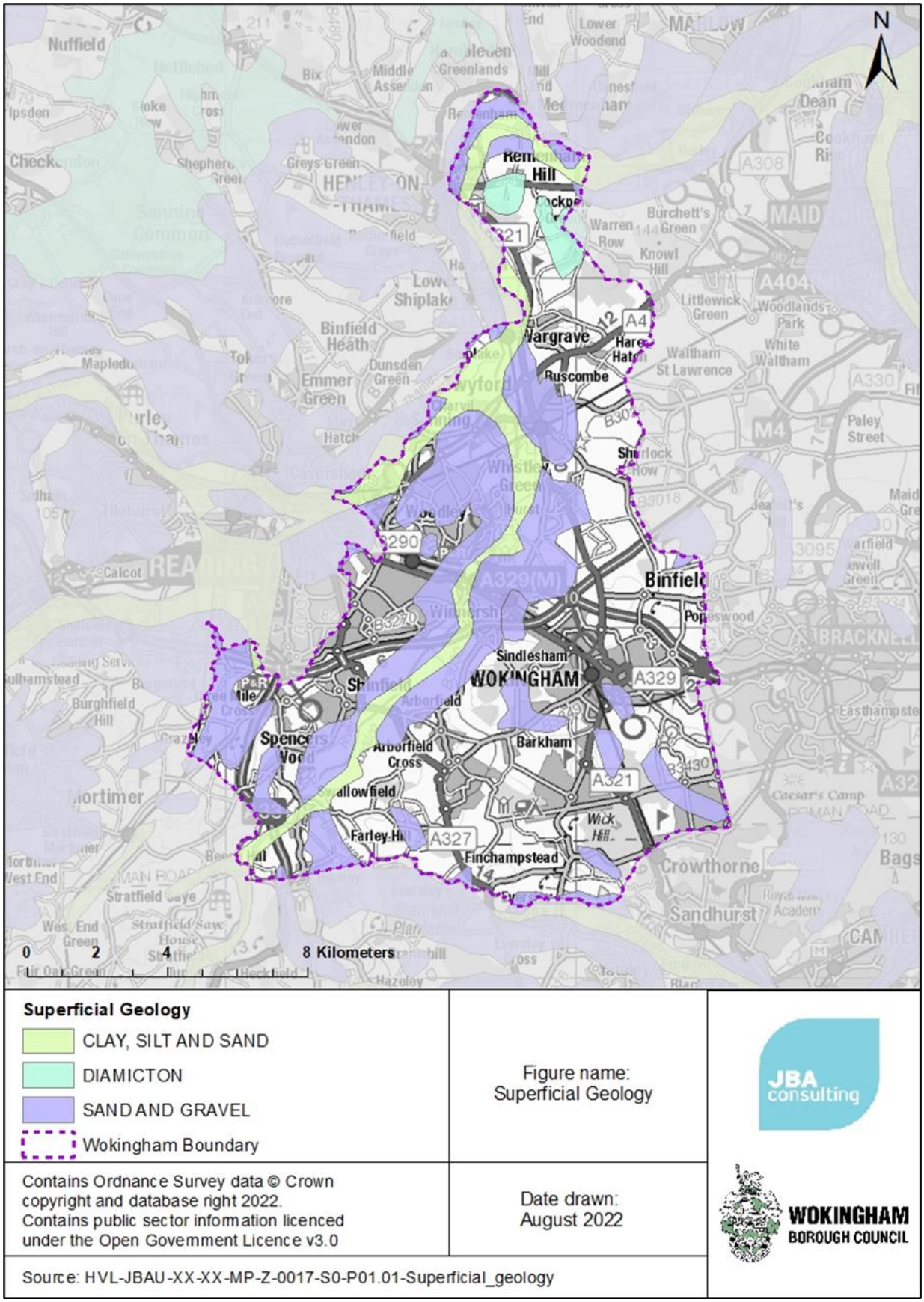


Figure 4.3 Superficial (at surface) geology of Wokingham Borough

4.4 Groundwaters

Groundwater bodies are shown in Figure 4.4 and their corresponding WFD classification is summarised in Table 4.1.

Table 4.1 WFD Status of groundwater bodies

Groundwater Bodies	Quantitative Status	Chemical Status	Overall Status
Aldermaston Bagshot Beds	Good	Good	Good
Berkshire Downs Chalk	Poor	Poor	Poor
Chiltern Chalk Scarp	Good	Poor	Poor
Chobham Bagshot Beds	Good	Poor	Poor
Maidenhead Chalk	Good	Poor	Poor
South-West Chiltern Chalk	Good	Good	Good
Thatcham Tertiaries	Good	Good	Good
Twyford Tertiaries	Good	Good	Good

Quantitative status of poor means that the water bodies failed the quantitative groundwater balance test, indicating the total existing abstraction may not be sustainable in the long term. This failure is associated with abstraction for agricultural and rural land management, as well as public water supply. Poor chemical status is associated with agriculture, rural and urban land management, point, and diffuse sources of pollution. One ground waterbody within the study area, the Berkshire Downs Chalk, has been given poor quantitative status. Despite this status, the WRMP does not predict a supply demand deficit for either Henley WRZ or Kennet Valley WRZ during the plan period.[35].

35 executive-summary.pdf (thameswater.co.uk)

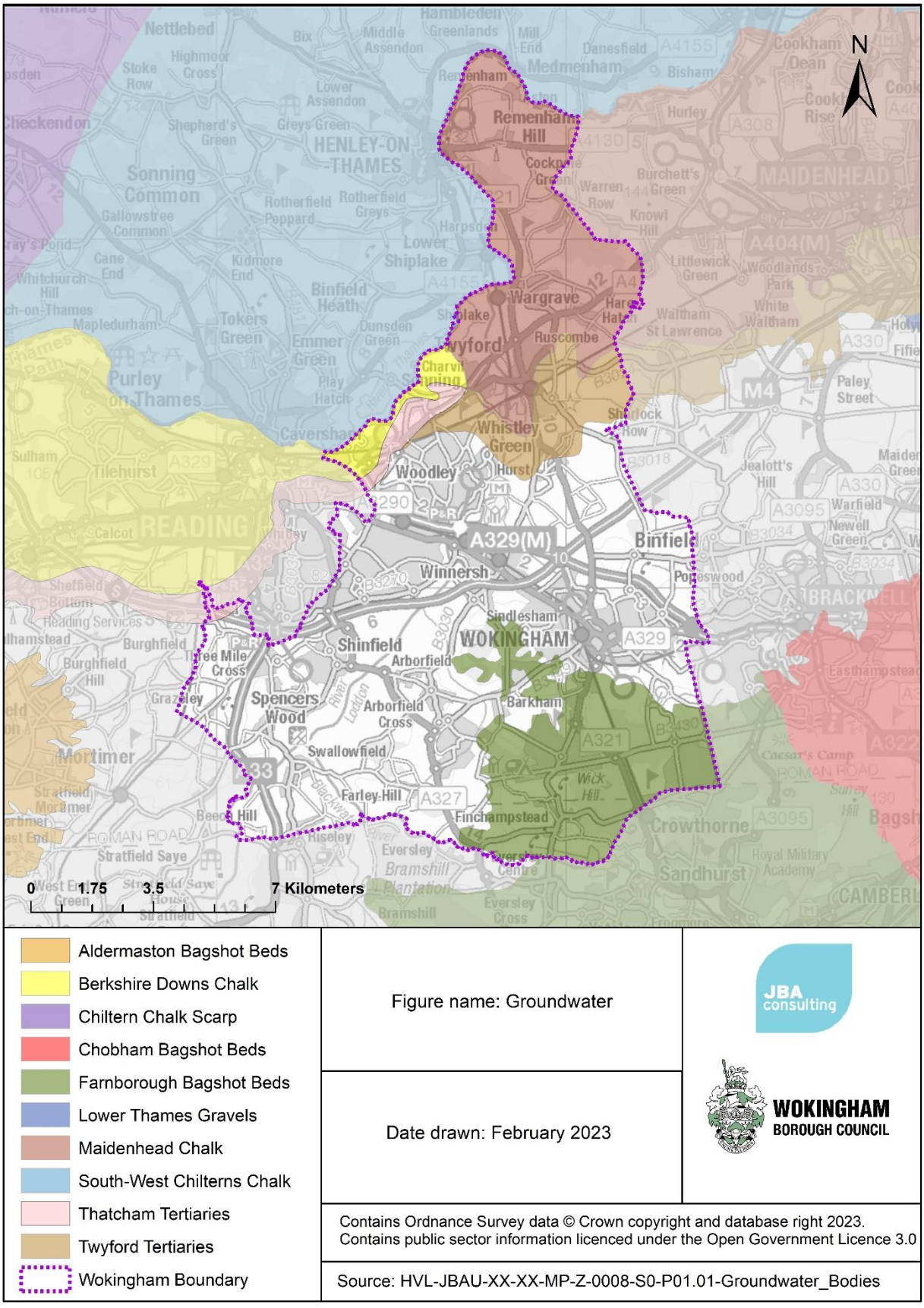


Figure 4.4 Groundwater bodies in Wokingham Borough

4.5 Availability of Water Resources

4.5.1 Abstraction Licensing Strategy

The Environment Agency (EA), working through their Resource Assessment Methodology (which replaces the former Catchment Abstraction Management Strategy (CAMS) process), prepare an Abstraction Licensing Strategy (ALS) for each sub-catchment within a river basin. Wokingham Borough is covered by three ALS areas: Loddon (south-east of Twyford), Thames Corridor (north-west of Twyford) and Kennet and Vale of White Horse (West of Spencers Wood). This are shown in Figure 4.5 below.

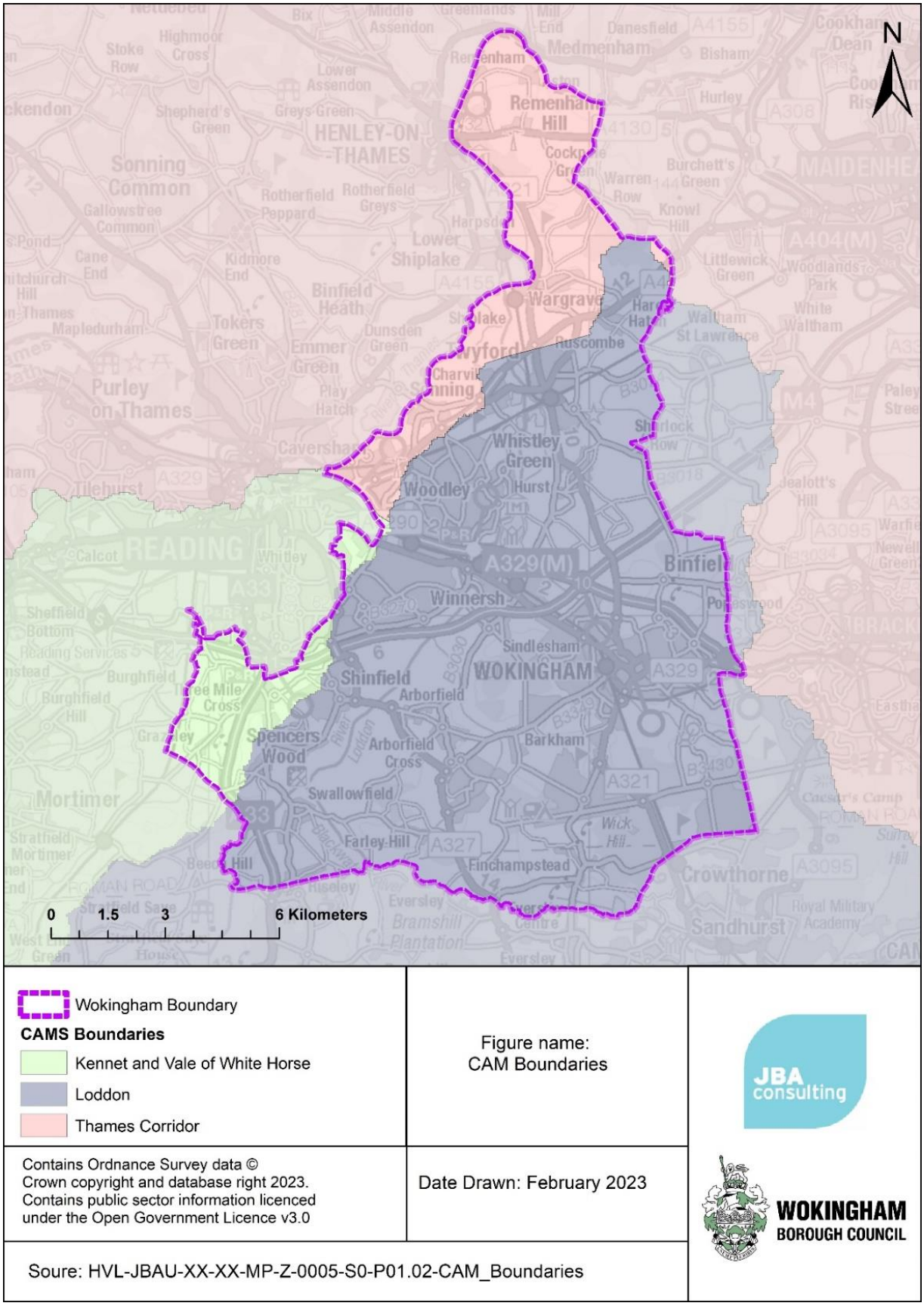


Figure 4.5 ALS (formally CAMS) boundaries covering Wokingham Borough

4.5.2 Resource Availability Assessment

In order to abstract surface water, it is important to understand what water resources are available within a catchment and where abstraction for consumptive purposes may pose a risk to resources or the environment. The Environment Agency has developed a classification system which shows:

- The relative balance between the environmental requirements for water and how much has been licensed for abstraction;
- whether there is more water available for abstraction in the area; and
- areas where abstraction may need to be reduced.

The availability of water for abstraction is determined by the relationship between the fully licensed (all abstraction licences being used to full capacity) and recent actual flows (amount of water abstracted in the last six years) in relation to the Environmental Flow Indicator (EFI). Results are displayed using different water resource availability colours, further explained in Table 4.2. In some cases, water may be scarce at low flows, but available for abstraction at higher flows. Licences can be granted that protect low flows, this usually takes the form of a "Hands-off Flow" (HOF) or Hands-off Level (HOL) condition on a licence, which mean abstractions have to stop when the river flow or level falls below a particular value. This value is known as the HOF or HOL and ensures there is always a minimum flow in the river. Surface Water Flows can be assessed at Assessment Points (APs) which are significant points on the river, often where two main rivers join or at a gauging station.

Groundwater availability as a water resource is assessed similarly, unless better information on principle aquifers is available or if there are local issues that need to be considered.

Table 4.2 Implications of surface water resource availability colours

Water Resource Availability Colour	Implications for Licensing
BLUE- High hydrological regime	There is more water than required to meet the needs of the environment. Due to the need to maintain the near pristine nature of the water body, further abstraction is severely restricted.
GREEN-Water available for licensing	There is more water than required to meet the needs of the environment. Licences can be considered depending on local/downstream impacts.
YELLOW-Restricted water available for licensing	Fully Licensed flows fall below the Environmental Flow Indicator (EFI). 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.

Water Resource Availability Colour	Implications for Licensing
	It may also be appropriate to investigate the possibilities for reducing fully licensed risks. Water may be available via licence trading.
RED- Water not available for licensing	Recent Actual flows are below the Environmental Flow Indicator (EFI). This scenario highlights water bodies where flows are below the indicative flow requirement to help support Good Ecological Status. No further licences will be granted. Water may be available via licence trading.
GREY-HMWBs (and /or discharge rich water bodies)	These water bodies have a modified flow that is influenced by reservoir compensation releases, or they have flows that are augmented. There may be water available for abstraction in discharge rich catchments.

Water resource availability is assessed under four different flow conditions:

- Q95 – very low flows which are exceeded 95% of the time
- Q70 – low flows which are exceeded 70% of the time
- Q50 – median flows which are exceeded 50% of the time
- Q30 – high flows which are exceeded 30% of the time

The resource availability for Thames Corridor, Loddon and Kennet and Vale of White Horse ALSs are summarised below, and for completeness the Water resource ALSs within the study area are presented graphically in Figure 4.6.

4.5.3 Thames Corridor ALS

The Thames Corridor ALS[36], referred to as TCAMS, extends the length of the non-tidal River Thames, from its source near to Kemble, Gloucestershire, through to the non-tidal limit at Teddington. Whilst it only covers a small area in the north of Wokingham, it has a significant impact on the other two CAMS areas. The TCAMS area supports significant abstractions for public water supply and to a lesser extent industry and agriculture. These are from both groundwater and the River Thames itself.

36 Thames catchment abstraction licensing strategy, Environment Agency (2014). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/321005/LIT_1855.pdf on: 10/11/2022

There are six gauging stations within the TCAMS area along the non-tidal Thames, with the closest to the study area being AP5 (Windsor gauging station) and AP6 (Kingston gauging station). AP6 is particularly significant as the resource availability at this gauging station overrides the availability at the other gauging stations and in the tributary ALS including the Loddon.

A bespoke licencing strategy has been adopted in the TCAMS area based on a tiered approach. The resource assessment process calculated that in order to protect the requirements for minimum flow at the critical AP6, an HOF of Q21 (7209 Ml/d) was required, i.e., abstraction will only be permitted at flows that occur 21% of the time or less. Investigations have shown that the current management of abstraction in the Lower Thames is not preventing the WFD requirement of “Good ecological status/potential” being met, and there was no evidence to suggest that significantly reducing abstraction would benefit the river. It was therefore decided to retain the existing Q50 HOF for the majority of abstractions.

The licencing strategy has the following levels:

- New consumptive licences below 2 Ml/d – no abstraction will take place when the average of the daily mean flows of the proceeding 5 days gauged at Kingston is less than or equal to Q50 (1780 Ml/d).
- New consumptive licences above 2 Ml/d – an HOF between Q21 and Q50 will be applied based on perceived risk to the waterbody. The applicant must provide a WFD assessment to show the abstraction will not cause environmental deterioration under the WFD or prevent the achievement of “Good ecological status/potential”.
- For abstractions of all sizes – additional HOFs may be applied to protect local features or existing abstractors.

Reliability of consumptive abstraction within the TCAMS area is dependent on the level of abstraction (due to the application of the bespoke licencing system). For abstractions greater than 2 Ml/d, reliability is less than 30%, therefore abstraction is only possible for approximately 77 days per year. For abstractions of 2 Ml/d or less, reliability is >50% and <70% and so abstraction is possible approximately 183 days per year.

All new licences have a common end date (CED), the next CED being 31st March 2028. Consumptive groundwater licences which do not have a direct impact upon main river flows may be permitted but may be subject to restrictions such as prescribed groundwater levels. Restrictions will be determined on a case-by-case basis, dependent upon the nature and scale of any abstraction.

Within the TCAMS areas there is an area of confined chalk south of Windsor. This aquifer does not directly or indirectly contribute to flow in the River Thames and is not linked to any of the assessment points. As it does not have an outcrop area, it receives no direct recharge, being maintained by inflow from the Maidenhead aquifer,

River Loddon and River Wey chalk outcrops. Groundwater levels are therefore sensitive to abstraction, with large scale abstraction unlikely to be viable. Small scale abstraction will be subject to a local assessment.

4.5.4 Loddon ALS

The Loddon ALS[37] area covers most of the Wokingham area, from Twyford in the north southwards. It has seven assessment points, the catchments for five of these, AP1, AP2 and AP5-7, are relevant to this study.

Four of the assessment points have a local resource status of “water available for licencing”, and one (AP5 – Whitewater) has the status “Water not available for licensing”. However, consumptive abstraction licences in this area are constrained by the need to maintain flow in the Lower Thames, and the Q50 restriction as measured at Kingston gauging station will apply.

In AP5 (Whitewater), there may be situations where the Loddon ALS area is subject to a dual HOF. Where this is applied, abstraction must cease when either the local or the TCAMs condition is met and can only resume once all conditions are clear.

Reliability of consumptive abstraction within the Loddon area is dependent upon conditions in the TCAMS area. For abstractions greater than 2 Ml/d, reliability is less than 30%, therefore abstraction is only possible for approximately 77 days per year.

A chalk formation to the south provides the dominant aquifer in the area. The groundwater availability in the Loddon ALS region is guided by the surface water assessment unless specific information on principle aquifers exists or local issues that need protecting overrule it.

Consumptive groundwater licences which do not have a direct impact upon main river flows may be permitted but may be subject to restrictions such as prescribed groundwater levels. Restrictions will be determined on a case-by-case basis, dependent upon the nature and scale of any abstraction.

4.5.5 Kennet and Vale of White Horse

The Kennet and Vale of White Horse ALS[38] covers a small area in the west of the Wokingham study area. Most abstractions within this CAMS area are from groundwater, with public supply the main use.

37 Loddon Catchment Abstraction Licensing Strategy, Environment Agency (2012). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289881/LIT_1777_a16a18.pdf on: 10/11/2022

38 Kennet and Vale of White Horse Abstraction Licencing Strategy, Environment Agency (2014). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachm

Both assessment points have a local resource status of “water available for licencing”. However, consumptive abstraction licences in this area are constrained by the need to maintain flow in the Lower Thames, and the Q50 restriction as measured at Kingston gauging station will apply.

There may be situations where this ALS area is subject to a dual HOF. Where this is applied, abstraction must cease when either the local or the TCAMs condition is met and can only resume once all conditions are clear.

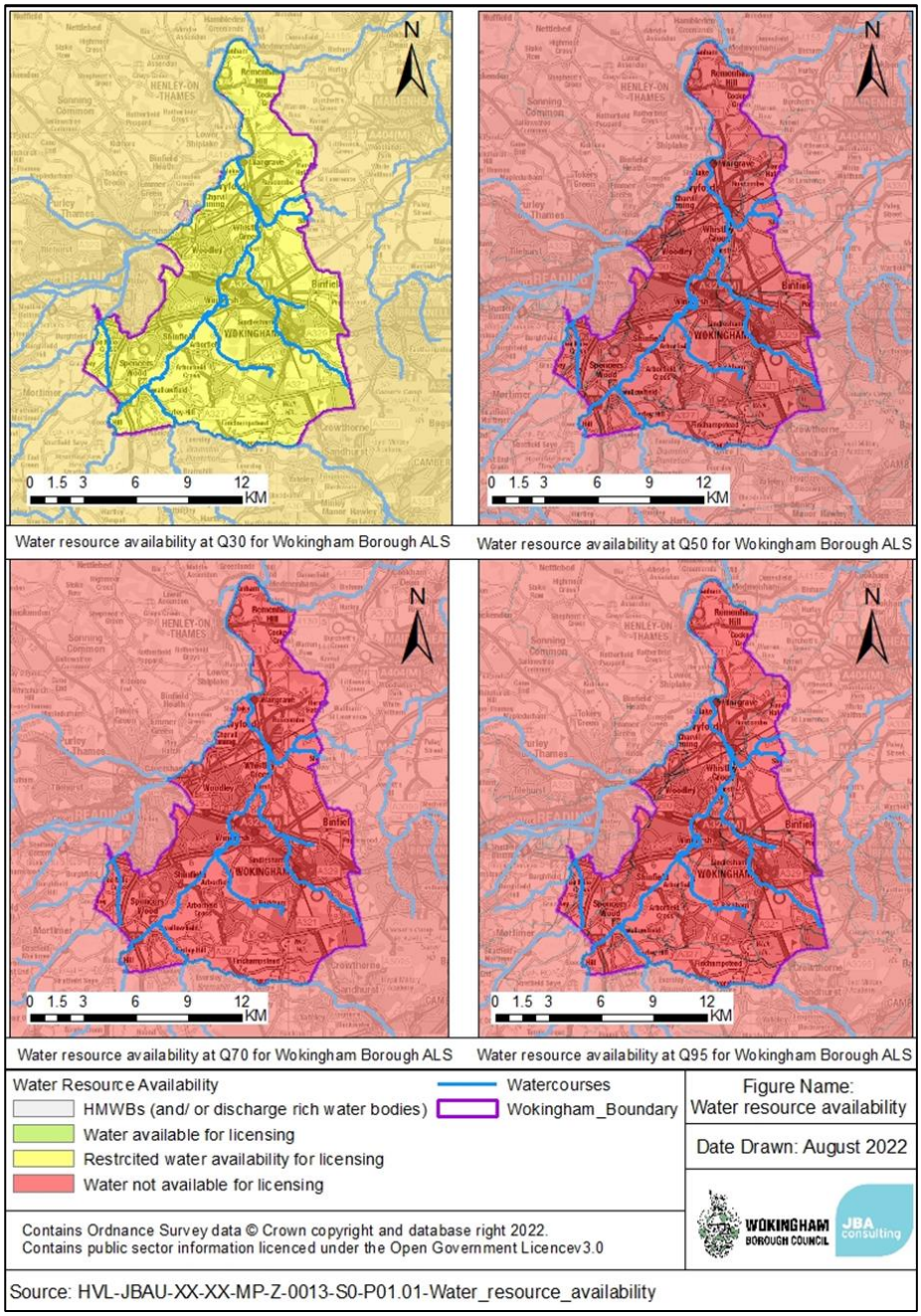


Figure 4.6 Water resource availability for Wokingham Borough

ent_data/file/289893/LIT_2517_39dc0f.pdf on: 10/11/2022

4.6 Water resource management plans

4.6.1 Overview

The scoping study presented a summary of the Draft 2019 WRMPs. The Final WRMPs were published in 2019 and reviewed for the Phase 2 WCS. There were no significant changes that would impact the WCS. Note that a draft consultation version of the 2024 WRMPs closed in March 2023. We have included a review of the dWRMP24, which gives an insight into what should be expected within the forthcoming WRMP24.

Thames Water's dWRMP24 is still under consultation until 21st March 2023, so reporting is still taking place from the 2019 WRMP within this report. South East Water's dWRMP finished consultation in February 2023, and a current outline of plans are available. These will be discussed in section 4.6.5 below.

4.6.2 Thames Water WRMP19

Thames Water have six water resource zones (WRZs) over the south of England. Two of these WRZs cover the study area, Kennet valley and Henley. In the Thames Valley, 30% of water supply is from surface water, and 70% from groundwater. Neither Kennet of Henley WRZs have any bulk transfer arrangements with other WRZ or with other supply companies.

Both Kennet Valley and Henley are predicted to have a surplus until 2099 in normal conditions. Kennet Valley WRZ is not predicted to be resilient in a 1 in 200-year drought, so a deficit in the 2090s is possible. Henley WRZ is resilient in a 1 in 200-year drought, which means it will have a surplus until 2099 in any conditions up to a 1 in 200-year drought[39].

4.6.3 Thames Water dWRMP24

Thames Water's dWRMP24 shows that Kennet Valley has a surplus supply-demand in the short term. Although, when considering the plan's resilience to a 1 in 500-year drought there is a deficit expected in all future scenarios. By 2050 the deficit in Kennet Valley will range from 7 Ml/d to 44 Ml/d. Subsequently, demand management is important in TW's plans for Kennet Valley.

Similar to Kennet Valley, in the short term there is a surplus of water within Henley WRZ, but by 2050 a supply-demand issue could arise with the supply-demand balance ranging from a 7 Ml/d surplus to a 3 Ml/d deficit.

To try to prevent this deficit in both Kennet Valley and Henley, TW are focussing on leakage reduction and metering of houses, as well as upgrades of current meters from

39 executive-summary.pdf (thameswater.co.uk)

AMP8 onwards. In the short-term TW have also stated they will continue with the reward-based incentive scheme for water efficiency that was introduced in AMP7[40].

4.6.4 South East Water WRMP19

South East Water has eight WRZs in the south-east of England, one of which covers part of the study area - WRZ04. This runs along the south-east of the borough. Outside of the study zone, WRZ04 also contains large urban areas such as Bracknell, Maidenhead and Basingstoke. There is also a transfer of water between WRZ04 and WRZ05 from groundwater. The WRMP identified a high reliance on groundwater with approximately 73% of water supply coming from underground aquifers.

Over the last six years, South East Water have reduced household per capita consumption (PCC). This is mainly due to the roll out of a compulsory metering scheme, but it is still higher than the national average at 150 l/p/d (litre per person per day). The reason for this is explained in their WRMP as socio-economic (higher level of affluence than average) and climate influences[41].

The Phase 1 scoping study stated that combined supply-demand balance is presented for WRZ04 and WRZ05 shows that a surplus is present until 2050. The most significant driver for this deficit from this point is the reduction in abstraction to ensure sustainability.

4.6.5 South East Water dWRMP24

The dWRMP states that WRZ4 (Bracknell) will have a deficit on average from 2045 onwards. To try to manage this deficit, there are plans to work towards leakage reduction, water efficiency activities and to diversify water resource[42].

SEWs plans to diversify water resources encompass:

- a new reservoir being built in 2036 at Broad Oak (Kent) and new reservoirs at preferred locations (Arlington, or at Broyle Place, Eastbourne)
- water recycling between Peacehaven Wastewater Treatment Plant (East Sussex)
- desalination at Reculver (Kent)

At this point it is unknown if these additional water resources will contribute supply to WRZ4.

40 Draft WRMP24 Document library - Thames Water Resources Management Plan (thames-wrmp.co.uk)
41 south-east-water-final-wrmp-2020-2080.pdf (southeastwater.co.uk)
42 Future water | South East Water

4.6.6 Draft Regional Plan for South East England

At the time of writing, Water Resources South East, a collaboration of the six water companies serving south east England, have issued a consultation version of their regional plan[43] for 2025 to 2075. From this water resources planning cycle, the role of this and other regional plans has been given much greater emphasis, given the need for a significant increase in water transfers and new strategic resources to address the challenges of climate change, a growing population and the need to reverse over-abstraction which is harming water habitats. In the South East, without intervention, this would amount to 2,670 megalitres per day (Ml/d) by 2075, as illustrated below:

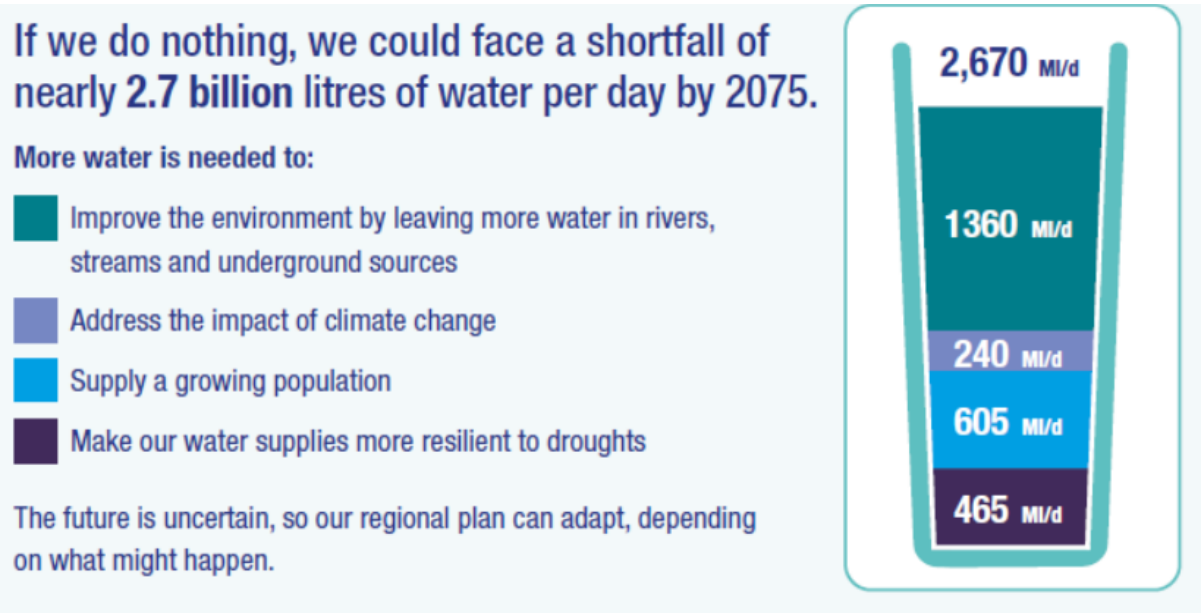


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Figure 4.7 Pressures on water supplies in the south east

Considering the Wokingham Local Plan period to 2040:

- 70% of the shortfall in water resources by 2035 is planned to be addressed by reduced leakage and reduced water consumption in homes and businesses. The plan forecasts per capita consumption to fall to 107l/p/d in the South East Water

43 Water Resources South East (2022) Futureproofing our water supplies. A consultation on our draft regional plan for South East England. Accessed online at: https://ehq-production-europe.s3.eu-west-1.amazonaws.com/6386456f87a70a2eb54d0587807767395e70146a/original/1668175434/1a9b2728e7384d4a4bb97a2313d06aa3_10306a_WRSE__BV_Plan_2022FINAL_Online.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA4KKNQAKICO37GBEP%2F20221118%2Feu-west-1%2Fs3%2Faws4_request&X-Amz-Date=20221118T113117Z&X-Amz-Expires=300&X-Amz-SignedHeaders=host&X-Amz-Signature=8931b530bca9f65863b6abfbbb3b28899b8deb49c3b37f4f281f69c9b33e883b on: 18/11/2022

area by 2050 and 121l/p/d in the Thames Water region. Whilst the plan doesn't rely upon a tightening of building regulations until 2060, it does identify very significant savings if these were to be introduced by 2040. The plan does not consider the other benefits of water efficiency in the home notably in lower water and energy bills.

- A further 13% will come from a reduced application of drought orders which permit abstractions that are harmful to the environment.
- The remaining 17% will come from a new reservoir, a new transfer from the Midlands via the Grand Union Canal, water recycling schemes and a mixture of smaller schemes. The plan also recommends development of the Abingdon reservoir, now known as the South East Strategic Resource Option (SESRO), to come online by 2040.

The cost of the full plan between 2025 and 2075 is estimated at between £10.7 billion and £16.4 billion. There are no specific schemes planned in Wokingham Borough, although the demand management measures will need to be applied everywhere. The plan makes minimal reference to new development and the role of the planning system in reducing water demand from new buildings

4.7 Water efficiency and water neutrality

4.7.1 Introduction

It is widely recognised that the climate is changing and in response, Wokingham Borough unanimously declared a climate emergency in July 2019. Climate change is predicted to increase pressure on water resources, increasing the potential for a supply-demand deficit in the future, and making environmental damage from over abstraction of water resources more likely. Furthermore, the delivery of water and wastewater services and the heating of water in the home require high energy inputs, and therefore contribute directly to emissions of greenhouse gases. Water efficiency therefore reduces energy use and carbon emissions. It is important therefore that new development does not result in an unsustainable increase in water abstraction. This can be done in several ways from reducing the water demand from new houses through to achieving "water neutrality" in a region by offsetting a new developments water demand by improving efficiency in existing buildings.

During 2019/20 water efficiency was a focus area for Thames Water. This included home and business visits to install devices and fix leaks. Household and business incentive schemes were also introduced such as an online Water Calculator as well as marketing. An Outcome Delivery Incentive (ODI) has also been introduced within the company to achieve leakage reduction targets. Within households, in partnership with Greenredeem, there is a customer rewards incentive scheme to encourage customers to save water. There is also a retail-based incentive for non-household water uses to reduce their water use.

In 2019/20 South East Water had installed water meters to 90% of household customers. Furthermore, water use information and demand management advice were given to households as well as an offer of a free water saving device. 18,000 properties have been visited for plumbing repairs to reduce water lost via leaks. South East Water do not offer incentives for water saving but focus on the education of their customers.

4.7.2 Required evidence

It is for Local Authorities to establish a clear need to adopt the tighter water efficiency target through the building regulations. This should be based on existing sources of evidence such as:

- the Environment Agency classification of water stress;
- water resource management plans produced by water companies;
- River Basin Management Plans which describe the river basin district and the pressure that the water environment faces. These include information on where water resources are contributing to a water body being classified as ‘at risk’ or ‘probably at risk’ of failing to achieve good ecological status, due to low flows or reduced water availability;
- consultations with the local water and sewerage company, the Environment Agency and catchment partnerships; and
- consideration of the impact on viability and housing supply of such a requirement.

4.7.3 Water stress

Water stress is a measure of the level of demand for water (from domestic, business and agricultural users) compared to the available freshwater resources, whether surface or groundwater. Water stress causes deterioration of the water environment in both the quality and quantity of water, and consequently restricts the ability of a waterbody to achieve a “Good” status under the WFD.

The Environment Agency has undertaken an assessment of water stress across the UK. This defines a water stressed area as where:

- “The current household demand for water is a high proportion of the current effective rainfall which is available to meet that demand; or
- the future household demand for water is likely to be a high proportion of the effective rainfall available to meet that demand.”

In the Environment Agency and Natural Resources Wales assessment both the South East Water and Thames Water supply regions are classed as areas of "serious" water stress.

4.7.4 River Basin Management Plans

The Cycle 3 Thames River Basin Management Plan (RBMP) was published in October 2022. One of the challenges identified in the RBMP is “changes to natural flow and levels of water”. Some of the measures planned within the Thames RBMP are:

- Diffuse pollution control initiatives, recovery of priority species - habitat restoration or creation and reintroducing species
- Habitat restoration or creation and species recovery. E.g., river and lake restoration, removing barriers to fish movement, tackle Invasive Non-Native Species, achieve objectives for water-dependent Sites of Special Scientific Interest and European sites, actions to conserve and enhance priority habitats and species.
- Engage with farmers across the catchment and develop a farmer cluster group to help tackle pollution and improve the water environment.
- Sewage treatment improvements by changes to licence conditions at specific sites[44].

4.7.5 National Water Resources Framework

A National Framework for Water Resources was published by the Government in March 2020. This outlines the water resources challenges facing England and sets out the strategic direction for the work being carried out by regional water resource groups.

A range of options were explored, and the most ambitious scenarios rely on policy change to introduce mandatory labelling of water using fittings and associated standards. The Government is currently reviewing policy on water efficiency following a recent consultation. The framework proposes that regional groups plan to help customers reduce their water use to around 110 l/p/d. This is achievable without policy interventions.

This aligns with the tighter standard of 110 l/p/d per day as described in building regulations. A water efficiency target for new build housing higher than 110 l/p/d would therefore make the overall target for the UK harder to achieve.

4.7.6 Regional Water Resources

As identified in section 3.3.4 the draft Water Resources South East plan forecasts that per-capita consumption in the South East Water area should come down to 107l/p/d by 2050, and 121l/p/d in the Thames Water region. Whilst the plan does not rely upon

44 River basin management plans, updated 2022: challenges for the water environment - GOV.UK (www.gov.uk)

reform of building regulations until 2060, it would clearly be contrary to the aims of this plan for new homes to be designed to 125l/p/d.

4.7.7 Impact on viability

As outlined in section 3.2.4 the cost of installing water-efficient fittings to target a per capita consumption of 110l/p/d has been estimated as a one-off cost of £9 for a four-bedroom house (compared with the cost of building to 125l/p/d). Research undertaken for the devolved Scottish and Welsh governments indicated potential annual savings on water and energy bills for householders of £24-£64 per year as a result of such water efficiency measures[45]. Water efficiency is therefore not only viable but of positive economic benefit to both private homeowners and tenants.

4.7.8 Summary of evidence for tighter efficiency standard

The strategic direction in the UK set out in the new National Water Resources Framework is to attain an average household water efficiency of 110 l/p/d by 2050. This also aligns with the recommendation in the River Basin Management Plan aimed at reducing the impact of abstraction. There would also be a positive economic impact for residents in terms of reduced energy and water bills.

As part of the Environmental Improvement Plan, a change to building regulations is being considered that would require a water efficiency standard of 105l/p/d and 100l/p/d where there is a clear local need, for instance in areas of water stress.

It is therefore recommended that the tighter water efficiency standard of 110 litres per person per day as described in Part G of Schedule 1 to the Building Regulations 2010 is adopted for Wokingham Borough. Future changes in building regulations may require this standard to be reviewed.

45 Waterwise (2018) Advice on water efficient new homes in England. Accessed online at: https://waterwise.org.uk/wp-content/uploads/2019/10/Advice-on-water-efficient-homes-for-England061118.pdf on 10/11/2022

4.7.9 Water neutrality concept

Water neutrality is a relatively new concept for managing water resources, but one that is receiving increased interest as deficits in future water supply/demand are identified. The definition adopted by the Government and the Environment Agency[46] is:

"For every development, total water use in the wider area after the development must be equal to or less than total water use in the wider area before development"

It is useful to also refer to the refined definition developed by Ashton:

"For every new significant development, the predicted increase in total water demand in the region due to the development should be offset by reducing demand in the existing community, where practical to do so, and these water savings must be sustained over time".[47]

This definition states the need to sustain water saving measures over time, and the wording "predicted increase in total water demand" reflects the need for water neutrality to be designed in at the planning stage.

Both definitions refer to water use in the region or "wider area", and the extent of this area should be appropriate to local authority boundaries, water resource zones, or water abstraction boundaries depending on what is appropriate for that particular location. For instance, if a development site is in an area of water stress relating to a particular abstraction source, offsetting water use in a neighbouring town that is served by a different water source will not help to achieve water neutrality.

In essence water neutrality is about accommodating growth in a region without increasing overall water demand.

Water neutrality can be achieved in several ways:

- Reducing leakage from the water supply networks.
- Making new developments more water-efficient.
- "Offsetting" new demand by retrofitting existing homes with water-efficient devices.
- Encouraging existing commercial premises to use less water.
- Implementing metering and tariffs to encourage the wise use of water.
- Education and awareness-raising amongst individuals.

46 Water Neutrality: An improved and expanded water resources management definition (SC080033/SR1), Environment Agency, 2009. Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291675/scho1009bqzr-e-e.pdf on: 10/11/2022

47 Water Resources in the Built Environment, edited by Booth and Charlesworth (2014). Published by Wiley.

Suggestions for water-efficiency measures are listed in Table 4.3 below.

Table 4.3 Consumer water efficiency measures

Topic	Measures
Educational and promotional campaigns	Encourage community establishments (e.g., schools, hospitals) to carry out self-audits on their water use Deliver water conservation message to schools and provide visual materials for schools Building awareness with homeowner/ tenants
Water-efficient measures for toilets	Cistern displacement devices to reduce volume of water in cistern Retro-fit or replacement dual flush devices Retro-fit interruptible flush devices Replacement low-flush toilets
Water-efficient measures for taps	Tap insert, such as aerators Low flow restrictors Push taps Infrared taps
Water-efficient measures for showers and baths	Low-flow shower heads Aerated shower heads Low-flow restrictors Shower timers Reduced volume baths (e.g., 60 litres) Bath measures
Rainwater harvesting and water reuse	Large-scale rainwater harvesting Small-scale rainwater harvesting for example with a water butt, or rainwater tank for toilet flushing Grey water recycling
Water efficient measures addressing outdoor use	Hosepipe flow restrictions Hosepipe siphons Hose guns (trigger hoses) Drip irrigation systems Mulches and composting
Commercial properties	Commercial water audits Rainwater recycling Grey water recycling Optimising processes Provide water efficiency information to all newly metered businesses
Metering	Promote water companies free meter option Compulsory metering (in water stressed areas) Smart metering (to engage customer with their consumption) Provide interactive websites that allow customers to estimate the

Topic	Measures
	savings associated with metering (environmental and financial) Innovative tariffs (seasonal, peak, rising block) Customer supply pipe leakages- supply pipe repair and replacement
Other	Household water audits, including DIY or with help of plumber Seek and fix internal leaks and/ or dripping taps Water efficient white goods, including washing machines and dishwashers Ask customers to spot and report leaks

Source: Adapted from Booth and Charleswell 2014

Many interventions are designed to reduce water use if operated in a particular way, and so rely on the user being aware and engaged with their water use. The educational aspect is therefore important to ensure that homeowners are aware of their role in improving water efficiency.

4.7.10 Rainwater Harvesting and Greywater Recycling

Rainwater harvesting

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

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

Benefits of RwH

- RwH reduces the dependence on mains water supply – reducing bills for homeowners and businesses.
- Less water needs to be abstracted from river, lakes and groundwater.
- Stormwater is stored in a RwH system reducing the peak runoff leaving a site providing a flood risk benefit (for smaller storms).
- By reducing surface water flow, RwH can reduce the first flush effect whereby polluted materials adhering to pavement surfaces during dry periods are removed by the first flush of water from a storm and can cause pollution in receiving watercourses.

Challenges of RwH

- Dependency on rainfall can limit availability of harvested rainwater during drought and hot weather events.
- Increased capital (construction) costs to build rainwater harvesting infrastructure into new housing (£2,674 for a 3/4bed detached home).
- Payback periods are long as the cost of water is low so there is little incentive for homeowners to invest.

Greywater Recycling

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

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

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

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

4.7.11 Energy and water use

According to EU statistics (Eurostat 2017), 17% of the UK’s domestic energy usage is for water heating. If less water was being used within the home, for instance through more water efficient showers, less water would need to be heated, and overall domestic energy usage would be reduced.

After analysing the results of a 2019 consultation on a Future Homes Standard, the Government made the decision that new homes need to be built with energy efficiency and the production of lower carbon emissions in mind (June 2022). Whilst there is no direct mention of water efficiency in this consultation, there is an important link

between water use and energy use, and therefore between water use and carbon footprint.

4.7.12 Funding for water neutrality

Water neutrality is unlikely to be achieved by just one type of measure, and likewise it is unlikely to be achieved by just one funding source. Funding mechanisms that may be available could be divided into the following categories:

- Infrastructure-related funding (generally from developer payments).
- Fiscal incentives at a national or local level to influence buying decisions of households and businesses.
- Water company activities, either directly funded by the five-year price review or because of competition and individual company strategies.
- Joint funding through energy efficiency schemes (and possibly to integrate with the heat and energy saving strategy).

Currently in the UK, the main funding resource for the delivery of water efficiency measures is the water companies, with some discretionary spending by property owners or landlords. For water neutrality to be achieved, policy shifts may be required in order to increase investment in water efficiency. Possible measures could include:

- Further incentivisation of water companies to reduce leakage and work with customers to reduce demand.
- Require water efficient design in new development.
- Developer funding to contribute towards encouraging water efficiency measures.
- Require water efficient design in refurbishments when a planning application is made.
- Tighter standards on water using fittings and appliances.

4.7.13 Thames Water incentives

Thames Water offer significant reductions in the developer connection charges for new building housing that achieves water efficiency better than the Building Regulations 125l/p/d standard. A tiered approach is taken as follows:

Tier 1: Basic water efficiency

“You’ll need to submit evidence that your development has been designed (as per the planning application) to achieve the ‘Optional Requirement’ of 110 litres/person/day, using the ‘Fittings Approach’ as outlined in Part G2 of the Building Regulations 2010 Approved Document G.”

Discount £200 per property

Tier 2: Rainwater Harvesting and Greywater Recycling

In addition to fulfilling the requirements of Tier 1, a further discount is offered if RwH or GwR is incorporated into the developers design.

Discount £1,000 per property

Tier 3: Water neutrality

"A water neutral development does not add additional water demand pressures to its water resource zone supply needs. This is achieved by making the development as water efficient as possible (by adhering to Tiers 1 and 2) and then offsetting the development's remaining water demand through savings made on existing homes and businesses in the same water resource zone."

Discount £1,800 per property.

Developers should be strongly encouraged to take up at least the Tier 2 incentives. These may be particularly applicable to larger developments where community scale RwH schemes could be applied, pooling the incentives and sharing cost.

4.8 Conclusions

- It is widely recognised that the climate is changing and in response Wokingham Borough Council declared a climate emergency in July 2019. Climate change is predicted to increase pressure on water resources, increasing the potential for a supply-demand deficit in the future, and making environmental damage from over abstraction of water resources more likely. Furthermore, the delivery of water and wastewater services and the heating of water in the home require high energy inputs, and therefore contribute directly to emissions of greenhouse gases. Water efficiency therefore reduces energy use and carbon emissions.
- It is important that new development does not result in an unsustainable increase in water abstraction. This can be undertaken in several ways from reducing the water demand from new houses through to achieving "water neutrality" in a region by offsetting a new developments water demand by improving efficiency in existing buildings.
- There is sufficient evidence to recommend the optional 110 litres per person per day design standard allowed under Building Regulations. This should be supported by an equivalent non-household water efficiency target. The BREEAM New Construction Standard can be used for this, and it is recommended that non-household development achieves a minimum of 3 credits under the measure "Wat01" which provides a 40% improvement in water consumption compared to the baseline for that type of building.
- Water resources are under significant pressure in the UK, and the direction of travel in water resources planning is to reduce per capita consumption in new build development below the optional building regulations standard of 110 l/p/d.

Currently this approach is not adequately supported in building regulations and the NPPF and policies requiring water efficiency standards less than 100l/p/d may only be supported at Local Plan examination in exceptional circumstances, such as a direct link between water abstraction and damage to a Special Area of Conservation.

- Until this changes, LPAs should encourage developers to go further than building regulations.
- This is supported by Thames Water's incentives for water efficient design in new builds outlined in 4.5 where significant inceptives are offered to reduce design consumption below 110l/p/d. Developers should be encouraged to achieve at least the Tier 2 incentive.

4.9 Recommendations

Table 4.4 Recommendations for water resources

Action	Responsibility	Timescale
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	TW and SEW	Ongoing
Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	WBC	Ongoing
Use planning policy to require the optional standard in Building Regulations of 110 l/p/d for new build housing.	WBC	In Wokingham LP
Use planning policy to require new build non-residential development to achieve at least 3 credits in the Wat01 Measure for water in the BREEAM New Construction standard.	WBC	In Wokingham LP
Larger residential developments (including new settlements), and commercial developments should consider incorporating greywater recycling and/or rainwater harvesting into development at the master planning stage in order to reduce water demand.	WBC, TW and SEW	In Wokingham LP
Water companies should advise WBC of any strategic water resource infrastructure developments within the study, where these may require safeguarding of land to prevent other type of development occurring.	WBC, TW and SEW	Part of Wokingham LP process

5 Water Supply Infrastructure

5.1 Introduction

An increase in water demand due to growth can exceed the hydraulic capacity of the existing supply infrastructure. This is likely to manifest itself as low pressure at times of high demand. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrades will be required. The time required to plan, obtain funding, and construct major pipeline works can be considerable and therefore water companies and planners need to work closely together to ensure that the infrastructure is able to meet growing demand.

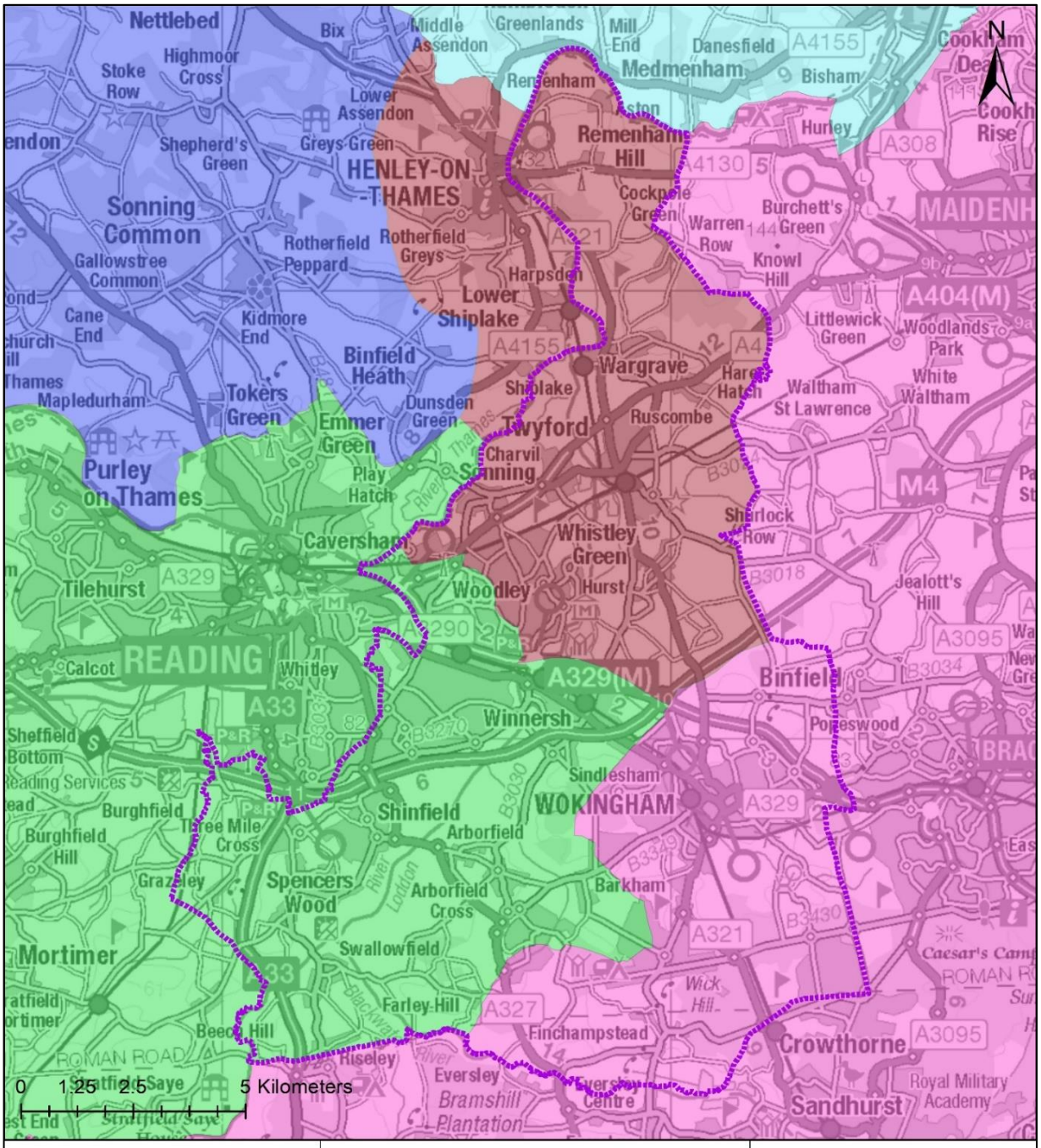
Water supply companies make a distinction between supply infrastructure, the major pipelines, reservoirs, and pumps that transfer water around a WRZ, and distribution systems, smaller scale assets which convey water around settlements to customers. This outline study is focused on the supply infrastructure. It is expected that developers should fund water company impact assessments and modelling of the distribution systems to determine requirements for local capacity upgrades to the distribution systems.

In addition to the work undertaken by water companies, there are opportunities for the local authority and other stakeholders to relieve pressure on the existing water supply system by increasing water efficiency in existing properties. This can contribute to reducing water consumption targets and help to deliver wider aims of achieving water neutrality.

A cost-effective solution can be for local authorities to co-ordinate with water supply companies and “piggyback” on planned leakage or metering schemes, to survey and retrofit water efficient fittings into homes[48]. This is particularly feasible within property owned or managed by the local authorities, such as social housing.

The WRZ and shown in Figure 5.1 with the corresponding water companies listed in Table 5.1.

48 Water Efficiency Retrofitting: A Best Practice Guide, Waterwise (2009). Accessed online at: http://www.waterwise.org.uk/wp-content/uploads/2018/01/Waterwise-2009_Water-efficiency-Retrofitting_Best-practice.pdf on: 10/11/2022



WRZ Wokingham

- Bracknell (WRZ4)
- Henley
- Kennet Valley
- SWOX
- Slough Wycombe Aylesbury
- Wokingham Boundary

Figure name:
WRZ in Wokingham

Date drawn: February 2023

Source:
HVL-JBAU-XX-XX-MX-Z-0010-S0-P01.02-WRZ

JBA consulting

WOKINGHAM BOROUGH COUNCIL

Figure 5.1 Water resource zones in Wokingham Borough

Table 5.1 Water resource zones in Wokingham Borough

WRZ	Water Company
Bracknell (WRZ4)	South East Water
Henley	Thames Water
Kennet Valley	Thames Water
SWOX	Thames Water
Slough Wycombe Aylesbury	Thames Water

5.2 Conclusion from Phase 1

The following conclusions were drawn in the Phase 1 study:

- In the Thames Water supply area, sites smaller than 50 houses can in general be accommodated without significant water supply infrastructure upgrades. Sites larger than 50, but smaller than 250 houses may require network reinforcement in order to be accommodated, and sites larger than 250 houses are likely to require significant network reinforcement.
- In the South East Water supply area, the conclusion above applies in general, however SEW noted specific network constraints in the area between the A329(M) and the M4 (east of the junction) and to the south of Wokingham. Development in these areas may require more extensive water supply infrastructure.
- Thames Water and South East Water did not identify any significant constraints to providing additional water supply infrastructure.
- South East Water also wanted to note that it has a statutory duty to serve new development. Given sufficient planning certainty over the locations and timing of new growth, this will be accommodated within the water supply network.

5.3 Phase 2 Methodology

An update to the assessment provided in Phase 1 was sought from TW and SEW who were provided a list of the potential allocations and asked to assess each site based on the impact on the water supply network. The following red/amber/green definition was applied to the water company assessment based on the comments provided:

LOW - GREEN	MEDIUM - AMBER	HIGH - RED
Capacity to serve the proposed growth	Infrastructure upgrades are required to serve proposed growth, but no significant constraints to the provision of this infrastructure have been identified	Infrastructure and/or treatment upgrades will be required to serve proposed growth. Major constraints have been identified

5.4 Results

5.4.1 Thames Water assessment

The assessment from TW is summarised in Table 5.2 and presented graphically in Figure 5.2. TW advised that at 12 of the sites, representing the majority of houses supplied by TW, the scale of development in this catchment is likely to require upgrades to the water supply network infrastructure. These may require flow and pressure modelling by TW as part of the planning process. No significant constraints to providing this infrastructure were identified by TW, so no red ratings were given to sites.

At 22, mostly smaller sites, 847 dwellings are likely to be accommodated within existing infrastructure.

It should be noted that an "amber" or "red" assessment does not indicate that a site cannot or should not be developed, it reflects the need for additional or upgraded infrastructure in order to accommodate it within the network without a detrimental impact on existing customers.

Table 5.2 TW water supply assessment

Type of growth	Red	Amber	Green
Number of residential sites	0	12	22
Number of houses	0	12,078 (9,711 outstanding)*	847 (825 outstanding)*
Number of employment sites	Not assessed	Not assessed	Not assessed
Employment floorspace (m^2)	Not assessed	Not assessed	Not assessed

* Based on housing data correct April 2022.

Sites that appear as "not assessed" in Figure 5.2 are served by SEW and so no site level assessment was available.

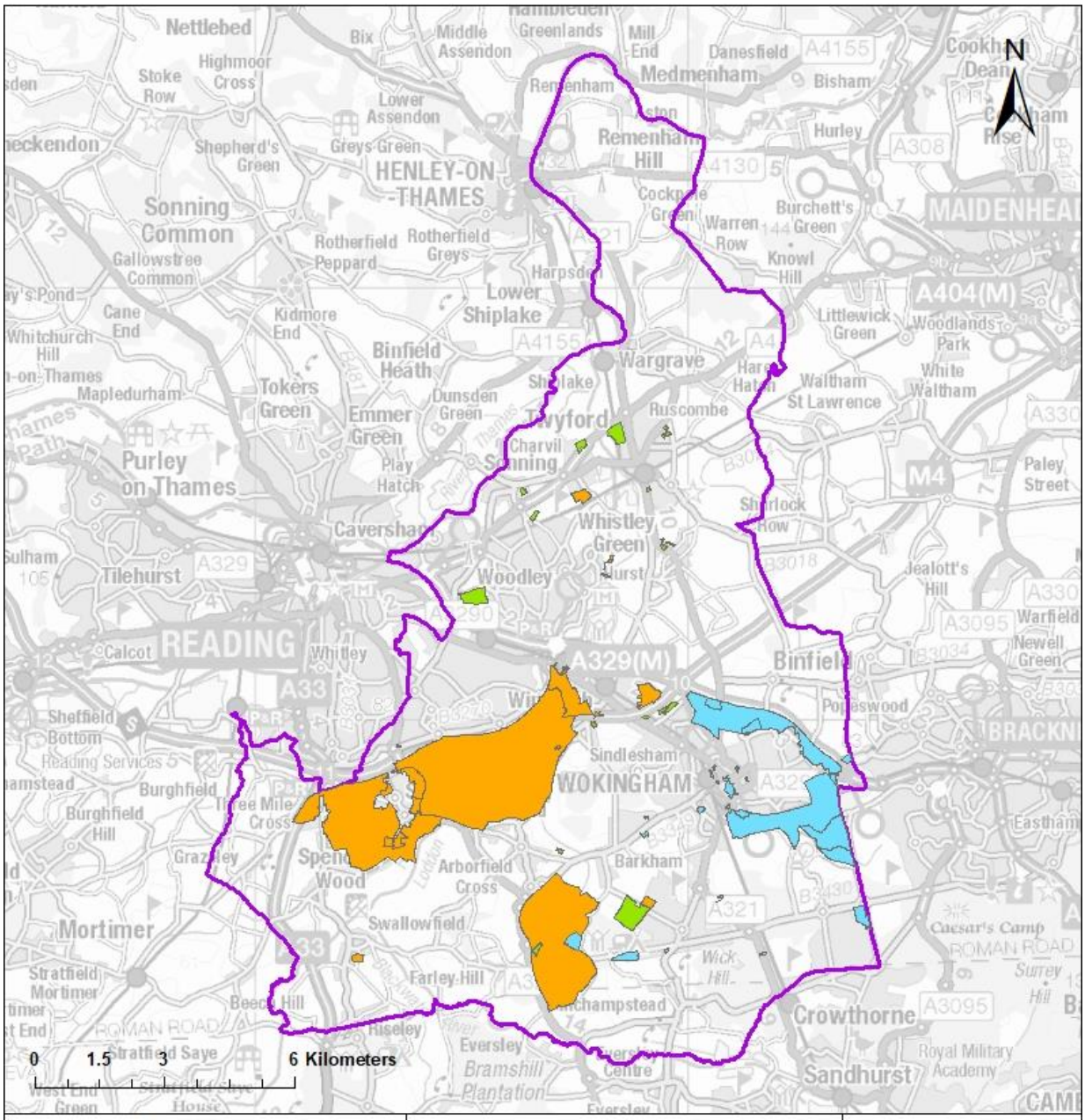


Figure 5.2 TW water supply assessment

5.4.2 South East Water assessment

SEW were provided potential allocations within their supply area and asked to apply a red/amber/green assessment to each as well as advising of any constraints in their area the LPA should aware of. Due to resource constraints within SEW this was not possible in the timescale of the project.

They provided the following comment at the time:

"As applications are made through our developer enquiry process, we will then carry out the appropriate detailed network modelling assessments, to ensure that any necessary infrastructure reinforcement is delivered (to move water to where is needed at a development level) ahead of the occupation of development. Where there are infrastructure constraints, we are aware not to underestimate the time required to deliver necessary infrastructure. We are therefore committed and willing to ensure engagement and communication at the earliest opportunity."

Following further engagement, SEW confirmed that based on the growth information provided as part of the WCS, they are "confident that our [Water Resource Management] plan accommodates a level of growth that aligns with the projections provided in your site tracker to ensure that sufficient water is available within the local area to meet supply-demand balance. It is recommended that the assessments originally requested be sought by WBC as part of the planning process as development sites come forwards.

5.5 Conclusions

TW advised that at 12 of the sites, representing the majority of new dwellings that would be supplied by TW, the scale of development was such that upgrades and /or new water supply infrastructure may be required in order to accommodate growth. Flow and pressure modelling may be required to be conducted as part of the planning process.

A similar assessment was sought from SEW but they were unable to provide this due to resource constraints. They advised that as applications are made through the developer enquiry process, they will then carry out the appropriate detailed network modelling assessments.

5.6 Recommendations

Early developer engagement with SEW and TW is essential to ensure that, where necessary, network reinforcement is delivered prior to developments becoming occupied. TW advise that, "failure to liaise with Thames Water will increase the risk of planning conditions being sought at the application stage to control the phasing of development in order to ensure that any necessary infrastructure upgrades are delivered ahead of the occupation of development. The housing phasing plan should determine what phasing may be required to ensure development does not outpace

delivery of essential network upgrades to accommodate future development/s in this catchment."

Table 5.3 Recommendations for water supply

Action	Responsibility	Timescale
Undertake network modelling to ensure adequate provision of water supply is feasible as part of the planning process.	SEW TW WBC	In planning process
WBC and Developers should engage early with SEW and TW to ensure infrastructure is in place prior to occupation.	WBC TW SEW Developers	In Local Plan
Obtain an assessment from SEW for proposed allocations.	WBC, SEW	As part of planning process

6 Wastewater collection

6.1 Sewerage undertaker for Wokingham

Thames Water is the Sewerage Undertaker (SU) for Wokingham Borough. The role of sewerage undertaker includes the collection and treatment of wastewater from domestic and commercial premises, and in some areas, it also includes the drainage of surface water from building curtilages to combined or surface water sewers. It excludes, unless adopted by the SU, systems that do not connect directly to the wastewater network, e.g., Sustainable Drainage Systems (SuDS) or highway drainage. At present, Thames Water do not adopt most forms of SuDS systems, however they will adopt conventional piped surface water drainage systems downstream of private or third-party SuDS, where these drain the building curtilage.

Increased wastewater flows into collection systems due to growth in populations or per-capita consumption can lead to an overloading of the infrastructure, increasing the risk of sewer flooding and, where present, increasing the frequency of discharges from storm overflows (also known as Combined Sewer Overflows or CSOs).

Likewise, headroom at Wastewater Treatment Works (WwTW) can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity. As the volumes of treated effluent rises, even if the effluent quality is maintained, the pollutant load discharged to the receiving watercourse will increase. In such circumstances the Environment Agency as the environmental regulator, may tighten consented effluent consents to achieve a "load standstill", i.e., ensuring that as effluent volume increases, the pollutant discharged does not increase. Again, this would require investment by the water company to improve the quality of the treated effluent.

In combined sewerage systems, or foul systems with surface water misconnections, there is potential to create headroom in the system, thus enabling additional growth, by the removal of surface water connections. This can most readily be achieved during the redevelopment of brownfield sites which have combined sewerage systems, where there is potential to discharge surface waters via sustainable drainage systems (SuDS) to groundwater, watercourses, or surface water sewers. In some areas of Wokingham, there are known issues of surface water causing localised flooding. Strategic schemes to provide improved local surface water drainage may be required in such areas, rather than solely relying upon on-site soakaways on brownfield or infill plots.

6.2 Sewerage System Capacity Assessment

New residential developments add pressure to the existing sewerage systems. An assessment is required to identify the available capacity within the existing wastewater

network, and the potential to upgrade overloaded systems to accommodate future growth. The scale and cost of upgrading works may vary significantly depending upon the location of the development in relation to the network itself and the receiving WwTW.

It may be the case that an existing sewerage system is already working at its full capacity and further investigations must be carried out to define which solution is necessary to implement an increase in its capacity. New infrastructure may be required if, for example, a site is not served by an existing system. Such new infrastructure will normally be secured through private third-party agreements between the developer and utility provider.

Sewerage Undertakers must consider the growth in demand for wastewater services when preparing their five-yearly Strategic Business Plans (SBPs) which set out investment for the next Asset Management Plan (AMP) period. Typically, investment is committed to provide new or upgraded sewerage capacity to support allocated growth with a high certainty of being delivered. Additional sewerage capacity to service windfall sites, smaller infill development or to connect a site to the sewerage network across third party land is normally funded via developer contributions, as third-party arrangements between the developer and utility provider.

6.3 Methodology

Thames Water were provided with a list of the sites and forecast housing numbers. Using this information, they were asked to assess each site using the range of datasets they hold.

A RAG score was then applied to each development site based on the comments provided by TW. Where TW advise: "On the information available to date we do not envisage infrastructure concerns regarding wastewater networks in relation to this development/s" a green score was given to the site. Where TW advised: "The scale of development/s is likely to require upgrades to the wastewater network", an amber score was given to the site. TW did advise of any significant constraints to providing upgrades so no red assessments were given to sites in the study area.

The following red / amber / green traffic light definition was therefore applied:

LOW - GREEN	MEDIUM - AMBER	HIGH - RED
Capacity to serve the proposed growth	Infrastructure and/or treatment work upgrades are required to serve proposed growth, but no significant constraints to the provision of this infrastructure have been identified	Infrastructure and/or treatment upgrades will be required to serve proposed growth. Major constraints have been identified

Amber or red assessments do not reflect a “showstopper” and it should be remembered that the water companies have a statutory duty to serve new development under the Water Industry Act 1991 – but there may be significant new infrastructure required.

An amber assessment indicates where further modelling may be required to understand local capacity in the network, and some network reinforcement to accommodate growth is likely to be required. A green assessment indicates that no constraints have been identified.

It should be noted that this assessment does not replace appropriate assessments or modelling as part of developer engagement with the sewerage undertaker, evidence of which should be demonstrated to the LPA as an application progresses through the planning process.

6.4 Results

6.4.1 Foul sewer network assessment

A summary of the TW assessment is provided in Table 6.1 TW foul sewer network assessment

Type of growth	Red Assessment	Amber Assessment	Green Assessment
Number of residential sites	0	23	39
Number of houses	0	17,990 (14,799 outstanding*)	1,570 (1,480 outstanding*)
Number of employment sites	Not assessed	Not assessed	Not assessed
Indicative Number of employees	Not assessed	Not assessed	Not assessed

*Based on housing data correct April 2022.

, and displayed graphically in Figure 6.1. 39 sites were given a “green” assessment, however as these are smaller sites, they only deliver 1,570 houses.

The remaining 23 sites were given an “amber” assessment indicating that some upgrades to infrastructure may be required to accommodate these sites. Typically, a network upgrade for a large-scale development could take 18 to 24 months to deliver depending on the complexity of the scheme. It is essential that Thames Water is engaged early so upgrade work can be planned and completed prior to occupation of new developments. In the case of some sites, significant investment may be required to pump wastewater to the nearest sewer, provide a bespoke treatment solution, undertake capacity upgrades, or undertake hydraulic modelling to better understand

the risk of flooding on site and the cumulative impacts of multiple sites within a catchment.

TW advise:

"It is recommended that the Developer and the Local Planning Authority liaise with Thames Water at the earliest opportunity to agree a housing and infrastructure phasing plan. The plan should determine the magnitude of spare capacity currently available within the network and what phasing may be required to ensure development does not outpace delivery of essential network upgrades to accommodate future development/s. Failure to liaise with Thames Water will increase the risk of planning conditions being sought at the application stage to control the phasing of development in order to ensure that any necessary infrastructure upgrades are delivered ahead of the occupation of development."

Table 6.1 TW foul sewer network assessment

Type of growth	Red Assessment	Amber Assessment	Green Assessment
Number of residential sites	0	23	39
Number of houses	0	17,990 (14,799 outstanding*)	1,570 (1,480 outstanding*)
Number of employment sites	Not assessed	Not assessed	Not assessed
Indicative Number of employees	Not assessed	Not assessed	Not assessed

*Based on housing data correct April 2022.

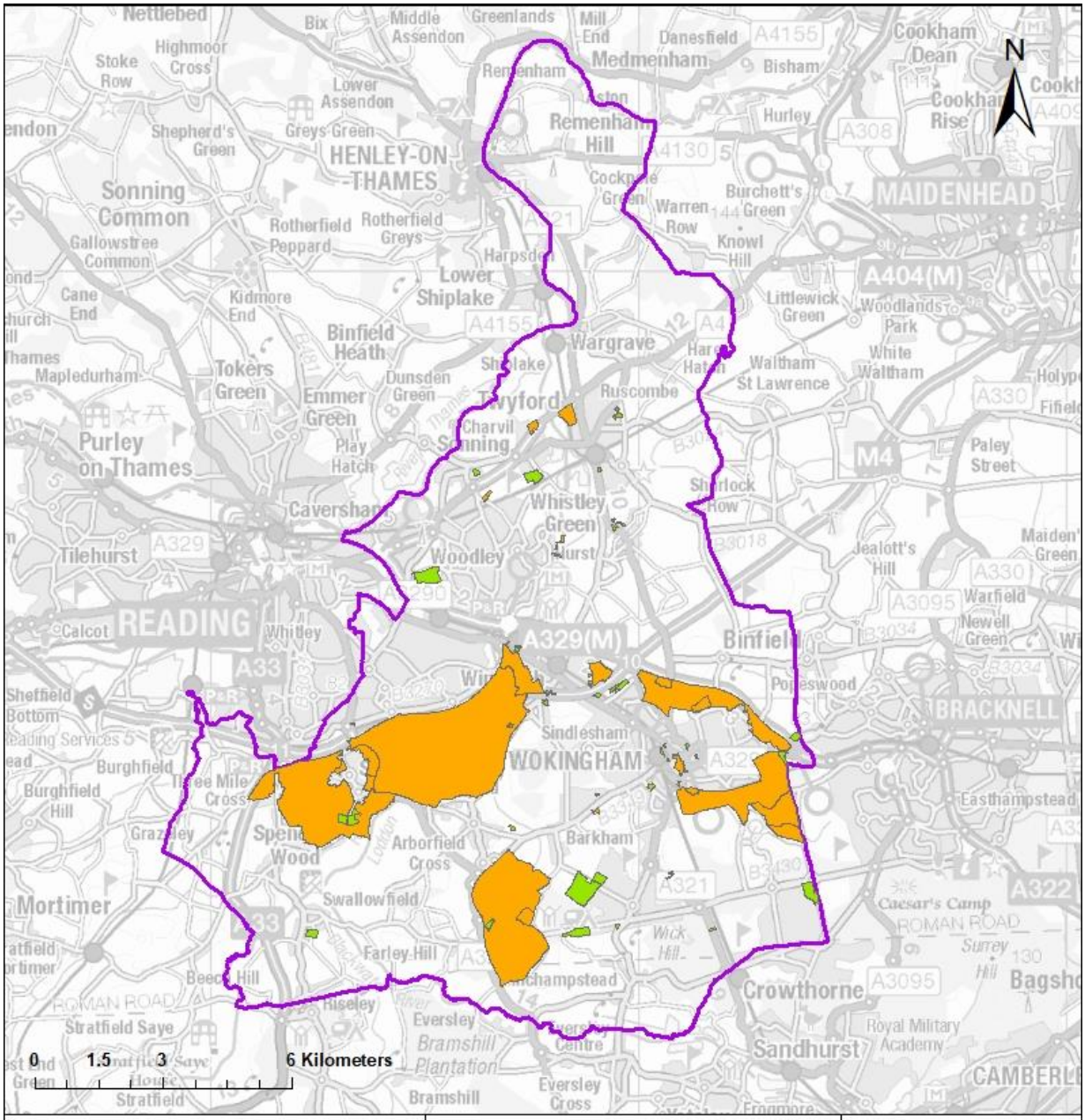


Figure 6.1 TW foul sewer network assessment

6.5 Storm overflows

6.5.1 Background

Storm overflows are an essential component in the sewer network – however when they operate frequently, they can cause environmental damage. They occur on combined sewer systems where the sewer takes both foul flow (sewage from homes and offices) and rainwater runoff. In normal conditions all of this flow passes through the sewer network and is treated at a wastewater treatment works.

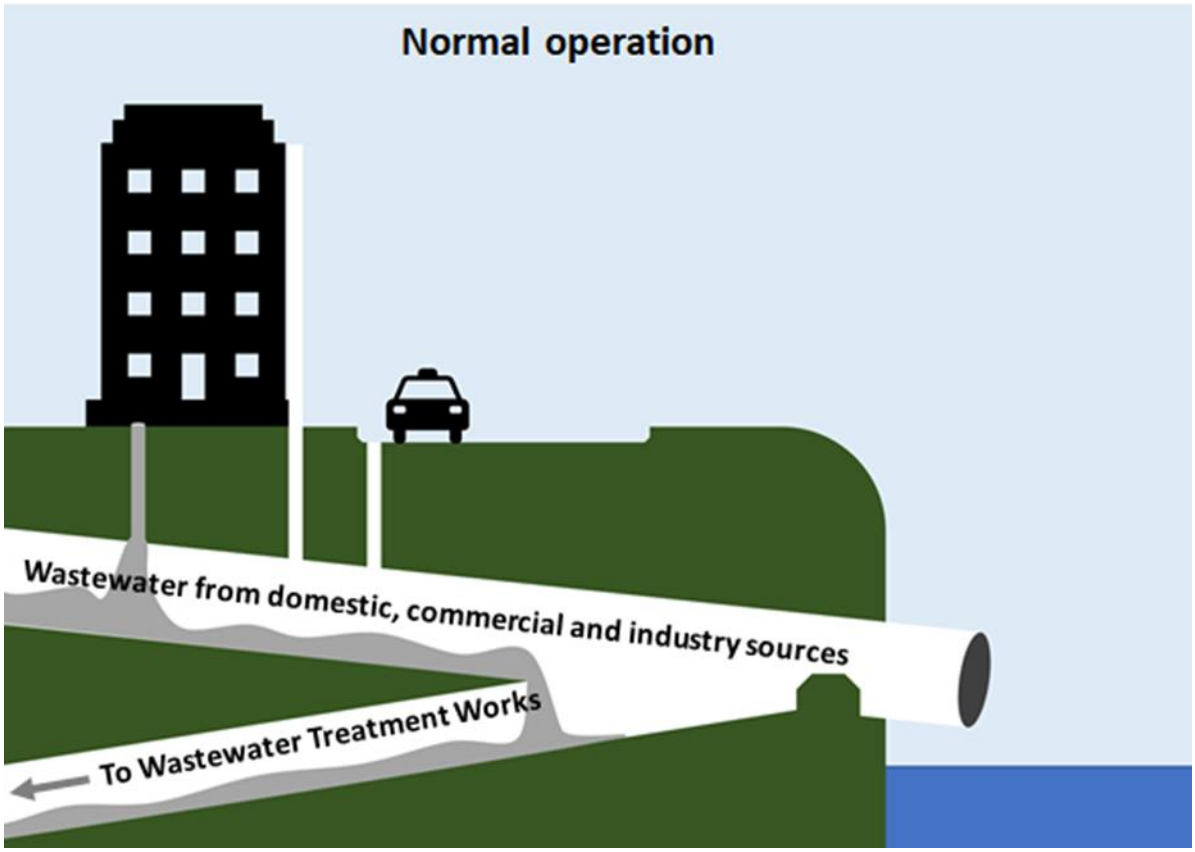


Figure 6.2 Storm overflow operation in normal conditions

In periods of exceptional rainfall, the capacity in a combined sewer may be used up by the additional flow from rooftops and storm drains. Once the capacity is exceeded, wastewater would back up into homes, businesses and on to roads. A storm overflow acts as a relief valve, preventing this from happening.

Storm overflows become problematic when they operate frequently in moderate or light rainfall, or for long periods as a result of groundwater infiltration in the sewerage system – possibly in breach of their permit.

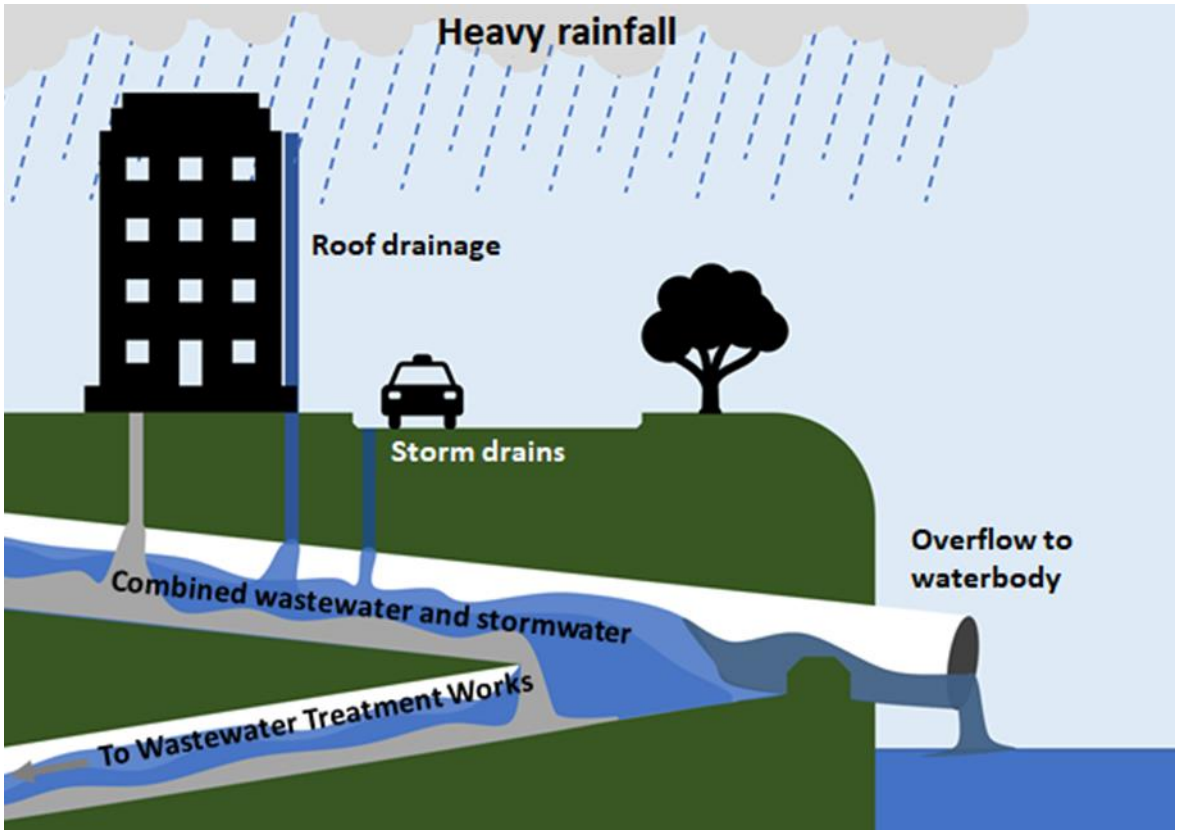


Figure 6.3 Storm overflow operations in exceptional rainfall event

6.5.2 Storm overflow assessment

The Environment Act now requires water companies to report and monitor storm overflows as well as reduce the harm caused to the rivers they discharge to. Figure 6.4 below shows the location of storm overflows on the wastewater network. Whilst these are outside the Wokingham Borough boundary, they discharge within wastewater catchments shared with Wokingham Borough.

Storm tank overflows are discussed in Section 7.2.1 and 0.

The Storm Overflow Taskforce[49] has agreed a long-term goal to end the damaging pollution caused by the operation of storm overflows. An important component of this is the monitoring of overflows, and a target has been set to monitor the frequency and duration of operation at all storm overflows by 2023[50]. This is called Event Duration Monitoring (EDM). The EDM dataset (which contains performance data on the 16,639

49 Made up of Defra, the EA, Ofwat, Consumer Council for Water, Blueprint for Water and Water UK

50 Event Duration Monitoring – lifting the lid on storm overflows, Environment Agency (2021). Accessed online at: https://environmentagency.blog.gov.uk/2021/03/31/event-duration-monitoring-lifting-the-lid-on-storm-overflows/ on: 15/11/2022

storm overflows monitored in 2021) has been used to provide information on storm overflows in Wokingham Borough. The EA have set a threshold of 60 operations per year above which a storm overflow should be investigated (if based on one year of data, the threshold is 50 for two years data and 40 for three years data).

Table 6.2 summarises the performance of the storm overflows on the network in Wokingham Borough. None of the overflows are currently operating above the threshold to trigger an investigation.

Although the overflows are operating below the threshold, it is important that development does not increase the frequency or duration of operation. There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing residential areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

Table 6.2 Storm overflow operation in 2020 and 2021

Storm overflow	Permit Ref.	Duration in 2020 (hours)	Duration in 2021 (hours)	% of year overflow operated (2020)	% of year overflow operated (2021)	Number of operations in 2020	Number of operations in 2021
COPPICE GREEN SU85708406 CSO	CTCR.1999	21.73	19.5	0.3%	0.2%	4	4
CAVERSHAM SPS	TEMP.1769	0	0.0	0.0%	0.0%	0	0
BLAKES LOCK SPS	TEMP.1768	0	0.0	0.0%	0.0%	0	0
FRIDAY STREET SU76823501 CSO	TEMP.1003	7.77	323.9	0.1%	3.7%	6	17

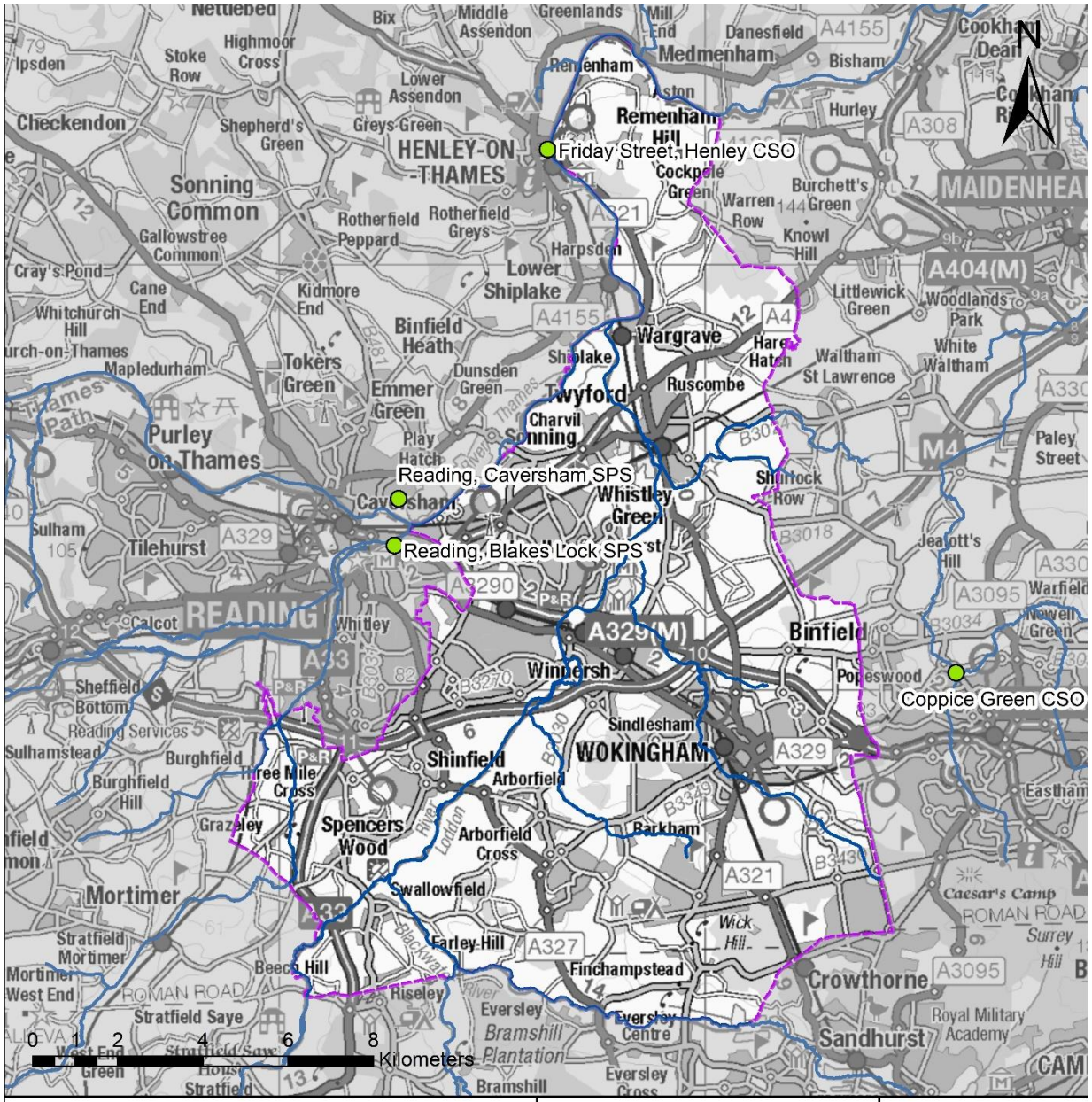


Figure 6.4 Location of network storm overflows around Wokingham Borough

6.6 Conclusions

Developments in the area where there is limited wastewater network capacity will increase pressure on the network. Subsequently, this will increase risk of a detrimental impact on existing customers and increasing likelihood of storm overflows (where present). The assessment performed by TW indicated that on larger development sites, modelling of the wastewater network was needed at part of the planning process, and upgrades to the network are likely to be required. These must be in place before occupation of development. No significant constraints to providing network upgrades have been identified.

Overall, there are no network storm overflows in the study area exceeding the threshold of 50 operations per year that would trigger an investigation. It is important that development does not increase the frequency or duration of operation.

There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing residential areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

6.7 Recommendations

Table 6.3 Recommendations for wastewater network

Actions	Responsibility	Timescale
Early engagement between Developers, WBC and TW is required to ensure that where upgrades to infrastructure is required, it can be planned in by TW.	WBC Developers TW	Ongoing
Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker	SCC TW SEW	Ongoing
Developers will be expected to work with the sewerage undertaker closely and early in the planning promotion process to develop an outline foul Drainage Strategy for sites to the satisfaction of the LPA that the development will not increase sewer flooding or the frequency or duration of storm overflow operation. The Outline Foul Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets / upgrades	Developers TW SEW	Ongoing

Actions	Responsibility	Timescale
to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.		
Developers will be expected to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to foul sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA. Where a surface water connection is proposed to the public sewerage network, it should be demonstrated to Thames Water that there is no other technically feasible option by selecting options as high as possible within the surface water hierarchy.	Developers LLFA TW SEW	Ongoing

7 Wastewater treatment

7.1 Wastewater Treatment Works in Wokingham Borough

There are eight WwTW within Wokingham, all of which are operated by Thames Water. Three of these are likely to serve growth within Wokingham Borough during the Local Plan period. In addition, there are four WwTW in neighbouring authority areas that are likely to serve growth from within Wokingham. The location of these WwTW is shown in Figure 7.1 below.

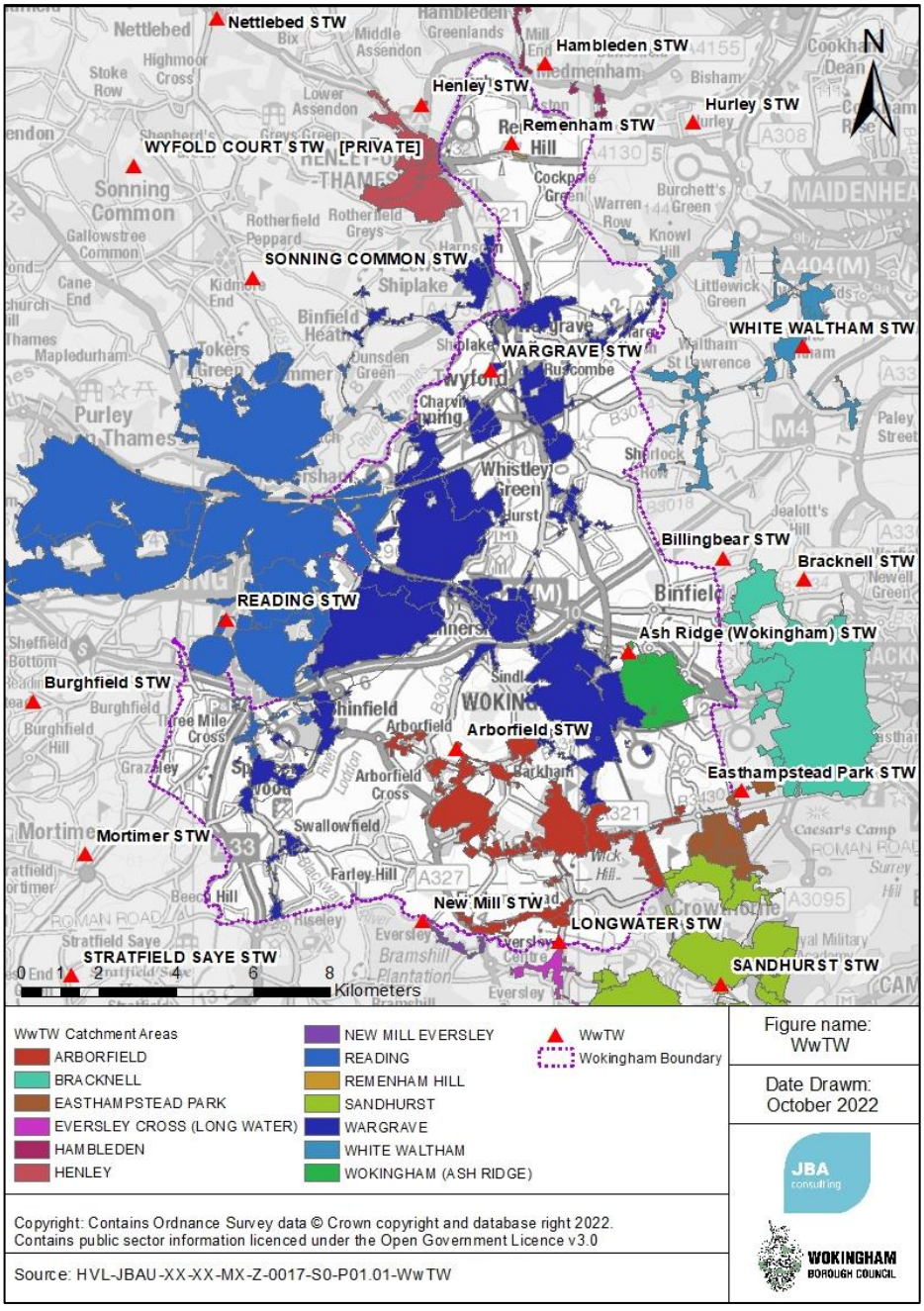


Figure 7.1 Location of WwTWs and their catchments in Wokingham Borough

7.2 Wastewater Treatment Works Flow Permit Assessment

7.2.1 Introduction

The Environment Agency is responsible for regulating sewage discharge releases via a system of Environmental Permits (EPs). Monitoring for compliance with these permits is the responsibility of both the EA and the plant operators. Figure 7.2 summarises the different types of wastewater releases that might take place, although precise details vary from works to works depending on the design.

During dry weather, the final effluent from the Wastewater Treatment Works (WwTW) should be the only discharge (1). With rainfall, the storm tanks fill and eventually start discharging to the watercourse (2) and Combined Sewer Overflows (CSOs) upstream of the storm tanks start to operate (3). The discharge of storm sewage from treatment works is allowed only under conditions of heavy rain or snow melt, and therefore the flow capacity of treatment systems is required to be sufficient to treat all flows arising in dry weather and the increased flow from smaller rainfall events. After rainfall, storm tanks should be emptied back to full treatment, freeing their capacity for the next rainfall event.

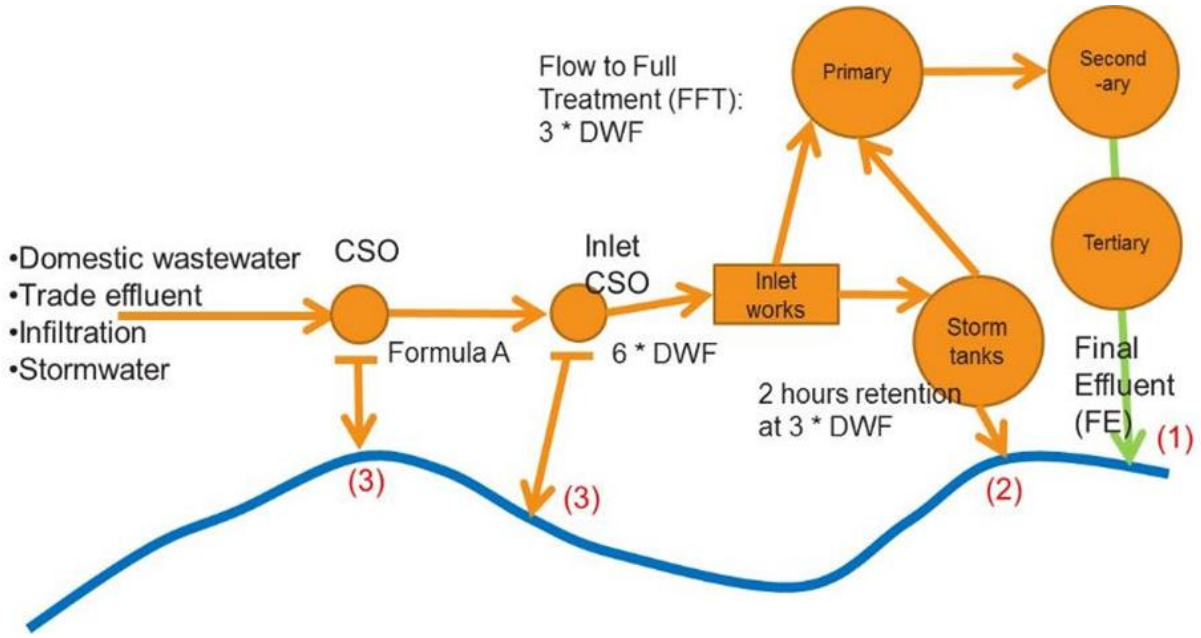


Figure 7.2 Overview of typical combined sewerage system and WwTW discharges

Environmental permits are used alongside water quality limits as a means of controlling the pollutant load discharged from a water recycling centre to a receiving watercourse. Sewage flow rates must be monitored for all WwTW where the permitted discharge rate is greater than 50 m^3/day in dry weather.

Permitted discharges are based on a statistic known as the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for WwTW design, as a means of estimating the 'base flow' in sewerage

modelling and for determining the flow at which discharges to storm tanks will be permitted by the permit (Flow to Full Treatment, FFT).

WwTW Environmental Permits also consent for maximum concentrations of pollutants, in most cases Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia (NH4). Some works (usually the larger works) also have permits for Phosphorous (P). These are determined by the Environment Agency with the objective of ensuring that the receiving watercourse is not prevented from meeting its environmental objectives, with specific regard to the Chemical Status element of the Water Framework Directive (WFD) classification.

Increased domestic population and/or employment activity can lead to increased wastewater flows arriving at a WwTW. Where there is insufficient headroom at the works to treat these flows, this could lead to failures in flow consents.

Areas not covered by catchments shown in Figure 7.1 may not have an existing public sewer system. Where this is the case, small developments in more rural areas may be suitable for on-site treatment and discharge, however the Environment Agency will not usually permit this where there is a public sewerage system within a distance calculated as 30m per dwelling from any part of the site boundary.

7.3 Methodology

Thames Water were provided with the list of proposed development sites and the potential housing numbers for each site. TW were then invited to provide an assessment of the receiving WwTW and provide any additional comments about the impacts of the development.

A parallel assessment of WwTW capacity was carried out using measured flow data supplied by the water companies. The process was as follows:

- Calculate the current measured Dry Weather Flow (DWF). This was calculated as the 80-percentile exceedance flow for the period January 2018 to December 2021.
- The flow data was cleaned to remove zero values and low outlier values which would bring the measured DWF down.
- Potential development sites and existing commitments were assigned to a WwTW using the sewerage drainage area boundaries.
- For each site, the future DWF was calculated using the occupancy rates and per-capita consumption values obtained from the Water Resource Management Plans (Table 7.1), and the assumption that 95% of water used is returned to sewer. Permitted headroom was used as a substitute for actual designed hydraulic capacity for each WwTW being assessed.

Table 7.1 Values used in water demand calculations

Water Company	Water Resource Zone	Occupancy rate (persons per dwelling)	Per capita consumption (m^3/person/day)
South East Water	WRZ4	2.4	0.2
Thames Water	Henley	2.1	0.2
Thames Water	Kennet Valley	2.2	0.2

The demand forecast contains all the expected development served by WwTWs within or shared with WBC. This included allocations, sites already in the planning system, windfall, and neighbouring authority growth.

The following red / amber / green traffic light definition was used by TW to score each site:

LOW - GREEN Capacity to serve the proposed growth	MEDIUM - AMBER Infrastructure and/or treatment work upgrades are required to serve proposed growth, but no significant constraints to the provision of this infrastructure have been identified	HIGH - RED Infrastructure and/or treatment upgrades will be required to serve proposed growth. Major constraints have been identified

7.4 Results

Thames Water provided a position statement outlining their response to growth within the study area and information on each WwTW.

The position statement provides the following general comments:

"Thames Water use LPA housing and employment growth figures and ONS data to help project likely increases in sewage flows to its STWs. We also take into consideration a range of other factors, including data on wastewater flows entering the STW. Using this information, we seek to ensure that the STW have sufficient capacity to cater for the growth being proposed. Where capacity constraints at STW are predicted, we aim to invest at the appropriate time to ensure our treatment permit levels continue to be met.

As our sewerage network and the STW are impacted by development in several other LPA areas, we also need to assess the cumulative impacts of these areas. It is important to understand that new dwellings do not create sewage; people do, so understanding population migration and occupancy rates in the catchment will be an important consideration as well as further changes to industrial and business discharges. The impact of changes to weather patterns also needs to be acknowledged.

We therefore require confidence in the delivery and timing of developments, to know where to base our assessments. Until such information is received, we can only really acknowledge, monitor and invest in upgrades accordingly.

As part of our five-year business plan, Thames Water advise Ofwat on the funding required to accommodate growth to ensure the STWs can continue to meet the standard required by the treatment consents. Where there are infrastructure constraints, Thames Water may require an 18-month to threeyear lead time for provision of extra capacity to drain new development sites. If any largescale engineering works are needed, the lead time could be up to five years. Implementing new technologies and the construction of a major treatment works extension or new treatment works could take up to ten years."

JBA carried out an independent assessment of WwTW capacity (Table 7.2) reviewing the spare hydraulic capacity up until the end of AMP11 (2045). Arborfield, Easthampstead and Wargrave WwTWs are predicted to exceed their DWF permit during the Local Plan period (2040) and until the end of AMP11 (2045) and are likely to require an increase in their permit and/ or upgrades to treatment capacity in order to serve proposed growth. In the case of Arborfield, this is due to growth proposed in the WBC Local Plan. For Easthampstead Park it is a combination of growth proposed in WBC and Bracknell Forest's Local Plans, and at Wargrave it is a combination of WBC and Reading Borough Council's Local Plans.

TW advise that modelling conducted as part of their DWMP process indicates that Arborfield and Wokingham WwTW will reach quality and/or flow exceedance over the coming AMPs (the 5-year periods used for planning). There are a few other smaller / non-strategic WwTWs (serving a population equivalent of less than 10,000) that will require some form of process adjustment / upgrades to comply with permit limit across the next investment period.

TW have advised that a growth upgrade will be required at Arborfield WwTW in AMP8 (2025-30). This will improve the WwTWs ability to treat volumes of incoming sewage, reducing the need for untreated discharges in wet weather.

Similar upgrades are also planned for Ashridge (Wokingham) and Wargrave WwTWs. In each case, the upgrades are subject to final PR24 determination (approval by Ofwat of TW's business plan - due to happen later in 2024).

Where upgrades are required, no significant constraints to the provision of these upgrades have been identified by Thames Water. The remaining WwTWs have available capacity to serve the proposed growth and operate within their permits.

For WwTW that need upgrading, typically around 5 years is required for permit changes to be agreed, funding obtained for the next AMP and major works upgrades to be completed.

Table 7.2 WwTW capacity assessment

WwTW	JBA Assessment	Estimated spare hydraulic capacity (number of dwellings)*
Arborfield	Amber	-15,814
Ashridge (Wokingham)	Green	4,644
Bracknell	Green	66,821
Easthampstead Park	Amber	-263
Reading	Green	394,429
Wargrave	Amber	-1,213

*Capacity in 2045 based on planned growth data correct April 2022.

7.5 Storm tank overflows

Table 7.3 presents the performance of storm tank overflows at WwTWs in Wokingham. None of the 12 storm tank overflows were operating above the threshold for investigations based on monitoring in 2020/21. The location of these overflows can be seen in Figure 7.3. Variation can be seen year to year in storm overflow data due to differences in weather conditions, and for operational reasons such as maintenance issues at particular overflows.

Where a storm tank overflow is operating in periods of moderate or light rainfall, or even in dry conditions it indicates either an infiltration problem within the network, or that the WwTW or its storm tanks are undersized for the population served. Further development within a catchment that has a poorly performing storm tank overflow is likely to exacerbate the issue.

Whilst the frequency of operation of overflows on storm tanks in the study area is below the threshold for investigation, it is important that development does not increase this frequency. The local plan can contribute to this by encouraging the use of SuDS to divert storm water away from the sewer network, reducing the volume that reaches the WwTW.

The consultation in 2022 on the Thames Water DWMP presented an outline of a policy aiming for no local adverse ecological impact at all storm overflow sites. It also included a target of no more than 10 discharges per year at a single storm overflow location during rainfall events by 2050[51].

51 OUR DWMP 2022 - 2027 (thameswater.co.uk)

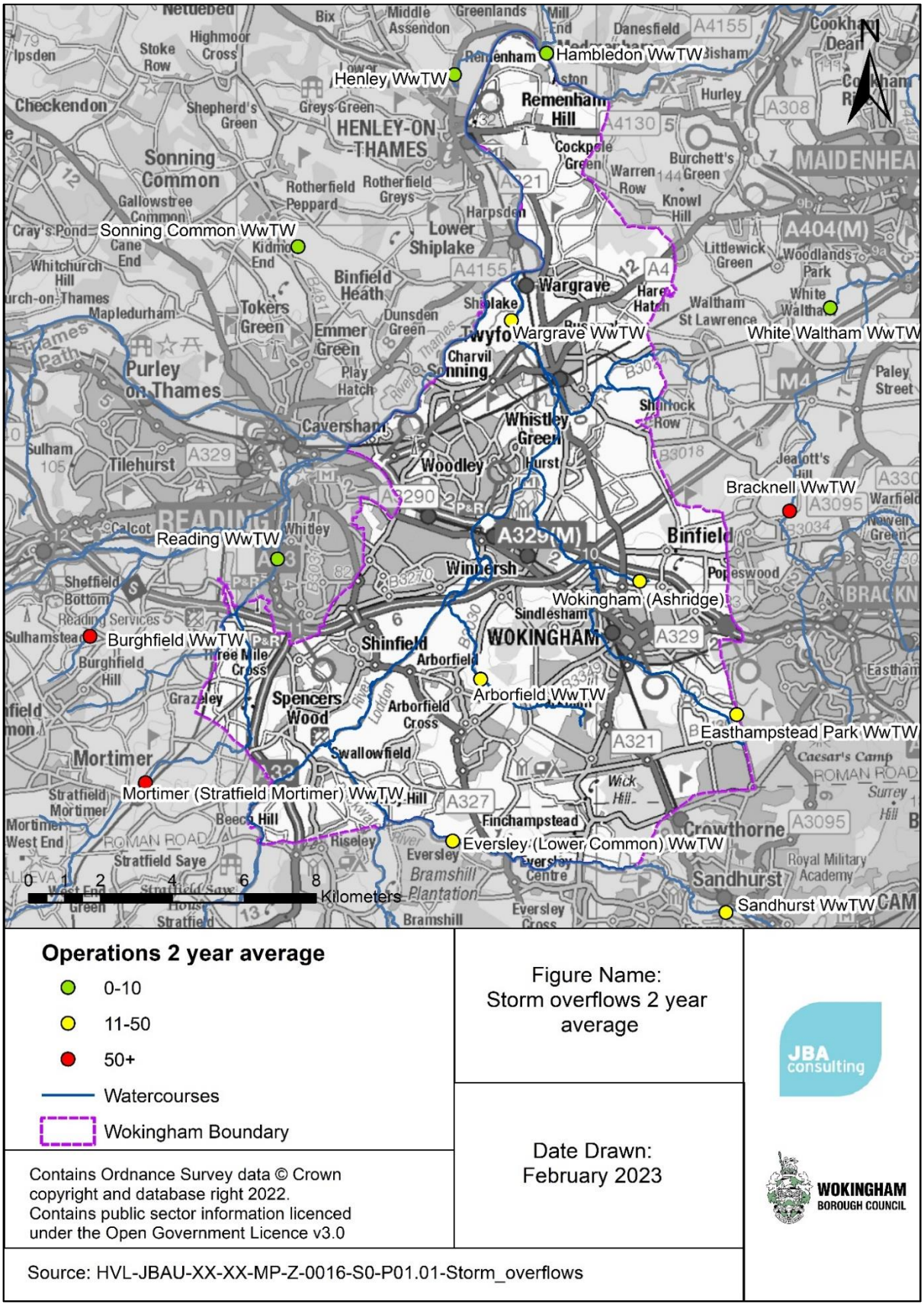


Figure 7.3 Location of storm tank overflows in Wokingham Borough

Table 7.3 WwTW storm overflow operation in 2020 and 2021

Storm overflow	Permit Ref.	Duration in 2020 (hours)	Duration in 2021 (hours)	% of year overflow operated (2020)	% of year overflow operated (2021)	Number of operations in 2020	Number of operations in 2021
READING STW STK 4	CAWM.0942	267.41	50.11	3.1%	0.6 %	16	6
WARGRAVE STW	CTCR.2079	117.94	108.26	1.4%	1.2 %	10	15
HENLEY STW	TEMP.2657	0	143.56	0.0%	1.6 %	0	9
ARBORFIELD STW	CNTD.0020	187.87	89.70	2.1%	1.0 %	54	15
ARBORFIELD STW_STK 1	CNTD.0020	473.58	N/A	5.4%	N/A	54	N/A
CAVERSHAM SPS	TEMP.1769	0	0.00	0.0%	0.0%	0	0
EASTHAMPSTEAD PARK STW	TEMP.2561	179.07	86.40	2.0%	1.0 %	23	15
NEW MILL STW/ EVERSLEY (LOWER COMMON) WWTW	CNTD.0078	225.74	265.27	2.6%	3.0 %	29	31
ASCOT STW	CTCR.2048	4.27	170.06	0.1%	1.9 %	10	29
SANDHURST STW LEVEL 2	TEMP.2881	489.47	601.60	5.6%	6.9 %	36	35
HAMBLEDEN STW	CAWM.0193	35.47	0.46	0.40%	0.01 %	12	2
ASHRIDGE (WOKINGHAM) STW	TEMP.3020	287.72	484.61	3.3%	5.5 %	47	50

7.6 Conclusions

There are six WwTWs that may serve growth during the plan period in Wokingham Borough. Three of these are expected to exceed their flow permit during the Local Plan period (Arborfield, Easthampstead Park and Wargrave WwTWs) and will require an increase in their permit and / or upgrades to treatment processes in order to serve growth. TW have advised that their modelling shows upgrades may be required at Arborfield, Ashridge (Wokingham) and Wargrave WwTWs as well as other smaller / non-strategic sites. These upgrades are expected to be delivered during the period 2025-2030 subject to final determination of their business plan.

No significant constraints to providing upgrades have been identified by TW. In addition to hydraulic capacity, it is important to consider water quality considerations which are discussed in section 9 and 11.

7.7 Recommendations

Table 7.4 Recommendations for wastewater treatment

Action	Responsibility	Timescale
Consider the available WwTW capacity when phasing development going to the same WwTW.	WBC TW	Ongoing
Provide Annual Monitoring Reports to TW detailing projected housing growth.	WBC	Ongoing
TW to assess growth demands as part of their wastewater asset planning activities and feedback to the Council if concerns arise.	TW WBC	Ongoing

8 Odour Assessment

8.1 Introduction

Where new developments encroach upon an existing Wastewater Treatment Works (WwTW), odour from that site may become a cause for nuisance and complaints from residents. Managing odour at WwTWs can add considerable capital and operational costs, particularly when retro fitted to existing WwTWs. National Planning Policy Guidance recommends that plan-makers consider whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, due to the risk of odour nuisance. Sewerage undertakers recommend that an odour assessment may be required if the site of a proposed development is close to a WwTW and is encroaching closer to the WwTW than existing urban areas. The general principle is that allocated sites should not be located where a suitable standard of amenity cannot be achieved, or the continuous operation of an existing WwTW would be prejudiced.

8.2 Methodology

An assessment was carried out based on a simple buffer of 800m (advised by Thames water) around each WwTW in the study area. Sites identified within this buffer are at risk of nuisance odour and further assessment may be required as part of the planning process (and paid for by developers).

A red/amber/green assessment was applied by JBA:

LOW - GREEN	MEDIUM - AMBER	HIGH - RED
Site is unlikely to be impacted by odour from WwTW	Site location is such that an odour impact assessment is recommended	Site is in an area with confirmed WwTW odour issues

8.3 Results

There are seven proposed allocations within 800m of a WwTW which have been given a RAG rating in Table 8.1 Sites at risk of nuisance odour from WwTWs. The location of these is shown in Figure 8.1. An odour assessment is recommended at these sites as part of the planning process. Consideration should also be given to the layout of these sites where only part of the site boundary lies within the 800m buffer zone. In some cases, only part of a larger site may be at risk, in which case zoning of lower impact land uses (e.g., landscaping, amenity, parking) closer to sources of odour may be sufficient to address this risk.

Table 8.1 Sites at risk of nuisance odour from WwTWs

Proposed Allocations	RAG rating
Hall Farm	AMBER
5BA013- Woodlands Farm, Wood Lane	AMBER
5TW010- Land at Bridge Farm	AMBER
5WK002-Ashridge Farm, Warren House Road	AMBER
5CV001-Land east of Park View Drive North	AMBER
Land at Pinewood	AMBER
5WK051-Land east of Toutley Depot	AMBER

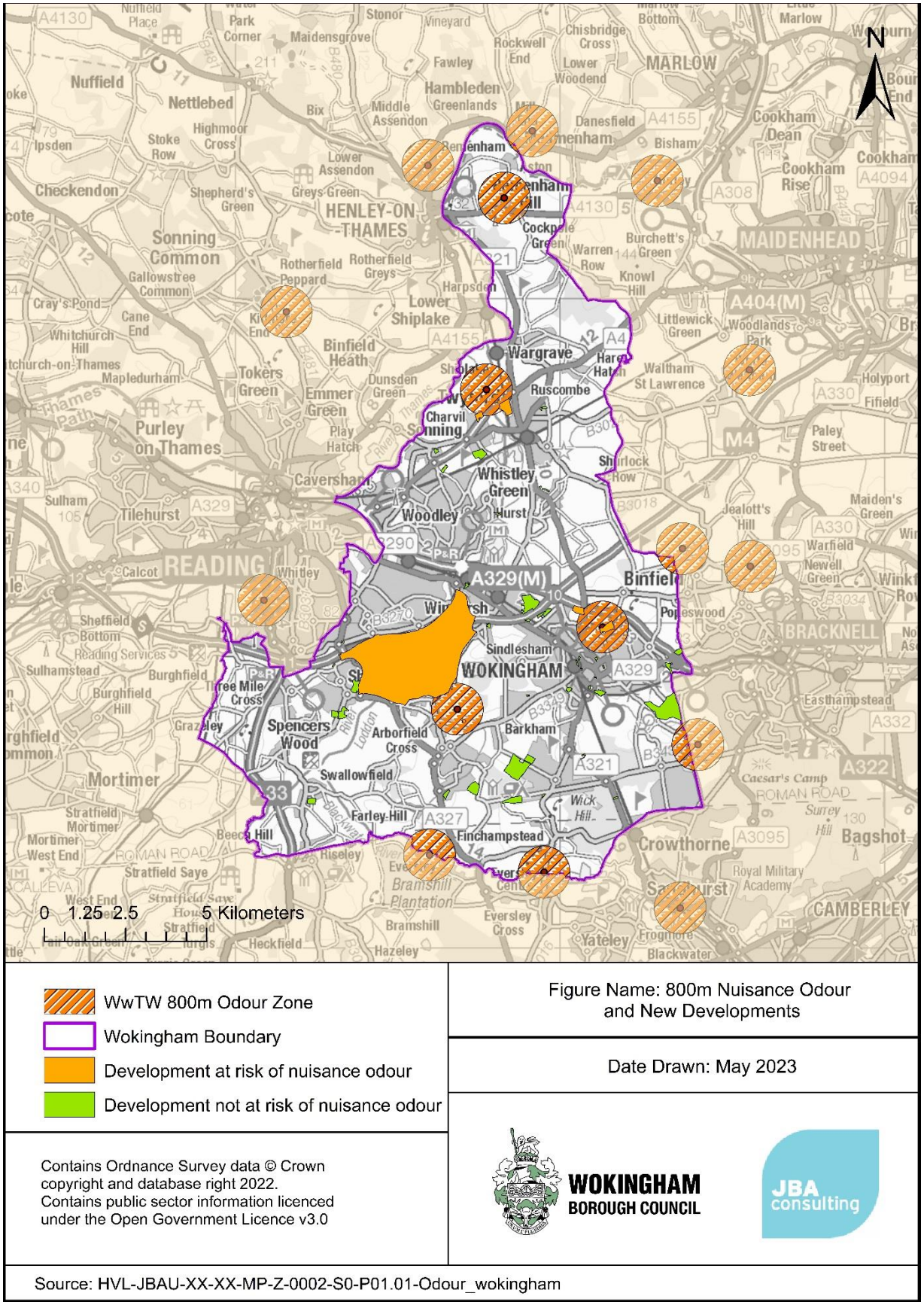


Figure 8.1 Sites at risk of nuisance odour from WwTW

8.4 Conclusions

Six sites have been identified that are close enough to a WwTW for nuisance odour to be a risk. At these sites, it is recommended that an odour assessment is carried out to investigate them further. This should be undertaken as part of the planning process, paid for by developers. These sites have been given an amber assessment. The remaining sites have been given a rating of green.

8.5 Recommendations

Table 8.2 Recommendations from the odour assessment

Actions	Responsibility	Timescale
Consider odour risk in the sites identified to be potentially at risk from nuisance odour.	WBC	Ongoing
Carry out an odour assessment for sites identified as being at risk of nuisance odour.	Developers	Ongoing

9 Water Quality

9.1 Introduction

An increase in the discharge of effluent from Wastewater Treatment Works (WwTW) because of development and growth in the area in which they serve can lead to a negative impact on the quality of the receiving watercourse. Under the Water Framework Directive (WFD), a watercourse is not allowed to deteriorate from its current WFD classification (either as an overall watercourse or for individual elements assessed).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourses. Where the scale of development is such that a deterioration is predicted, a variation to the Environmental Permit (EP) may be required for the WwTW to improve the quality of the final effluent, so that the increased pollution load will not result in a deterioration in the water quality of the watercourse. This is known as "no deterioration" or "load standstill". The need to meet river quality targets is also taken into consideration when setting or varying a permit.

The Environment Agency operational instructions on water quality planning and no-deterioration are currently being reviewed. Previous operational instructions[52] (now withdrawn) set out a hierarchy for how the no-deterioration requirements of the WFD should be implemented on inland waters. The potential impact of development should be assessed in relation to the following objectives:

- Could the development cause a greater than 10% deterioration in water quality? This objective ensures that all the environmental capacity is not taken up by one stage of development and there is sufficient capacity for future growth.
- Could the development cause a deterioration in WFD class of any element assessed? This is a requirement of the Water Framework Directive to prevent a deterioration in class of individual contaminants. The "Weser Ruling"[53] by the European Court of Justice in 2015 specified that individual projects should not be permitted where they may cause a deterioration of the status of a water body. If a water body is already at the lowest status ("bad"), any impairment of a quality element was considered to be a deterioration. Emerging practice is that a 3% limit of deterioration is applied.

52 Water Quality Planning: no deterioration and the Water Framework Directive, Environment Agency (2012). Accessed online at: http://www.fwr.org/WQreg/Appendices/No_deterioration_and_the_WFD_50_12.pdf on: 10/11/2022

53 PRESS RELEASE No 74/15, European Court of Justice (2015). Accessed online at: https://curia.europa.eu/jcms/upload/docs/application/pdf/2015-07/cp150074en.pdf on: 10/11/2022

- Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) or Potential? Is GES possible with current technology or is GES technically possible after development with any potential WwTW upgrades.

The overall WFD classification of a water body is based on a wide range of ecological and chemical classifications. This assessment focuses on three physico-chemical quality elements; Biochemical Oxygen Demand (BOD), Ammonia, and Phosphate as set out in the EA guidance[54].

BOD – Biochemical Oxygen Demand

BOD is a measure of how much organic material – sewage, sewage effluent or industrial effluent – is present in a river. It is defined as the amount of oxygen taken up by micro-organisms (principally bacteria) in decomposing the organic material in a water sample stored in darkness for 5 days at 20°C. Water with a high BOD has a low level of dissolved oxygen. A low oxygen content can have an adverse impact on aquatic life.

Ammonia

Nitrogen is an essential nutrient required by all plants and animals for the formation of amino acids. In its molecular form nitrogen cannot be used by most aquatic plants, and so it is converted into other forms. One such form is ammonia (NH_3). This may then be oxidized by bacteria into nitrate (NO_3) or nitrite (NO2). Ammonia may be present in water in either the unionized form NH_3 or the ionized form NH_4. Taken together these forms care called Total Ammonia Nitrogen.

Although ammonia is a nutrient, in high concentrations it can be toxic to aquatic life, in particular fish, affecting hatching and growth rates.

The main sources in rivers include agricultural sources, (fertilizer and livestock waste), residential sources (ammonia containing cleaning products and septic tank leakages), industrial processes and WwTWs.

Phosphate

Phosphorus is a plant nutrient and elevated concentrations in rivers can lead to accelerated plant growth of algae and other plants. Its impact on the composition and abundance of plant species can have adverse implications for other aspects of water quality, such as oxygen levels. These changes can cause undesirable disturbances to other aquatic life such as invertebrates and fish.

Phosphorus (P) occurs in rivers mainly as Phosphate (PO_4), which are divided into Orthophosphates (reactive phosphates), and organic Phosphates.

54 H1 Annex D2 - Assessment of sanitary and other pollutants within Surface Water Discharges, Environment Agency (2014).

Orthophosphates are the main constituent in fertilizers used in agriculture and domestic gardens and provide a good estimation of the amount of phosphorus available for algae and plant growth and is the form of phosphorus that is most readily utilized by plants.

Organic phosphates are formed primarily by biological processes and enter sewage via human waste and food residues. Organic phosphates can be formed from orthophosphates in biological treatment processes or by receiving water biota.

Although it is phosphorus in the form of phosphates that is measured as a pollutant, the term phosphorus is often used in water quality work to represent the total phosphorus containing pollutants.

9.2 Methodology

9.2.1 General Approach

SIMCAT is used by the Environment Agency to model water bodies and identify where permit changes are needed to prevent deterioration or improve water quality as well as supporting decision making to guide development to locations where environmental deterioration will be reduced. SIMCAT is a 1D stochastic, steady state, deterministic model which represents inputs from both point-source effluent discharges and diffuse sources, and the behaviour of solutes in the river[55].

SIMCAT can simulate inputs of discharge and water quality data and statistically distribute them from multiple effluent sources along the river reach. It uses the Monte Carlo method for distribution that randomly models up to 2,500 boundary conditions. The simulation calculates the resultant water quality as the calculations cascade further downstream.

Once the distribution results have been produced, an assessment can be undertaken on the predicted mean and ninetieth percentile concentrations or loads.

The study area is covered by the Thames SIMCAT model.

Within SIMCAT, the determinands modelled were Biochemical Oxygen Demand (BOD), Ammonia (NH4) and Phosphorus (P). In fresh waterbodies, phosphate is usually the limiting nutrient for algal growth. However, in marine environments, nitrogen is considered to be the limiting nutrient.

The methodology followed is summarised in Figure 9.1 below. In this flow chart, all of the questions in the top row must be answered.

55 Cox. B. A. (2003) A Review of Currently Available in-Stream Water-quality models their applicability for simulating dissolved oxygen in lowland rivers. The Science of the Total Environment. 314 -316, 355 -377. Elsevier

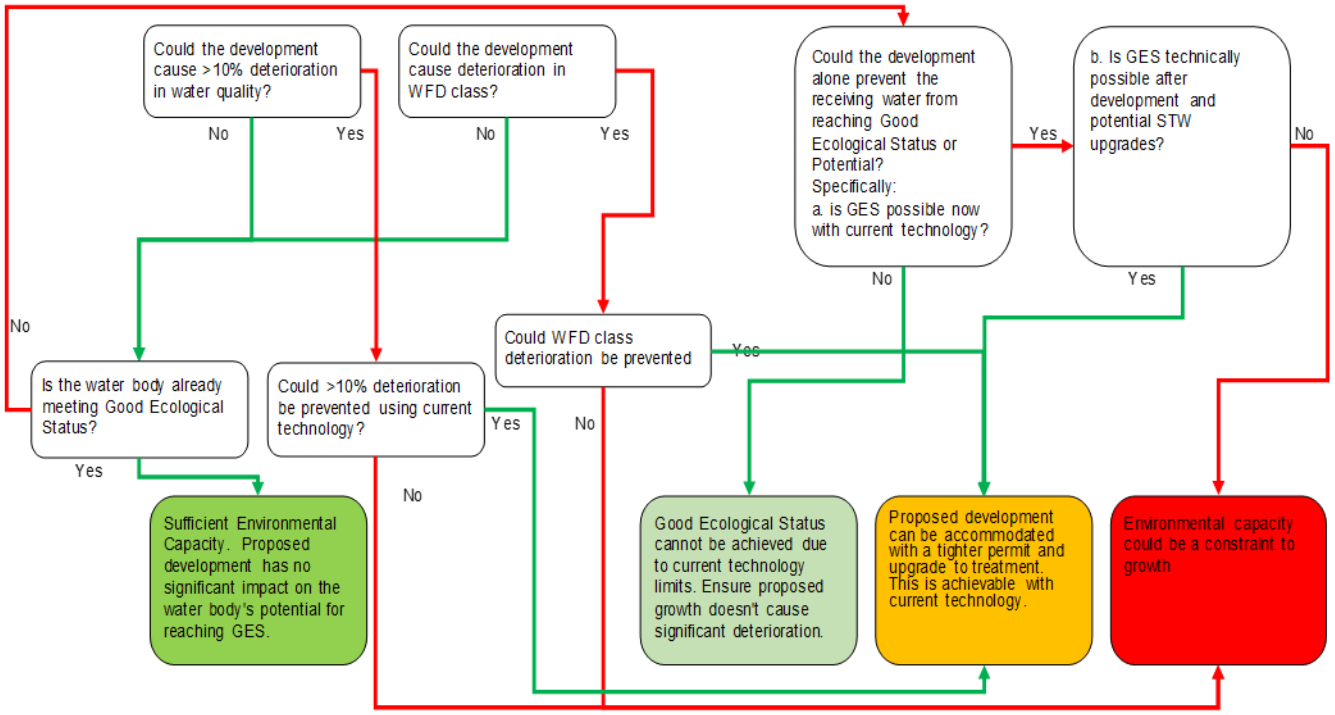


Figure 9.1 Water quality impact assessment following EA guidance

Where modelling indicated growth may lead to a deterioration in the watercourse, or where the watercourse is not currently meeting at least a 'Good' class for each determinant, the models were used to test whether this could be addressed by applying stricter discharge limits. In such cases, a Technically Achievable Limit (TAL) was considered.

The EA advised that the following permit values are achievable using treatment at TAL, and that these values should be used for modelling all WwTW potential capacity irrespective of the existing treatment technology and size of the works:

- Ammonia (90%ile): 1 mg/l
- BOD (90%ile): 5 mg/l
- Phosphorus (mean): 0.25 mg/l

This assessment did not take into consideration whether it is feasible to upgrade each existing WwTW to TAL due to constraints of costs, timing, space, carbon costs etc.

9.3 Data Sets

The datasets used to assess the water quality impact were as follows:

- Water quality, river and effluent flow data from within the Environment Agency SIMCAT model.
- Effluent flow data from the last three years provided by Thames Water.

- Future wastewater demand calculated from site information provided by Wokingham Borough Council and a mean occupancy rate and per capita consumption taken from Thames Water's WRMP.
- Current reach specific WFD class limits for each determinant and tighter common standards monitoring guidance (CSMG) where appropriate for river reaches designated as SACs or SSSIs.
- TAL limits for each contaminant.

9.4 SIMCAT Modelling Approach

9.4.1 Model setup

The study area is covered by the Thames SIMCAT model developed by the Environment Agency. The models have been largely based on observed flow and quality data for the period 2014-2020. A widespread update of the models, and the resultant recalibration were not within scope of this project. It was therefore agreed with the EA to update just the effluent flow at WwTWs receiving growth in the study area. Consequently, the modelling work presented should be used to identify areas at risk of water quality deterioration, but not for permit setting.

Flow data from the last three years for each WwTW in the study area was supplied by Thames Water and used to update the model. Several of the WwTWs in the study area already had upgrades completed in AMP6 or planned in AMP7, which would be expected to improve water quality at those locations. These were therefore factored into the model by applying the updated permit limit where it was less than the current discharge in the model. The model was then run in its updated form to set a 2022 baseline.

Additional effluent flow from growth during the Local Plan Update period was added to current flow at WwTWs receiving growth and the model re-run as a future scenario.

Some smaller WwTWs within the model have descriptive permits which do not set specific numerical limits for DWF and effluent quality, and do not have flow monitoring in place. The models are calibrated to observed water quality measurements and represent the overall water quality in the catchment well, however at a local scale some of these smaller WwTWs are not well represented and do not have discharge data or have pollutant discharges modelled as a load in kilograms rather than an effluent flow and concentration.

9.4.2 No deterioration test

The results from the baseline and future versions of the model were compared to assess the predicted percentage deterioration for each of the modelled determinands. WFD targets for each river reach were provided by the EA and used to determine if there was a risk of a class deterioration.

Where a deterioration of 10% or greater was predicted or a change in class (considered to be a significant deterioration under WFD) a further test was conducted to see if this deterioration could be prevented by upgrades to treatment processes. This used another version of the model with each WwTW set to operate at their Technically Achievable Limit (TAL).

9.4.3 Good Ecological Status assessment

Where treatment at TAL and reductions in diffuse sources in the present day could improve water quality to achieve Good Ecological Status (GES), it is important to understand whether this could be compromised as a result of future growth within the catchment.

Guidance from the EA suggests breaking this down in to two questions:

a) Is GES possible now with current technology?

b) Is GES technically possible after development and any potential WwTW upgrades?

If the answer to questions a) and b) are both ‘Yes’ or both ‘No’ then the development can be assessed as having no significant impact on the water bodies potential for reaching GES, i.e., the development alone is not preventing GES from being achieved. An "amber" score is given where GES could be achieved with improvements in treatment technology reflecting the need for an intervention at that WwTW, but growth is not preventing this. It is given a "yellow" score where a WwTW would need to be upgraded beyond the current technically achievable limit in order to achieve GES, but as for the amber rating it is not growth that is preventing this.

If the answer to a) is ‘Yes’ and the answer for b) is ‘No’ then development is having a significant impact, i.e., before development GES could be achieved with upstream improvements, and after growth the additional effluent from growth prevents GES being achieved - so it is growth that is preventing GES from being achieved leading to a "red" score.

The possible answers are summarised in Table 9.1 Possible GES assessment results.

Run type 9 within SIMCAT was used which assumes that upstream flow at each treatment works is at good ecological status. This simulates improvements being made in upstream water quality. The water quality of the discharge from each WwTW in order to maintain GES is then calculated by the model.

Table 9.1 Possible GES assessment results

Predicted to achieve GES after growth	Could achieve GES today with improvements in upstream water quality? (a)	Could achieve GES in the future with improvements in upstream water quality? (b)	Assessment Result
YES	N/A	N/A	GREEN -

Predicted to achieve GES after growth	Could achieve GES today with improvements in upstream water quality? (a)	Could achieve GES in the future with improvements in upstream water quality? (b)	Assessment Result
			Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES.
NO	YES	YES	AMBER - Proposed development can be accommodated with a tighter permit and upgrade to treatment. This is achievable with current technology.
NO	NO	NO	YELLOW - Good ecological status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
NO	YES	NO	RED - Environmental capacity could be a constraint to growth.

9.5 Summary of WFD status

Figure 9.2 shows the Cycle 2 Water Framework Directive ecological status classifications or watercourses in the study area, and the location of the five WwTW serving growth. The River Basin Management Plans, updated in 2022, show that 14

out of the 22 waterbodies in the Loddon and Trib management catchment are not achieving good status due to pollution from wastewater treatment.

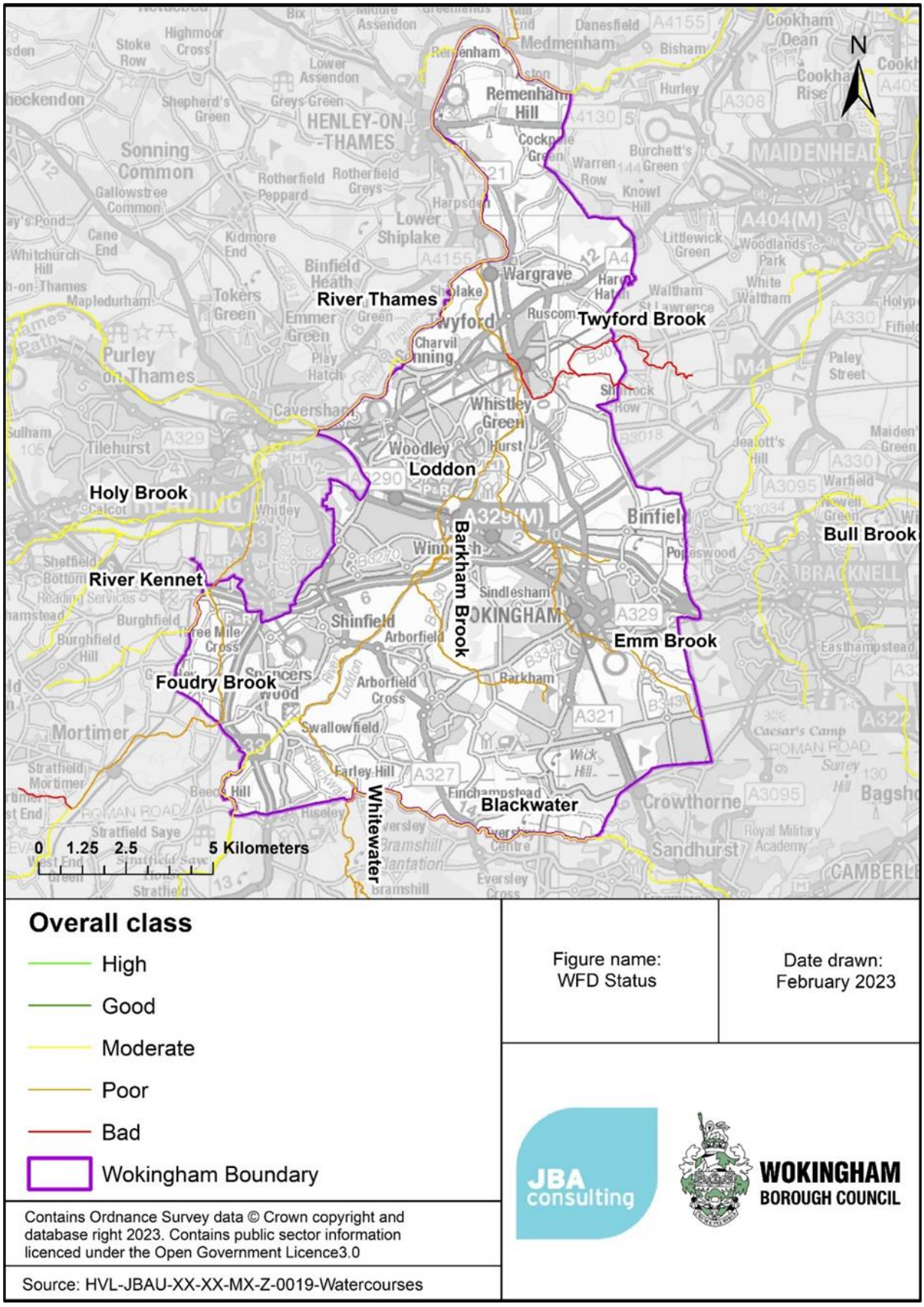


Figure 9.2 WFD status of waterbodies in Wokingham Borough

9.6 Summary of Modelling Results

The first test applied compares the future scenario to the baseline and assesses whether a significant deterioration in water quality occurs – either a 10% deterioration in water quality or a deterioration in WFD class. Where, a significant deterioration is predicted, the TAL scenario then assesses whether this deterioration could be prevented by improvements in treatment processes.

Table 9.2 below summarises the results of the water quality assessments. Where a “green” score is given, deterioration was less than 10% for each determinand, and no change in WFD class is predicted. Where an “amber assessment is given, a 10% deterioration or change in WFD class is predicted, but this could be prevented by improvements in treatment technology. In these cases, upgrades may therefore be required at that WwTW or at WwTW upstream.

A “red” assessment would be given where a significant deterioration in water quality is predicted, and it cannot be prevented by improvements in treatment processes.

Two of the six WwTWs serving growth during the plan period are predicted to experience a significant deterioration, with a greater than 10% deterioration in BOD predicted at Arborfield WwTW, which may be accompanied by a deterioration in WFD class from High to Good. This can be prevented by improvements in treatment processes. At Easthampstead Park WwTW a deterioration in phosphate of greater than 3% is predicted. As this is already within Bad class, this is considered to be a significant deterioration. This can also be prevented by improvements in treatment processes.

In this assessment, improvements in treatment processes have been modelled by assuming the WwTW is operating TAL. It has not investigated the feasibility of upgrading individual WwTWs. This should be performed by Thames Water who have the detailed knowledge of their assets, and the Environment Agency who are responsible for setting permit limits at WwTW.

Appendix A maps the predicted deterioration in water quality visually for Ammonia, BOD and Phosphate in the future, and the predicted deterioration if WwTWs were performing at the technically achievable limit.

The growth stated in Table 9.2 includes recent completions and neighbouring authority growth as well as growth from within Wokingham Borough.

Table 9.2 Water quality modelling results

WwTW	Housing growth over plan period (dwellings)	Employment growth over plan period (m^2)	Could the development cause a greater than 10% deterioration in water quality for one or more of BOD, Ammonia or Phosphate?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?
Arborfield STW	9,322	0	Yes - 11% deterioration in BOD	Yes (BOD deteriorates from High status to Good)	Yes
Wokingham (Ashridge)	5,254	0	No	No	Yes
Bracknell STW	967	0	No	No	Yes
Easthampstead Park STW	304	0	Yes - >3% deterioration in Phosphate within bad class.	No	Yes
Reading STW	20,884	19,402	No	No	Yes
Wargrave STW	4,484	218,178	No	No	Yes

Table 9.3 summarises the results of the GES assessment outlined in section 9.4.3. Four different assessments are possible which are shown in Table 9.1 above.

If good ecological status is predicted to be achieved within the receiving waterbody following growth during the plan period, a green assessment is given. In this case, it can be said that there is environmental capacity to accommodate growth.

Where GES is not currently being achieved but could be achieved if upstream water quality were improved, then an amber score is given – growth could be accommodated without preventing a waterbody achieving GES in the future.

Where GES cannot be achieved either today or in the future, despite upgrades in treatment processes, and improvements in upstream water quality, then a yellow assessment is given – and it can be said that GES cannot be achieved due to the limits of current technology. Growth alone is not predicted to prevent GES being achieved in the future.

Should GES be achievable today, but not in the future due to growth, a red assessment would be given, and it can be said that environmental capacity could be a constraint to growth, i.e., growth alone could prevent good ecological status being achieved in the future.

Table 9.3 Good Ecological Assessment (GES) results

WwTW	Ammonia assessment	Biochemical Oxygen Demand (BOD) assessment	Phosphate assessment
Arborfield STW	GREEN-Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES	GREEN-Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES	YELLOW-Good ecological status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration
Wokingham (Ashridge)	YELLOW-Good ecological status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration	AMBER-Proposed development can be accommodated with a tighter permit and upgrade to treatment. This is achievable with current technology	YELLOW-Good ecological status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration
Bracknell STW	AMBER-Proposed development can be accommodated with	AMBER-Proposed development can be accommodated	YELLOW-Good ecological status cannot be achieved

WwTW	Ammonia assessment	Biochemical Oxygen Demand (BOD) assessment	Phosphate assessment
	a tighter permit and upgrade to treatment. This is achievable with current technology	with a tighter permit and upgrade to treatment. This is achievable with current technology	due to current technology limits. Ensure proposed growth doesn't cause significant deterioration
Easthampstead Park STW	GREEN-Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES	GREEN-Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES	YELLOW-Good ecological status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration
Reading STW	AMBER-Proposed development can be accommodated with a tighter permit and upgrade to treatment. This is achievable with current technology	GREEN-Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES	YELLOW-Good ecological status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration
Wargrave STW	GREEN-Proposed development can be accommodated with a tighter permit and upgrade to treatment. This is achievable with current technology	GREEN-Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES	AMBER-Proposed development can be accommodated with a tighter permit and upgrade to treatment. This is achievable with current technology

9.6.1 Priority substances

As well as the physico-chemical water quality elements (BOD, Ammonia, Phosphate etc.) addressed above, a watercourse can fail to achieve Good Ecological Status due to exceeding permissible concentrations of hazardous substances. Currently 33 substances are defined as hazardous or priority hazardous substances, with others under review. Such substances may pose risks both to humans (when contained in drinking water) and to aquatic life and animals feeding in aquatic life. These substances are managed by a range of different approaches, including EU and international bans

on manufacturing and use, targeted bans, selection of safer alternatives and end-of-pipe treatment solutions. There is considerable concern within the UK water industry that regulation of these substances by setting permit values which require their removal at wastewater treatment works will place a huge cost burden upon the industry and its customers, and that this approach would be out of keeping with the "polluter pays" principle.

We also consider how the planning system might be used to manage priority substances:

- Industrial sources – whilst this report covers potential employment sites, it doesn't consider the type of industry and therefore likely sources of priority substances are unknown. It is recommended that developers should discuss potential uses which may be sources of priority substances from planned industrial facilities at an early stage with the EA and, where they are seeking a trade effluent consent, with the sewerage undertaker.
- Agricultural sources - There is limited scope for the planning system to change or regulate agricultural practices. UK water companies are involved in a range of “Catchment-based Approach” schemes aimed at reducing diffuse sources of pollutants, including agricultural pesticides.
- Surface water runoff sources - some priority substances e.g., heavy metals, are present in urban surface water runoff. It is recommended that future developments would manage these sources by using SuDS that provide water quality treatment, designed following the CIRIA SuDS Manual. This is covered in more detail in sections 11.6.2 and 11.6.3.
- Domestic wastewater sources - some priority substances are found in domestic wastewater as a result of domestic cleaning chemicals, detergents, pharmaceuticals, pesticides or materials used within the home. Whilst an increase in the population due to housing growth could increase the total volumes of such substances being discharged to the environment, it would be more appropriate to manage these substances through regulation at source, rather than through restricting housing growth through the planning system.

No further analysis of priority substances will be undertaken as part of this study.

9.7 Conclusions

The modelling indicates that growth during the Local Plan period could result in a significant deterioration (10% or over or deterioration in class) in water quality at two WwTWs (Arborfield and Easthampstead Park). In the case of Easthampstead Park, deterioration in phosphate is predicted to be 3% and as this is already within bad class, this is considered to be significant. This can be prevented by a tightening of the environmental permit and / or upgrades to treatment processes.

Growth alone will not prevent good ecological status being prevented in the future should improvements in upstream water quality be made.

Where a WwTW is shared with a neighbouring authority, coordination of growth plans in collaboration with Thames Water is essential to ensure that infrastructure is in place prior to development to prevent a breach of the environmental permit.

TW provided the following statement on water quality:

"Thames Water will continue to work with the Environment Agency to understand what future water quality consents changes may be necessary for Water Framework Directive compliance. These may be in respect of volumetric discharges and / or the final effluent discharge standards e.g. Ammonia, Phosphorous. Should such changes be required these would need to be agreed with the water company via the EA's Water Industry National Environmental Programme (WINEP), to ensure any solutions to meet these consents are deliverable with best available technology and affordable. The WINEP would also establish realistic time-frames to implement the STW improvements (up to 5-years in some cases)."

9.8 Recommendations

Table 9.4 Recommendations from the water quality section

Actions	Responsibility	Timescale
Provide annual monitoring reports to TW and SEW detailing projected housing growth in the Local Authority.	WBC	Ongoing
Take into account the full volume of growth (from WBC and neighbouring authorities) within the catchment.	WBC	Ongoing

10 Flood Risk Management

10.1 Assessment of additional flood risk from increased WwTW discharges

In catchments with a large, planned growth in population and which discharge effluent to a small watercourse, the increase in the discharged effluent might have a negative effect on the risk of flooding. An assessment has been carried out to quantify such an effect.

10.2 Methodology

The following process has been used to assess the potential increased risk of flooding due to the extra flow reaching a specific WwTW:

- Calculate the increase in DWF attributable to planned growth;
- identify the point of discharge of these WwTWs;
- at each outfall point, identify the FEH v1.0 catchment descriptors associated with the WwTW;
- use FEH Statistical method to calculate peak 1 in 30 (Q30) and 1 in 100 (Q100) year fluvial flows; and
- calculate the additional foul flow as a percentage of the Q30 and Q100 flow.

A red/amber/green rating was applied to score the associated risk as follows:

LOW - GREEN Additional flow ≤5% of Q30. Low risk that increased discharges will increase fluvial flood risk	MEDIUM - AMBER Additional flow ≥5% of Q30. Moderate risk that increased discharges will increase fluvial flood risk	HIGH - RED Additional flow ≥5% of Q100. High risk that increased discharges will increase fluvial flood risk

The following datasets were used to assess the risk of flooding:

- Current and predicted future DWF for each WwTW
- Location of WwTW outfalls
- Catchment descriptors from FEH CD-Rom v1.0

The hydrological assessment of river flows was applied using a simplified approach, appropriate to this type of screening assessment. The Q30 and Q100 flows quoted should not be used for other purposes, e.g., flood modelling or flood risk assessments.

10.3 Results

Table 10.1 reports the additional flow from each WwTW as a percentage of the Q30 and Q100 peak flow. This shows that additional flows from the WwTW post development would have a negligible effect on the predicted peak flow events with return periods of 30 and 100 years.

Table 10.1 Flood risk assessment results

WwTW	FEH Stat Q30 (m3/s)	FEH Stat Q100 (m3/s)	Additional Flow (m3/s)	Flow increase as % of Q30	Flow increase as % of Q100
Arborfield STW	6.14	7.77	0.03	0.53 % (GREEN)	0.42 % (GREEN)
Wokingham (Ashridge) STW	2.96	3.74	0.03	0.87 % (GREEN)	0.69 % (GREEN)
Bracknell STW	23.69	28.84	0.01	0.02 % (GREEN)	0.02 % (GREEN)
Easthampstead Park STW	1.92	2.42	0.00	0.09 % (GREEN)	0.07 % (GREEN)
Reading STW	27.52	34.64	0.09	0.33 % (GREEN)	0.26 % (GREEN)
Wargrave STW	126.92	160.25	0.03	0.02 % (GREEN)	0.02 % (GREEN)

10.4 Conclusions

At each of the points of discharge for WwTWs, the additional flow from growth makes up less than 5% of the Q30 flow and less than 5% of the Q100 flow. The impact of increased effluent flows is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

10.5 Recommendations

Table 10.2 Flood risk recommendations

Actions	Responsibility	Timescale
Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	TW	During design of WwTW upgrades

11 Environmental Impacts

11.1 Introduction

Development has the potential to cause an adverse impact on the environment through several routes such as worsening of air quality, pollution to the aquatic environment, or disturbance to wildlife. Of relevance in the context of a Water Cycle Study is the impact of development on the aquatic environment.

A source-pathway-receptor approach can be taken to investigate the risk and identify where further assessment or action is required.

11.2 Sources of pollution

Water pollution is usually categorised as either diffuse or point source. Point source sources come from a single well-defined point, an example being the discharge from a WwTW. Section 9 models the WwTWs serving growth within WBC as point sources of pollution and predicts the likely concentration of pollutants downstream.

Diffuse pollution is defined as “unplanned and unlicensed pollution from farming, old mine workings, homes and roads. It includes urban and rural activity and arises from industry, commerce, agriculture and civil functions and the way we live our lives.”

Examples of diffuse sources of water pollution include:

- Contaminated runoff from roads – this can include metals and chemicals
- Drainage from housing estates
- Misconnected sewers (foul drains to surface water drains)
- Accidental chemical/oil spills from commercial sites
- Surplus nutrients, pesticides, and eroded soils from farmland
- Septic tanks and non-mains sewer systems

The most likely sources of diffuse pollution from new developments include drainage from housing estates, runoff from roads and discharges from commercial and industrial premises. The pollution risk posed by a site will depend on the sensitivity of the receiving environment, the pathway between the source of the runoff and the receiving waters, and the level of dilution available. After or during heavy rainfall, the first flush of water carrying accumulated dust and dirt is often highly polluting.

Whilst the threat posed by an individual site may be low, several sites together may pose a cumulative impact within the catchment.

Runoff from development sites should be managed by a suitably designed SuDS scheme, more information on SuDS can be found in section 11.6.2.

Potential impacts on receiving surface waters include the blanketing of riverbeds with sediment, a reduction in light penetration from suspended solids, and a reduction in natural oxygen levels, all of which can lead to a loss in biodiversity.

11.3 Pathways

Pollutants can take several different pathways from their source to a “receptor” – a habitat or species that can be impacted. This could be overland via surface water flow paths, via the river system, or via groundwater or a combination of all three.

11.4 Receptors

A receptor in this case is a habitat or species that is adversely impacted by a pollutant. Both the rivers and groundwater as well as being pathways, can also be considered to be receptors, and the impact on the ecological status of rivers as defined within the Water Framework Directive is the subject of Section 9. Groundwater bodies are also given a status under the WFD which is reported in Section 4.2 for the groundwater bodies.

Within the study area and downstream are many sites with environmental designations such as:

- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Sites of Special Scientific Interest (SSSI)
- Ramsar sites (Wetlands of International Importance)
- Priority Habitats and Priority Headwaters

A description of these, and the relevant legislation that defines and protects them, can be found in sections 3.5 to 3.7.

11.5 Assessment of point source risk

11.5.1 Screening

To identify which of the protected sites may be at risk, Flood Zone 2 from the Risk of Flooding from Rivers and the Sea mapping was used to define an area that was either beside a river or could be reasonably expected to receive surface water from a river during times of flood. Where a WwTW serving growth in the plan period was present in the catchment upstream of the protected site, this site was taken forward for further assessment.

Where there was no WwTW serving growth upstream, these protected sites were discounted as no deterioration would be predicted in a water quality model, and the impact would be expected to be minimal. However, in these cases the overall catchment water quality should be considered where for example they are designated

for migratory fish species that may spend part of their lifecycle elsewhere in the catchment.

Whilst deterioration in water quality may not always lead to a significant impact at a protected site such as a SSSI, modelled deterioration can be used to highlight areas of risk for further analysis in the Habitat Regulations Assessment.

Table 11.1 contains a list of protected sites (SSSIs, SACs, SPAs and Ramsar sites) that are within or downstream of Wokingham Borough, and adjacent to a watercourse, and have a WwTW serving growth during the plan period upstream. These protected sites are considered further in section 11.5.2.

Table 11.1 List of protected sites with WwTW upstream

Receptor Name	Reference	WwTW Upstream further assessment required? Y/N
Great Thrift Wood SSSI	SU871782	Y
Lodge Wood & Sandford Mill SSSI	SU785736	Y
Rodbed Wood SSSI	SU803836	Y
Temple Island Meadows SSSI	SU768846	Y
Bisham Woods SSSI	SU857849	Y

11.5.2 Impact Assessment

Figure 11.1 to Figure 11.3 show the location of the protected sites downstream of WwTWs in the study area. The predicted deterioration in water quality in the river adjacent to the protected site is shown in Table 11.2 In all cases deterioration could be prevented by an improvement in upstream treatment processes.

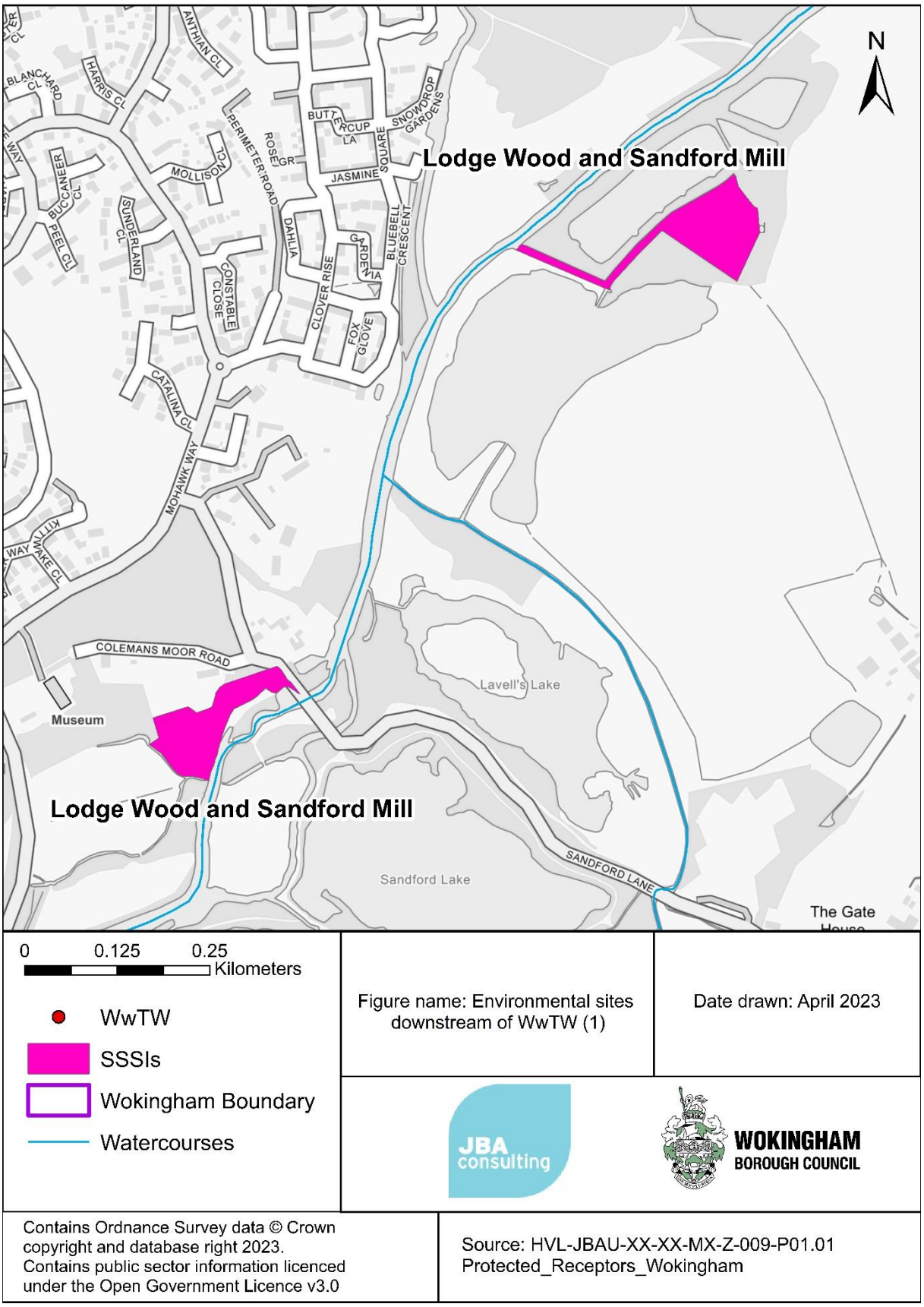


Figure 11.1 Environmental sites downstream of WwTW (1)

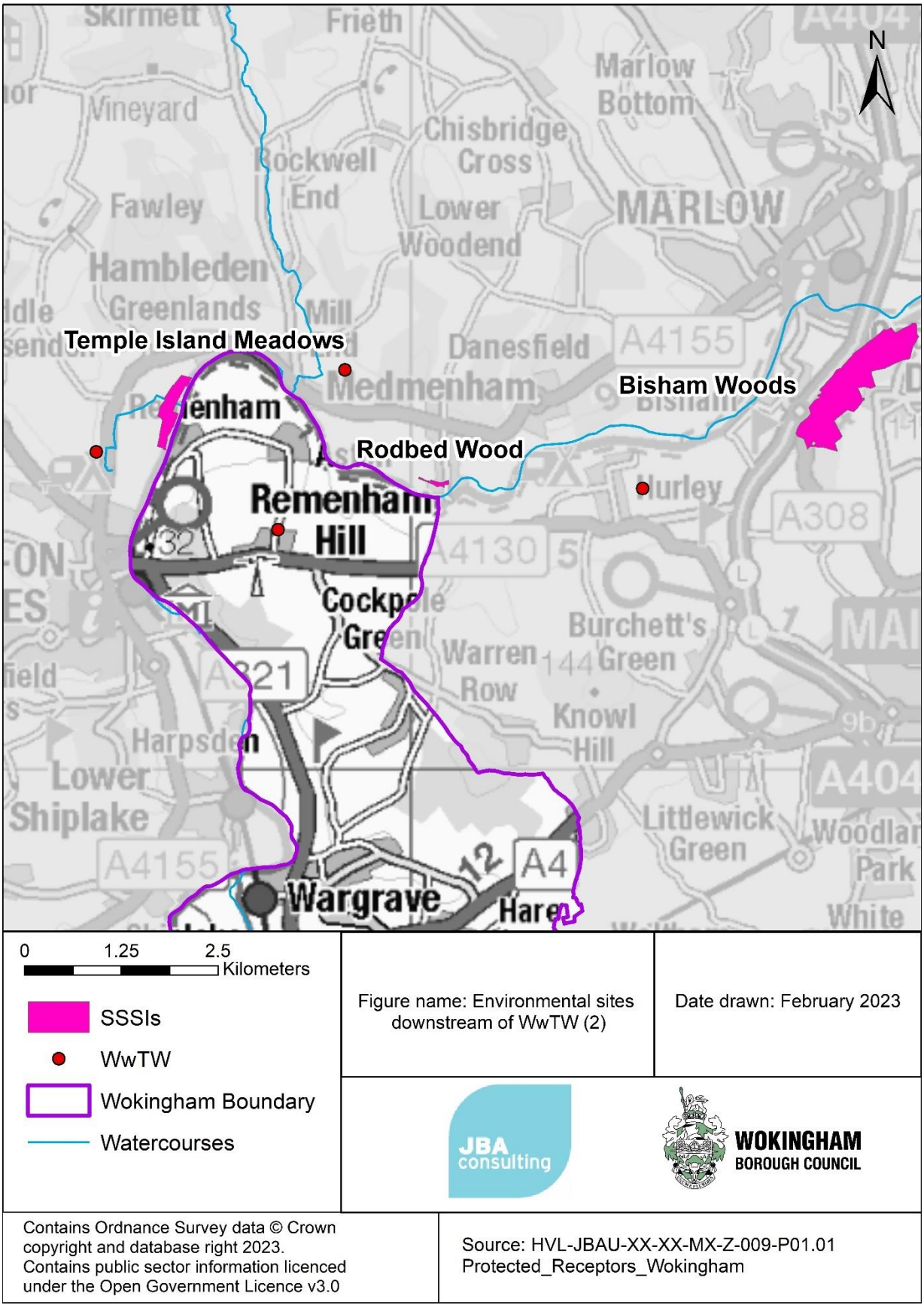


Figure 11.2 Environmental sites downstream of WwTW (2)

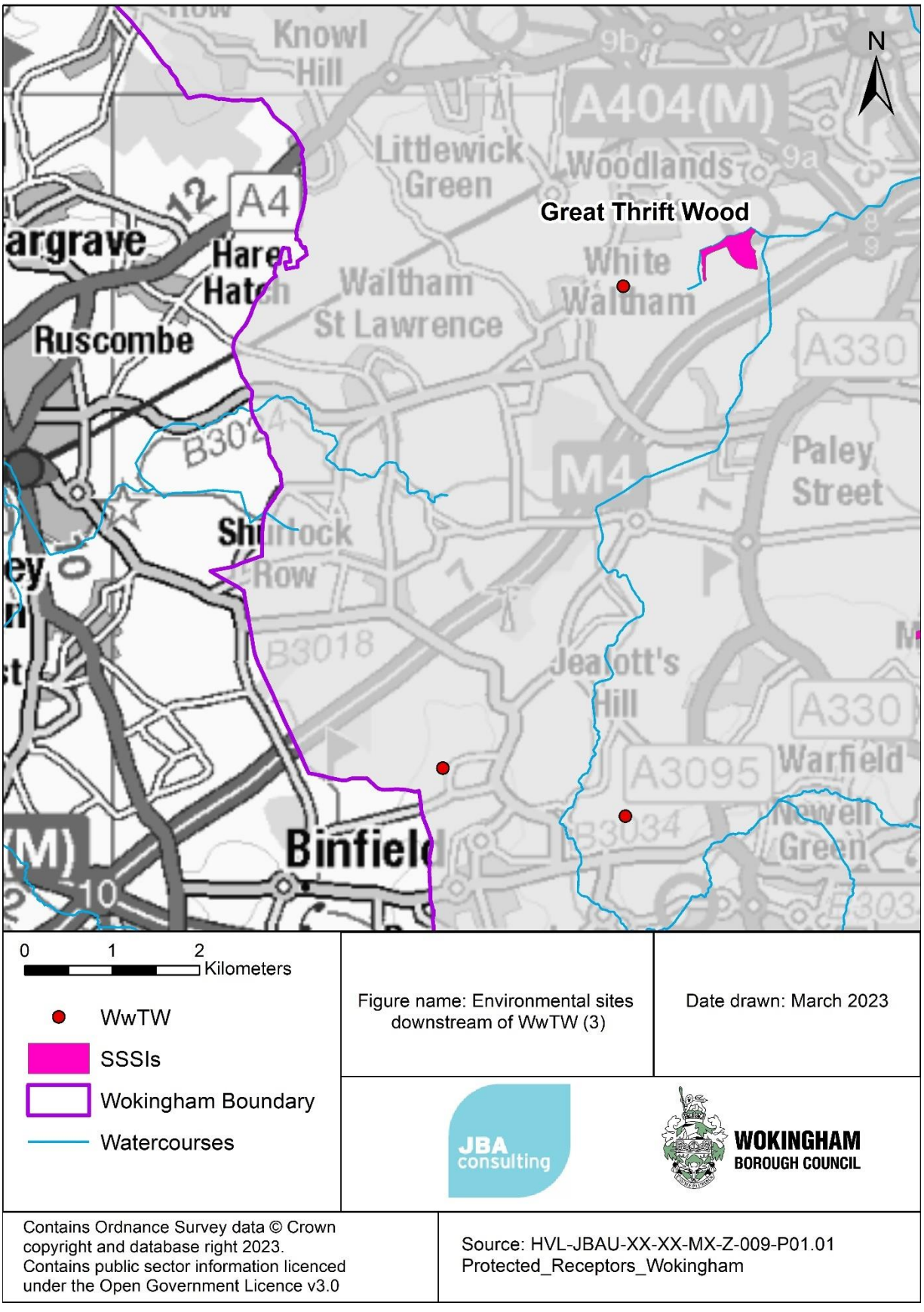


Figure 11.3 Environmental sites downstream of WwTW (3)

Table 11.2 Predicted water quality adjacent to SSSIs

SSSI Name	% Deterioration Ammonia	% Deterioration BOD	% Deterioration Phosphate	Can deterioration be prevented by treatment at TAL?
Lodge Wood & Sandford Mill*	0.00%	10.79%	0.00%	Y
Lodge Wood & Sandford Mill*	-0.46%	11.06%	1.84%	Y
Rodbed Wood	6.43%	9.23%	0.53%	Y
Temple Island Meadows	6.68%	9.42%	0.59%	Y
Great Thrift Wood	0.83%	24.49%	0.35%	Y
Bisham Wood	6.18%	8.99%	9.55%	Y

*There are two separate sites within this designation.

11.6 Protection and mitigation

11.6.1 Groundwater Protection

Groundwater is an important source of water in England and Wales.

The Environment Agency is responsible for the protection of “controlled waters” from pollution under the Water Resources Act 1991. These controlled waters include all watercourses and groundwater contained in underground strata.

The zones are based on an estimate of the time it would take for a pollutant which enters the saturated zone of an aquifer to reach the source of abstraction or discharge point (Zone 1 = 50 days, Zone 2 = 400 days, Zone 3 is the total catchment area). The Environment Agency will use SPZs (alongside other datasets such as the Drinking Water Protected Areas (DrWPAs) and aquifer designations as a screening tool to show:

- areas where it would object in principle to certain potentially polluting activities, or other activities that could damage groundwater;
- areas where additional controls or restrictions on activities may be needed to protect water intended for human consumption; and
- how it prioritises responses to incidents.

The EA have published a position paper[56] outlining its approach to groundwater protection which includes direct discharges to groundwater, discharges of effluents to ground and surface water runoff. This is of relevance to this water cycle study where a development may manage surface water through SuDS.

Sewage and trade effluent

Discharge of treated sewage of $2m^3$ per day or less to ground are called small sewage discharges (SSDs). Most SSDs do not require an environmental permit if they comply with certain qualifying conditions. A permit will be required for all SSDs in source protection zone 1 (SPZ1).

For treated sewage effluent discharges, the EA encourages the use of shallow infiltration systems, which maximise the attenuation within the drainage blanket and the underlying unsaturated zone. Whilst some sewage effluent discharges may not pose a risk to groundwater quality individually, the cumulative risk of pollution from aggregations of discharges can be significant. Improvement or pre-operational conditions may be imposed before granting an environmental permit. The EA will only agree to developments where the addition of new sewage effluent discharges to ground in an area of existing discharges is unlikely to lead to an unacceptable cumulative impact.

Generally, the Environment Agency will only agree to developments involving release of sewage effluent, trade effluent or other contaminated discharges to ground if it is satisfied that it is not reasonable to make a connection to the public foul sewer. The EA would normally expect to only permit new private discharges where the distance to connect to the nearest public sewer exceeds the number of dwellings multiplied by 30m. So, for example, a development of 100 dwellings would need to be more than 3km from a public sewer. The developer would have to provide evidence of why the proposed development cannot connect to the foul sewer in the planning application. This position will not normally apply to surface water run-off via sustainable drainage systems and discharges from sewage treatment works operated by sewerage undertakers with appropriate treatment and discharge controls.

Deep infiltration systems (such as boreholes and shafts) are not generally accepted by the EA for discharge of sewage effluent as they bypass soil layers and reduce the opportunity for attenuation of pollutants.

Discharges of surface water run-off to ground at sites affected by land contamination, or from sites for the storage of potential pollutants are likely to require an environmental

56 The Environment Agency's approach to groundwater protection, Environment Agency (2018). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Envirnment-Agency-approach-to-groundwater-protection.pdf on: 18/11/2022

permit. This could include sites such as garage forecourts and coach and lorry parks. These sites would be subject to a risk assessment with acceptable effluent treatment provided.

Discharge of clean water

"Clean water" discharges such as runoff from roofs or from roads, may not require a permit. However, they are still a potential source of groundwater pollution if they are not appropriately designed and maintained.

Where infiltration SuDS schemes are proposed to manage surface runoff they should:

- be suitably designed,
- meet Government non-statutory technical standards[57]for sustainable drainage systems – these should be used in conjunction with the NPPF and PPG; and
- use a SuDS management treatment train

A hydrogeological risk assessment is required where infiltration SuDS is proposed for anything other than clean roof drainage in a SPZ1.

Deep infiltration systems (such as boreholes and shafts) could be accepted by the EA for discharge of clean roof water via sealed system. Separation of clean roof water and other runoff should be considered early stage of design in a project.

Source Protection Zones in Wokingham Borough

The North of Wokingham Borough is covered by a Source Protection Zone and another smaller SPZ is present between Arborfield and Shinfield. Parts of the Hall Farm SDL are within Zone 1, one proposed allocation is within zone 2, and nine are within zone three. A list of the development sites, and the appropriate EA guidance for each is contained in Table 11.3 Proposed allocations within SPZs.

57 Sustainable Drainage Systems: non-statutory technical standards, Department for Environment, Food & Rural Affairs (2015). Accessed online at:
https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
on: 18/11/2022

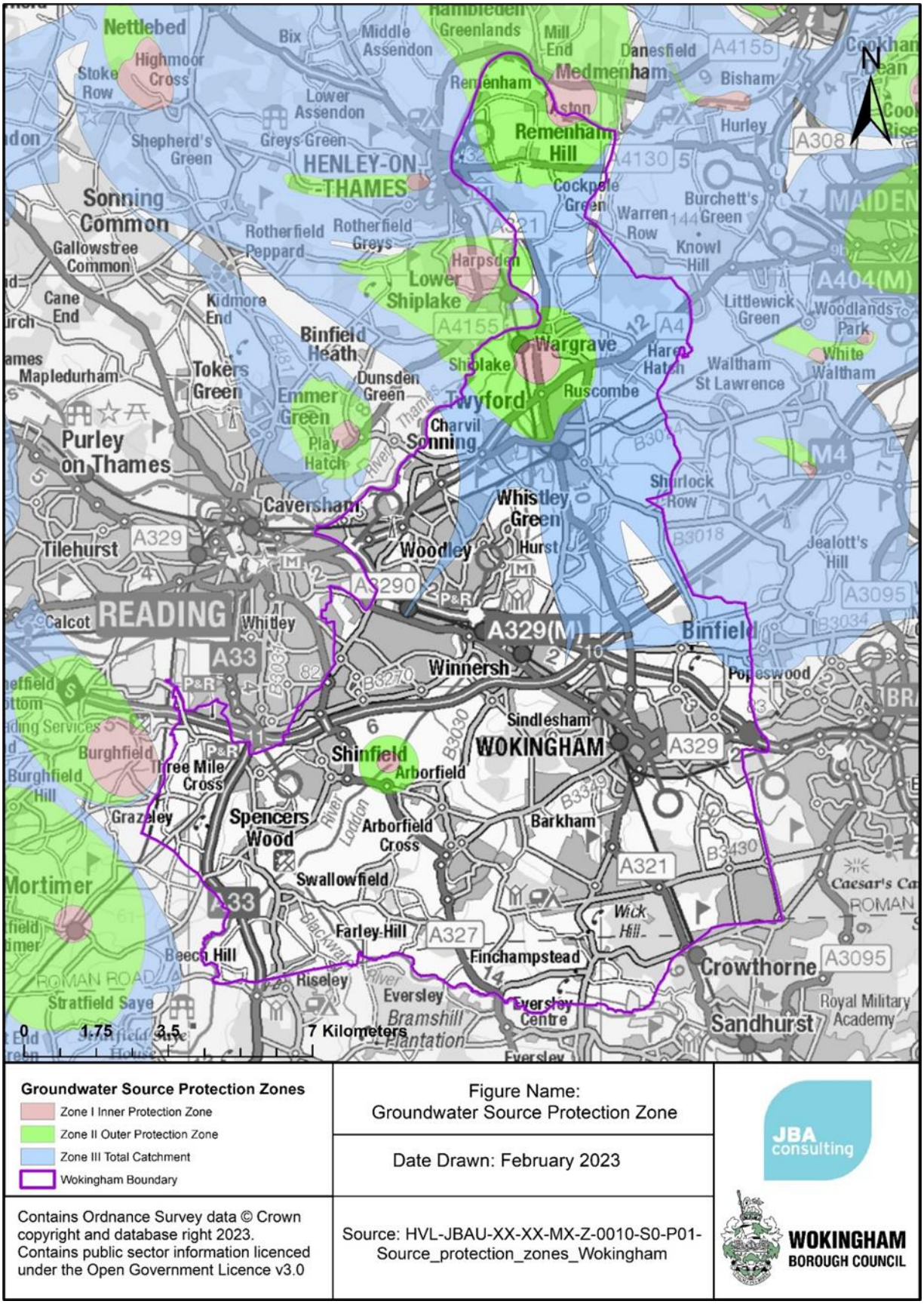


Figure 11.4 Source Protection zones (SPZs) in Wokingham Borough

Table 11.3 Proposed allocations within SPZs

Source Protection Zone	Sites	Management advice/ EA position statement
Zone 1- Inner Protection Zone	Hall Farm SDL	G2 – Inside SPZ1 all sewage effluent discharges to ground must have an environmental permit. G4 – Inside SPZ1 the EA will object to any new trade effluent, storm overflow from sewage system or other significantly contaminated discharges to ground where the risk of groundwater pollution is high and cannot be adequately mitigated. G12 – Discharge of clean roof water to ground is acceptable both within and outside SPZ1, provided all roof water down-pipes are sealed against pollutants entering the system from surface runoff, effluent disposal or other forms of discharge. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminant already in the ground. No permit is required if these criteria are met. G13 – Where infiltration SuDS are proposed for anything other than clean roof drainage in a SPZ1, a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. SuDS schemes must be suitably designed.
Zone 2- Outer Protection Zone	5TW010	A hydrogeological risk assessment is not a requirement for SuDS schemes, however they should still be “suitably designed”, for instance following best practice guidance in the CIRIA SuDS Design Manual.
Zone 3- Total Catchment	5CV001 5CV002 5HU002 5HU030 5RU007 5RU008 5WI004, 06, 10	A hydrogeological risk assessment is not a requirement for SuDS schemes, however they should still be “suitably designed”, for instance following best practice guidance in the CIRIA SuDS Design Manual.

11.6.2 Surface Water Drainage and SuDS

Since April 2015[58], management of the rate and volume of surface water has been a requirement for all major development sites, using Sustainable Drainage Systems (SuDS).

Wokingham Borough Council as Lead Local Flood Authority (LLFA), is a statutory consultee to the planning system for surface water management within major development, which covers the following development scenarios:

- 10 or more dwellings
- a site larger than 0.5 hectares, where the number of dwellings is unknown
- building greater than 1,000 square metres
- a site larger than 1 hectare

SuDS are drainage features which attempt to replicate natural drainage patterns, through capturing rainwater at source, and releasing it slowly into the ground or a water body. They can help to manage flooding through controlling the quantity of surface water generated by a development, improve water quality by treating urban runoff and provide a useful function in aquifer recharge. SuDS can also deliver multiple benefits, through creating habitats for wildlife and green spaces for the community. SuDS also have the advantage of providing effective Blue and Green infrastructure and ecological and public amenity benefits when designed and maintained properly.

National standards on the management of surface water are outlined within the Defra Non-statutory Standards for Sustainable Drainage Systems[59], with local guidance specified by Wokingham Borough Council[60]. The CIRIA C753 SuDS Manual[61] and

58 Department for Communities and Local Government (2014) House of Commons: Written Statement (HCWS161) Written Statement made by: The Secretary of State for Communities and Local Government (Mr Eric Pickles) on 18 Dec 2014. Available at: https://www.parliament.uk/documents/commons-vote-office/December%202014/18%20December/6.%20DCLG-sustainable-drainage-systems.pdf on: 18/11/2022

59 Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems, DEFRA (2015) Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf on: 18/11/2022

60 Wokingham SuDS Strategy, Wokingham Borough Council (2017). Accessed online at: https://www.wokingham.gov.uk/EasySiteWeb/GatewayLink.aspx?alId=417843 on: 18/11/2022

61 CIRIA Report C753 The SuDS Manual, CIRIA (2015). Accessed online at: https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx on: 18/11/2022

Guidance for the Construction of SuDS[62] provide the industry best practice guidance for design and management of SuDS.

11.6.3 Use of SuDS in Water Quality Management

SuDS allow the management of diffuse pollution generated by urban areas through the sequential treatment of surface water reducing the pollutants entering lakes and rivers, resulting in lower levels of water supply and wastewater treatment being required. This treatment of diffuse pollution at source can contribute to meeting WFD water quality targets, as well as national objectives for sustainable development.

This is usually facilitated via a SuDS Management Train of several components in series that provide a range of treatment processes delivering gradual improvement in water quality and providing an environmental buffer for accidental spills or unexpected high pollutant loadings from the site. Considerations for SuDS design for water quality are summarised in Table 11.4 below.

Table 11.4 Considerations for SuDS design for water quality

Objective	Advice
Manage surface water close to source	Where practicable, treatment systems should be designed to be close to source of runoff. It is easier to design effective treatment when the flow rate and pollutant loadings are relatively low. Treatment provided can be proportionate to pollutant loadings and the sensitivity of receptors. Accidental spills or other pollution events can be isolated more easily without affecting the downstream drainage system. Encourages ownership of pollution. Poor treatment performance or component damage/ failure can be dealt with more effectively without impacting on the whole site.

62 Guidance on the Construction of SuDS (C768), CIRIA (2017), Accessed online at: https://www.ciria.org/ItemDetail?iProductcode=C768&Category=BOOK on: 18/11/2022

Objective	Advice
Treat surface water runoff on the surface	Where practicable, treatment systems should be designed to be on the surface. Where sediments are exposed to UV light, photolysis and volatilisation processes can act to break down contaminants. If sediment is trapped in accessible parts of the SuDS, it can be removed more easily as part of maintenance. It enables use of evapotranspiration and some infiltration to the ground to reduce runoff volumes and associated total contamination loads (provided risk to groundwater is managed appropriately). It allows treatment to be delivered by vegetation. Sources of pollution can be easily identified. Accidental spills or misconnections are visible immediately and can be dealt with rapidly. Poor treatment performance can be easily identified during routine inspections, and remedial works can be planned efficiently.
Treat surface water runoff to remove a range of contaminants	SuDS design should consider the likely presence and significance of any contaminant that may pose a risk to the receiving environment. The SuDS component or combination of components selected should include treatment processes that, in combination, are likely to reduce this risk to acceptably low levels.
Minimise risk of sediment remobilisation	The SuDS design should consider and mitigate the risks of sediments (and other contaminants) being remobilised and washed into receiving surface waters during events greater than those which the component has been specifically designed for.
Minimise impacts from accidental spills	By using a number of components in series, SuDS can help ensure that accidental spills are trapped in/on upstream component surfaces, facilitating contamination management and removal. The selected SuDS components should deliver a robust treatment design that manages risks appropriately - taking into account the uncertainty and variability of pollution loadings, sensitivity of receptors and treatment processes.

11.6.4 Additional benefits

Flood Risk

The Strategic Flood Risk Assessment contains recommendations for SuDS to manage surface water on development sites, with the primary aim of reducing flood risk.

SuDS are most effective at reducing flood risk for relatively high intensity, short and medium duration events, and are particularly important in mitigating potential increases in surface water flooding, sewer flooding and flooding from small and medium sized watercourses resulting from development.

Water Resources

A central principle of SuDS is the use of surface water as a resource. Traditionally, surface water drainage involved the rapid disposal of rainwater, by conveying it directly into a sewer or Water Recycling Centres.

SuDS techniques such as rainwater harvesting, allow rainwater to be collected and re-used as non-potable water supply within homes and gardens, reducing the demand on water resources and supply infrastructure.

Climate Resilience

Climate projections for the UK suggest that winters may become milder and wetter, and summers may become warmer, but with more frequent higher intensity rainfall events. This would be expected to increase the volume of runoff, and therefore the risk of flooding from surface water, and diffuse pollution, and reduce water availability.

SuDS offer a more adaptable way of draining surfaces, controlling the rate and volume of runoff leaving urban areas during high intensity rainfall, and reducing flood risk to downstream communities through storage and controlled release of rainwater from development sites.

Through allowing rainwater to soak into the ground, SuDS are effective at retaining soil moisture and groundwater levels, which allows the recharge of the watercourses and underlying aquifers. This is particularly important where water resource availability is limited, and likely to become increasingly scarce under future drier climates.

Biodiversity

The water within a SuDS component is an essential resource for the growth and development of plants and animals, and biodiversity benefits can be delivered even by very small, isolated schemes. The greatest value can be achieved where SuDS are planned as part of a wider green landscape, providing important habitat, and wildlife connectivity. With careful design, SuDS can provide shelter, food, foraging and breeding opportunities for a variety of species including plants, amphibians, invertebrates, birds, bats, and other animals.

Amenity

Designs using surface water management systems to help structure the urban landscape can enrich its aesthetic and recreational value, promoting health and well-being and supporting green infrastructure. Water managed on the surface rather than underground can help reduce summer temperatures, provide habitat for flora and fauna and act as a resource for local environmental education programmes and working groups and directly influence the sense of community in an area.

11.7 Nutrient reduction options

11.7.1 Natural flood management

Natural Flood Management (NFM) is used to protect, restore, and re-naturalise the function of catchments and rivers to reduce flood risk. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes to store or slow down flood waters before they can damage flood risk receptors (e.g., people, property, infrastructure, etc.). NFM involves taking action to manage flood and coastal erosion risk by protecting, restoring, and emulating the natural regulating functions of catchments, rivers, floodplains, and coasts. Techniques and measures, which could be applied include:

- Offline storage areas.
- Re-meandering streams.
- Targeted woodland planting.
- Reconnection and restoration of functional floodplains.
- Restoration of rivers and removal of redundant structures.
- Installation or retainment of large woody material in river channels.
- Improvements in management of soil and land use.
- Creation of rural and urban SuDS.

In 2017, the Environment Agency published on online evidence base[63] to support the implementation of NFM and with JBA produced maps showing locations with the potential for NFM measures[64]. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. There are limitations with the maps; however, it is a useful tool to help start dialogue with key partners.

63 Working with natural processes to reduce flood risk, Environment Agency (2018). Accessed online at: https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk on: 13/07/2021

64 Mapping the potential for working with natural process, Environment Agency and JBA. Accessed online at: https://naturalprocesses.jbahosting.com/ on: 13/07/2021

11.7.2 Multiple benefits of NFM

In addition to flood risk benefits, there are also significant benefits in other areas such as habitat provision, air quality, climate regulation and of note for the water cycle study - Water Quality.

Many NFM measures can reduce nutrient and sediment sources by reducing surface runoff flows from higher ground, reducing soil erosion, trapping sediment at the edge of agricultural land, or encouraging deposition of sediments behind natural dams upstream in watercourses.

Suitable techniques may include:

- Leaky dams.
- Woodland planting.
- Buffer strips.
- Runoff retention ponds.
- Land management techniques (soil aeration, cover crops etc).

Case Study – Black Brook Slow the Flow

Four engineered log dams were installed on Black Brook at an estimated cost of £2,000, funded by Natural England and the Environment Agency to restore Stanley Bank SSSI. The scheme aimed to improve habitat and reduce the risk of flooding. However, the scheme also resulted in reduced levels of phosphate and nitrate in Black Brook, with phosphate concentrations falling by 3.6mg/l. By 2035, it is predicted that 792m^3 of sediment will be stored in three ponds retained by the jams.

Figure 11.5 Example of a leaky dam

Reproduced from Case study 17. Black Brook Slow the Flow, St Helens, Norbury, Rogers and Brown, EA WwNP Evidence Base 2017. Photograph taken on 8 May 2015; courtesy of Matthew Catherall.

11.7.3 Integrated Constructed Wetlands

An integrated constructed wetland (ICW) is an artificial wetland created for the purpose of treating polluted water, whether this is municipal wastewater, grey water from residential properties, or agricultural runoff.

They are usually unlined, free surface flow wetlands, designed to contain and treat influents within emergent vegetated areas.

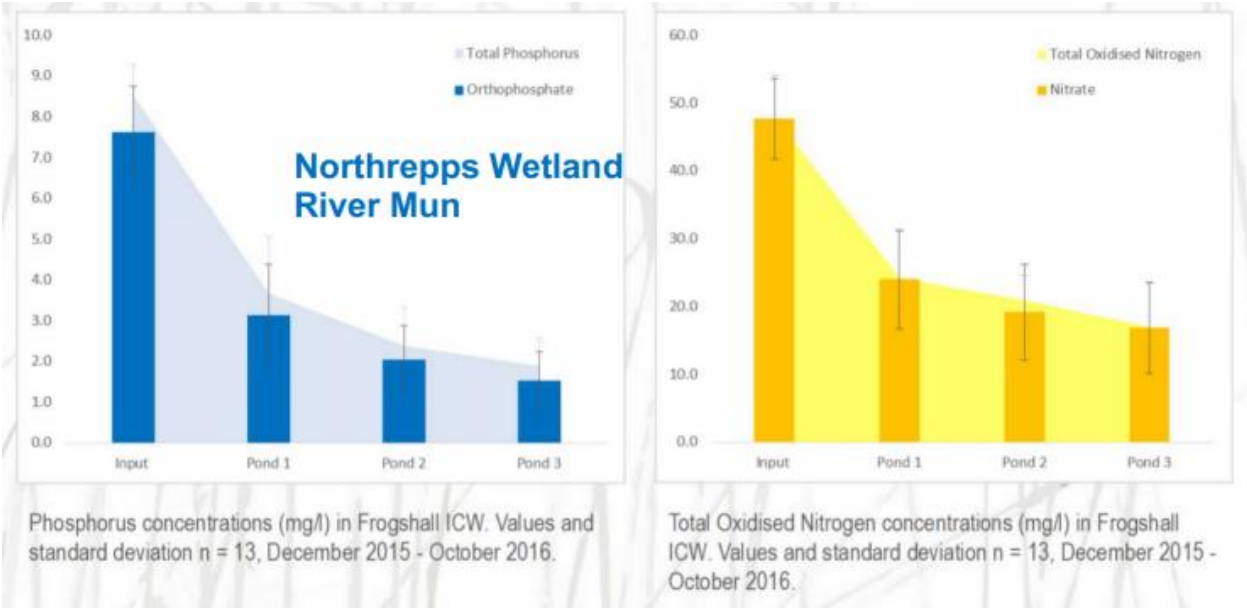
Defra carried out a systematic review of the effectiveness of various wetland types, including ICWs for mitigating agricultural pollution such as phosphate and nitrate. The overall conclusion was that all wetland types are very effective at reducing major nutrients and suspended sediments, with the exception of nitrite in ICWs. Nitrate is only reduced when passing through overland buffer strips and through constructed wetlands with vegetation, where the systematic review showed a mean reduction of 29% across the evidence included in the study. The mean reduction in Total Phosphorus across the evidence base was 78%.

Case Study – Frogshall ICW

The Upper River Mun in Norfolk was experiencing chronic pollution, and a loss in biodiversity in the river. Investigation found that nutrients from a Sewage Treatment Works upstream were contributing to this issue.

A pilot ICW was created consisting of three shallow ponds, filled with 18,000 emergent aquatic plants, and the outfall from the treatment works was diverted to pass through the wetland.

Early monitoring has shown that 90% of the phosphate is being removed by the wetland, and a large increase in biodiversity downstream observed.



Phosphorus concentrations (mg/l) in Frogshall ICW. Values and standard deviation n = 13, December 2015 - October 2016.

Total Oxidised Nitrogen concentrations (mg/l) in Frogshall ICW. Values and standard deviation n = 13, December 2015 - October 2016.

Figure 11.6 Water quality changes from the WwTW input through the wetland
Reproduced from “Stripping the Phosphate” a presentation by the Norfolk Rivers Trust (2018)[65].

11.7.4 Agricultural Management

There is a big potential to improve water quality by interventions aimed at agricultural sources, especially considering the measures already taken by STW to reduce their contribution to phosphate load.

Potential schemes could include:

- Buffer strips.
- Cross slope tree planting.
- Runoff retention basins.
- Contour ploughing.
- Cover crops.

There is considerable overlap with NFM measures, and the challenges are also very similar. Exact impacts are difficult to measure, although modelling tools such as Farmscoper[66] exist to help with this. Once a scheme is implemented it relies on the landowner to continue to maintain it in order to maintain the mitigation benefit.

Funding for agricultural interventions could come from Catchment Sensitive Farming or a Payment for Ecosystem Services approach.

65 https://www.theriverstrust.org/media/2018/08/2.-Stripping-the-phosphate-David-Diggens-Norfolk-Rivers-Trust.pdf

66 Farmscoper webpage, ADAS (2020) https://www.adas.uk/Service/farmscoper Accessed on 13/07/2021

Wessex Water and United Utilities have both recently used a reverse auction approach[67], which enables farmers to bid for funding to plant cover crops in winter to manage runoff from agricultural land.

Case Study – Wessex Water - EnTrade

Wessex Water catchment team used EnTrade to invite farmers to bid to grow cover crops over winter to reduce the nitrogen leaching into the watercourse.

This avoided the need to upgrade Dorchester WwTW to provide the same nitrogen removal capacity.

A trial auction was held in 2015, and two further auctions have since taken place attracting 557 bids from 63 farmers to save 153 tonnes of nitrogen.

“Using EnTrade to create a market in measures to deliver reductions in nitrogen has delivered a 30% saving for Wessex Water compared to traditional catchment approaches.” Ruth Barden, Director of Environmental Strategy, Wessex Water

11.8 Conclusions

- WwTWs serving growth within Wokingham Borough are point sources of pollution in the study area.
- Five protected sites (SSSIs) are downstream of the study area. In the river adjacent to these sites, there is risk of a deterioration in water quality. This could be prevented by improvements in upstream treatment technology.
- Development sites within Wokingham Borough could also be sources of diffuse pollution from surface runoff.
- SuDS are required on all sites and their design must consider water quality as well as quantity.
- Runoff from these sites should be managed through implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites.
- Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity, as well as opportunities for groundwater recharge to provide a water resources benefit.
- Wokingham Borough, as an LLFA, should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors.

Although primarily an urban area, opportunities exist to implement natural flood management techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

67 EnTrade webpage, Entrade (2020). https://www.entrade.co.uk/ Accessed on: 18/11/2022

11.9 Recommendations

Table 11.5 Recommendations from the environment section

Action	Responsibility	Timescale
The Local Plan should include policies that require development sites to adopt SuDS to manage water quality of surface runoff.	WBC	Ongoing
The local plan should include policies that require all development proposals with the potential to impact on areas with environmental designations to be considered in consultation with Natural England (for national designations).	WBC	Ongoing
In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	WBC, TW, SEW and EA	Ongoing
Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme.	Developers	Ongoing
Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	WBC, TW, SEW, Developers	Ongoing
Opportunities for Natural Flood Management that include schemes aimed at reducing / managing runoff should be considered to reduce nutrient and sediment pollution alongside reducing flood risk within Wokingham Borough.	WBC, TW, SEW	Ongoing

12 Climate change impact assessment

12.1 Approach

An assessment was undertaken to assess the potential impacts of climate change on the assessments made in this water cycle study. This was conducted using a matrix which considered both the potential impact of climate change on the assessment in question, and also the degree to which climate change has been considered in the information used to make the assessment.

The impacts have been assessed on a Wokingham Borough area wide basis; the available climate models are generally insufficiently refined to draw different conclusions for different parts of Wokingham Borough or doing so would require a degree of detail beyond the scope of this study.

Table 12.1 Climate change pressures scoring matrix

Have climate change pressures been considered in the assessment?	Low Potential Impact	Medium Potential Impact	High Potential Impact
Yes- quantitative consideration	GREEN	AMBER	AMBER
Some consideration but qualitative only	GREEN	AMBER	RED
Not considered	AMBER	RED	RED

12.2 Impact assessment

Thames Water and South East Water recognise the threat of climate change in their WRMP and have both published separate Climate Change Adaption Report in 2021.

Table 12.2 Climate change risk assessment

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the Water Cycle Study?	RAG
Water resources	High	Yes – quantitative assessment within the WRMP[68].	AMBER

68 Thames Water WRMP - Appendix U - Climate Change, Thames Water (2022). Accessed online at: https://thames-wrmp.co.uk/assets/images/documents/technical-appendices/U-Climate-Change.pdf on: 17/03/2023

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the Water Cycle Study?	RAG
Water supply infrastructure	Medium – some increased demand in hot weather	Yes – qualitative assessment within the WRMP.	AMBER
Wastewater Collection	High – Intense summer rainfall and higher winter rainfall increases flood risk	This has not been considered in site-by-site assessments. However, it is taken into account by TW within the draft DWMP.	AMBER
Wastewater treatment	Medium – Increased winter flows and more extreme weather events reduces flow headroom	This has not been considered in site-by-site assessments. However, it is taken into account by TW when modelling future flow at WwTWs in the draft DWMP.	AMBER
WwTW odour	Medium – higher temperatures will exacerbate existing odour control issues.	This has not been considered in site-by-site assessments.	AMBER
Water quality	Nutrients: High Sanitary determinands: Medium to High	Reduction in river low flow (summer) values could reduce dilatation available and increase deterioration in water quality due to growth.	AMBER
Flooding from increased WwTW discharge	Low	No – not considered	AMBER

12.3 Conclusions

The impact of Climate Change on water resources and water infrastructure are receiving increasing levels of attention by water companies and sewerage undertakers

at a strategic level. This has not been included in assessments at a site level as detailed modelling has not been carried out. Changes in water and wastewater demand should be considered when carrying out detailed site assessments in the future.

There is a risk that lower river flows in the future could exacerbate water quality issues as there would be less opportunity for dilution of pollutants.

12.4 Recommendations

Table 12.3 Climate change recommendations

Action	Responsibility	Timescale
When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, TW, SEW	As required
Take “no regrets” * decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	WBC and Developers	As required

* “No-Regrets” Approach: “No-regrets” actions are actions by households, communities, and local/national/international institutions that can be justified from economic, and social, and environmental perspectives whether natural hazard events or climate change (or other hazards) take place or not. “No-regrets” actions increase resilience, which is the ability of a “system” to deal with different types of hazards in a timely, efficient, and equitable manner. Increasing resilience is the basis for sustainable growth in a world of multiple hazards (Heltberg, Siegel, Jorgensen, 2009; UNDP, 2010).

13 Conclusions and recommendations of this study

13.1 Conclusions

13.1.1 Water resources

Climate change is predicted to increase pressure on water resources, increasing the potential for a supply-demand deficit in the future, and making environmental damage from over abstraction of water resources more likely. Furthermore, the delivery of water and wastewater services and the heating of water in the home require high energy inputs, and therefore contribute directly to emissions of greenhouse gases. Water efficiency therefore reduces energy use and carbon emissions.

It is important that new development does not result in an unsustainable increase in water abstraction. This can be done in a number of ways from reducing the water demand from new houses through to achieving “water neutrality” in a region by offsetting a new developments water demand by improving efficiency in existing buildings.

There is sufficient evidence to recommend the optional 110 litres per person per day design standard allowed under Building Regulations. This should be supported by an equivalent non-household water efficiency target. The BREEAM New Construction Standard can be used for this, and it is recommended that non-household development achieves a minimum of three credits under the measure “Wat01” which provides a 40% improvement in water consumption compared to the baseline for that type of building.

Water resources are under significant pressure in the UK, and the direction of travel in water resources planning is to reduce per capita consumption in new build development below the optional building regulations standard of 110 l/p/d. Currently this approach is not adequately supported in building regulations and the NPPF and policies requiring water efficiency standards less than 100l/p/d may only be supported at Local Plan examination in exceptional circumstances, such as a direct link between water abstraction and damage to a Special Area of Conservation.

Until this changes, LPAs should encourage developers to go further than building regulations.

This is supported by Thames Water’s incentives for water efficient design in new builds outlined in section 4.5 where significant incentives are offered to reduce design consumption below 110l/p/d. Developers should be encouraged to achieve at least the Tier 2 incentive (Rainwater harvesting and greywater recycling).

13.1.2 Water supply infrastructure

TW advised that at 12 of the sites, representing the majority of new dwellings that would be supplied by TW, the scale of development was such that upgrades and /or new water supply infrastructure may be required in order to accommodate growth. Flow and pressure modelling may be required as part of the planning process.

A similar assessment was sought from SEW but they were unable to provide this at the time due to resource constraints. However, SEW have subsequently confirmed that the WRMP is able to accommodate a level of growth that aligns with the projections provided. This should be followed up by WBC as part of the planning process as development sites come forwards.

13.1.3 Wastewater collection

Developments in the area where there is limited wastewater network capacity will increase pressure on the network. Subsequently, this will increase risk of a detrimental impact on existing customers

and increasing likelihood of storm overflows (where present). The assessment performed by TW indicated that on larger development sites, modelling of the wastewater network was needed at part of the planning process, and upgrades to the network are likely to be required. These must be in place before occupation of development. No significant constraints to providing network upgrades have been identified.

Overall, there are no network storm overflows in the study area exceeding the threshold of 50 operations per year that would trigger an investigation. It is important that development does not increase the frequency or duration of operation.

There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing residential areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

13.1.4 Wastewater treatment

There are six WwTWs that may serve growth during the plan period in Wokingham Borough. Three of these are expected to exceed their flow permit during the Local Plan period and will require an increase in their permit and / or upgrades to treatment processes in order to serve growth. No significant constraints to providing upgrades have been identified by TW. In addition to hydraulic capacity, it is important to consider water quality considerations.

Whilst the frequency of operation of overflows on storm tanks in the study area is below the threshold for investigation, it is important that development does not increase this frequency. The local plan can contribute to this by encouraging the use of SuDS to divert storm water away from the sewer network, reducing the volume that reaches the WwTW.

13.1.5 Odour

Eight sites have been identified that are close enough to a WwTW for nuisance odour to be a risk. At these sites, it is recommended that an odour assessment is carried out to investigate them further. This should be undertaken as part of the planning process, paid for by developers. These sites have been given an amber assessment. The remaining sites have been given a rating of green.

13.1.6 Water quality

The modelling indicates that growth during the Local Plan period could result in a significant deterioration (10% or over or deterioration in class) in water quality at two WwTWs (Arborfield and Easthampstead Park). In the case of Easthampstead Park, deterioration in phosphate is predicted to be 3% and as this is already within bad class, this is considered to be significant. This can be prevented by a tightening of the environmental permit and / or upgrades to treatment processes.

Growth alone will not prevent good ecological status being prevented in the future should improvements in upstream water quality be made.

Where a WwTW is shared with a neighbouring authority, coordination of growth plans in collaboration with Thames Water is essential to ensure that infrastructure is in place prior to development to prevent a breach of the environmental permit.

13.1.7 Flood risk

At each of the points of discharge for WwTWs, the additional flow from growth makes up less than 5% of the Q30 flow and less than 5% of the Q100 flow. The impact of increased effluent flows is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

13.1.8 Environmental impacts

WwTWs serving growth within Wokingham Borough are point sources of pollution in the study area. Five protected sites (SSSIs) are downstream of the study area. In the river adjacent to these sites, there is risk of a deterioration in water quality. This could be prevented by improvements in upstream treatment technology.

Development sites within Wokingham Borough could also be sources of diffuse pollution from surface runoff. Runoff from these sites should be managed through

implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites.

Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity, as well as opportunities for groundwater recharge to provide a water resources benefit.

Wokingham Borough, as an LLFA, should be consulted at an early stage to ensure SuDS are implemented and designed in response to site characteristics and policy factors.

Although primarily an urban area, opportunities exist to implement natural flood management techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

13.1.9 Climate change

The impact of Climate Change on water resources and water infrastructure are receiving increasing levels of attention by water companies and sewerage undertakers at a strategic level. This has not been included in assessments at a site level as detailed modelling has not been carried out. Changes in water and wastewater demand should be considered when carrying out detailed site assessments in the future.

There is a risk that lower river flows in the future could exacerbate water quality issues as there would be less opportunity for dilution of pollutants.

13.2 Recommendations

Topic	Action	Responsibility	Timescale
Water resources	Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	TW and SEW	Ongoing
Water resources	Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	WBC	Ongoing
Water resources	Use planning policy to require the optional standard in Building Regulations of 110 l/p/d for new build housing.	WBC	In Wokingham LP

Topic	Action	Responsibility	Timescale
Water resources	Use planning policy to require new build non-residential development to achieve at least 3 credits in the Wat01 Measure for water in the BREEAM New Construction standard.	WBC	In Wokingham LP
Water resources	Larger residential developments (including new settlements), and commercial developments should consider incorporating greywater recycling and/or rainwater harvesting into development at the master planning stage in order to reduce water demand.	WBC, TW and SEW	In Wokingham LP
Water resources	Water companies should advise WBC of any strategic water resource infrastructure developments within the study, where these may require safeguarding of land to prevent other type of development occurring.	WBC, TW and SEW	Part of Wokingham LP process
Water supply	Undertake network modelling to ensure adequate provision of water supply is feasible as part of the planning process.	SEW TW WBC	In planning process
Water supply	WBC and Developers should engage early with SEW and TW to ensure infrastructure is in place prior to occupation.	WBC TW SEW Developers	In planning process
Water supply	Obtain an assessment from SEW for proposed allocations.	WBC SEW	As part of Local Plan evidence base
Wastewater collection	Early engagement between Developers, WBC and TW is required to ensure that where upgrades to infrastructure is required, it can be planned in by TW.	WBC Developers TW	Ongoing
Wastewater collection	Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker	SCC TW SEW	Ongoing

Topic	Action	Responsibility	Timescale
Wastewater collection	Developers will be expected to work with the sewerage undertaker closely and early in the planning promotion process to develop an outline foul Drainage Strategy for sites to the satisfaction of the LPA that the development will not increase sewer flooding or the frequency or duration of storm overflow operation. The Outline Foul Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets / upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	Developers TW SEW	Ongoing
Wastewater collection	Developers will be expected to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to foul sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA. Where a surface water connection is proposed to the public sewerage network, it should be demonstrated to Thames Water that there is no other technically feasible option by selecting options as high as possible within the surface water hierarchy.	Developers LLFA TW SEW	Ongoing
Wastewater treatment	Consider the available WwTW capacity when phasing development going to the same WwTW.	WBC TW	Ongoing
Wastewater	Provide Annual Monitoring Reports	WBC	Ongoing

Topic	Action	Responsibility	Timescale
treatment	to TW detailing projected housing growth.		
Wastewater treatment	TW to assess growth demands as part of their wastewater asset planning activities and feedback to the Council if concerns arise.	TW WBC	Ongoing
Odour	Consider odour risk in the sites identified to be potentially at risk from nuisance odour.	WBC	Ongoing
Odour	Carry out an odour assessment for sites identified as being at risk of nuisance odour.	Developers	Ongoing
Water quality	Provide annual monitoring reports to TW and SEW detailing projected housing growth in the Local Authority.	WBC	Ongoing
Water quality	Take into account the full volume of growth (from WBC and neighbouring authorities) within the catchment.	WBC	Ongoing
Flood risk	Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	TW	During design of WwTW upgrades
Environmental impact	The Local Plan should include policies that require development sites to adopt SuDS to manage water quality of surface runoff.	WBC	Ongoing
Environmental impact	The local plan should include policies that require all development proposals with the potential to impact on areas with environmental designations to be considered in consultation with Natural England (for national designations).	WBC	Ongoing

Topic	Action	Responsibility	Timescale
Environmental impact	In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	WBC, TW, SEW and EA	Ongoing
Environmental impact	Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme.	Developers	Ongoing
Environmental impact	Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	WBC, TW, SEW, Developers	Ongoing
Environmental impact	Opportunities for Natural Flood Management that include schemes aimed at reducing / managing runoff should be considered to reduce nutrient and sediment pollution alongside reducing flood risk within Wokingham Borough.	WBC, TW, SEW	Ongoing
Climate change	When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, TW, SEW	As required
Climate change	Take “no regrets” * decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	WBC and Developers	As required

A Map of potential allocations

B Water quality modelling results

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