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Huntingdonshire Integrated Water Management Strategy: Stage 1 Water Cycle Study

Final Report

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Abbreviations

1D ....One Dimensional (modelling)

AMP ....Asset Management Plan

AMP7 ....Seventh Asset Management Plan period (runs 2020-2025)

AONB ....Area of Outstanding Natural Beauty

BNG ....Biodiversity Net Gain

BOD ....Biological Oxygen Demand

BRE..........................The Building Research Establishment

CAMS.......................Catchment Abstraction Management Strategy

CAPEX.....................Capital Expenditure

CFMP.......................Catchment Flood Management Plan

CIL ....Community Infrastructure Levy

CIRIA........................Company providing research and training in the construction industry

CIWEM.....................The Chartered Institution of Water & Environmental Management

CSO ....Combined Sewer Overflow

DCG ....Design and Construction Guidance

DEFRA.....................Department of the Environment, Food and Rural Affairs (formerly MAFF)

DrWPA.....................Drinking Water Protected Areas

DS............................Downstream

DWMP......................Drainage and Wastewater Management Plan

DYAA ....Dry Year Annual Average

EA ....Environment Agency

EC ....European Community

FCT ....Favourable Condition Targets

FRA..........................Flood Risk Assessment

FWMA ....Flood and Water Management Act

GEP.......................... Good Ecological Potential

GES.......................... Good Ecological Status

GI ....Ground Investigations

GIS...........................Geographical Information System

GWMU ....Groundwater management unit

HDC ....Huntingdonshire District Council

HMWB.....................Heavily Modified Water Body

HoF ....Hands-off flow: river flow below which an abstractor may be required to stop or reduce abstraction

HoL...........................Hands-off-Level

ID ....Identifier

IWM..........................Integrated Water Management

JNCC........................Joint Nature Conservation Committee

LAA ....Land Availability Assessment

LLFA.........................Lead Local Flood Authority

LNR ....Local Nature Reserve

LNRS........................Local Nature Recovery Strategies

LPA ....Local Planning Authority

MODA ....Multi-Objective Decision Analysis

NBS..........................Nature Based Solutions

NE ....Natural England

NERC ....Natural Environment Research Council

NFM ....Natural Flood Management

NPPF........................National Planning Policy Framework

OEP..........................Office for Environmental Protection

OfWAT ....Water Services Regulation Authority

PE ....Potential Evaporation

PM............................Project Manager

PPG..........................Planning Practice Guidance

PR ....Percentage Runoff

PTP ....Package Treatment Plant

Ramsar.....................The intergovernmental Convention on Wetlands, signed in Ramsar, Iran, in 1971

RBD..........................River Basin District

RBMP.......................River Basin Management Plan

rdWRMP...................Revised Draft Water Resource Management Plan

REUL........................Retained EU Law

SABs ....SuDS Approval Bodies

SAC..........................Special Area of Conservation, protected under the EU Habitats Directive

SEA..........................Strategic Environmental Assessment

SFRA........................Strategic Flood Risk Assessment

SPA..........................Special Protection Area for birds, protected under the EU Habitats Directive

SPG..........................Strategic Planning Group

SPZ..........................Source Protection Zones

SSD..........................Small Sewage Discharge

SSSI.........................Site of Special Scientific Interest

STW.........................Sewage Treatment Works

SuDS........................Sustainable Drainage Systems

SWMP......................Surface Water Management Plan

UKWIR.....................UK Water Industry Research Ltd

uPBT........................Ubiquitous, Persistent, Bioaccumulative or Toxic

UWWTD...................Urban Wastewater Treatment Directive

US...........................Upstream

WaSC.......................Water and Sewerage Company

WCS.........................Water Cycle Study

WFD.........................Water Framework Directive

WINEP.....................Water Industry National Environment Programme

WRC.........................Water Recycling Centre

WRE.........................Water Resources East

WRMP......................Water Resource Management Plan

WRZ.........................Water Resource Zone

WwTW......................Wastewater Treatment Works

Executive Summary

JBA was commissioned by Huntingdonshire District Council to undertake an Integrated Water Management Study (IWMS).

This report is the first stage in the IWMS. It sets out how the study area which covers the administrative area of Huntingdonshire, is expected to grow up to 2046 and agrees a set of objectives that can be used in assessing future water management options. Following the IWMS guidance developed by CIRIA, a baseline is presented showing Huntingdonshire in the context of the wider catchment and presenting information on the status of water resources, wastewater infrastructure and water quality. An approach to quantifying integrated water management benefits was presented and a preliminary scoring of identified options undertaken.

Integrated Water Management (IWM) is focussed on creating a water management strategy beyond water itself and observing the interdisciplinary actions between energy, carbon, waste, biodiversity, agriculture, and ecosystem services.

Unmitigated future development and climate change can adversely affect the environment and water infrastructure capability. An IWMS 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.

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 IWMS has been carried out in co-operation with Huntingdonshire District Council, Cambridgeshire County Council, Anglian Water, Cambridge Water and the neighbouring Local Planning Authorities (LPAs).

Baseline

Water resources - Section 4.5

Huntingdonshire lies within the Anglian Water (AW) and Cambridge water (CW) supply areas. Huntingdonshire is covered by three WRZs including Anglian Water's Ruthamford North and Ruthamford South WRZs and Cambridge Water's Company Wide Zone as shown in Figure 4.10.

Water Resource Management Plans (WRMPs) are 50-year strategies that water companies are required to prepare, with updates every five years. They document the expected demand for water during the plan period, and how that demand will be met. Both Water companies have published revised draft Water Resource Management Plans (rdWRMP) with final plans expected in 2024.

AW show an initial surplus in their supply demand balance, with a deficit across their supply area by 2050 if no interventions are made. The rdWRMP then outlines their "best value plan" to achieve a supply-demand balance which includes measures such as demand management and Strategic Resource Options (SROs) such as the Fens and the South Lincolnshire Reservoirs, as well as transfers from neighbouring zones.

AW have also published a position statement on non-domestic water demand that will require new or expanding businesses requiring over 0.05Ml/d (equivalent to the demand from approximately 190 new dwellings) will need to maximise process efficiency to be considered for supply.

CW submitted their draft WRMP to the Environment Agency in October 2022. The EA then completed a review of the plan and provided their representation in May 2023. The representations showed that EA are concerned Cambridge Water will not be able to meet the demand for water in its area without increasing the risk of deterioration in the status of waterbodies. The EA recently objected to planning applications for large developments in South Cambridgeshire and Cambridge based on the impact of CW's abstractions. In principle this objection would also apply to large developments within the CW WRZ in Huntingdonshire (the east of the HDC area).

The EA and Defra completed a review of CW’s Statement of Response and rdWRMP in December 2023. The updated Statement of Response and rdWRMP were published in February 2024 in response to the recommendations received.

A review of CW's rdWRMP alongside the EA's advice report should therefore be carried out in a Stage 2 IWMS.

Each of these Water Resource Zones have been identified as being at risk of climate change impacts in the future. Consequently, finding alternative water resources and increased water efficiency may be important in mitigating these risks.

Within AW and CWs WRMPs[1] there is a focus on climate change resilience, the implementation of smart meters and working towards leakage reduction by better pipe connections to increase water availability. The objective to increase water availability and water efficiency is mirrored in the Water Resource East (WRE) summary, with the goals for desalination, reservoir design and planning and water re-use. Affordable bills and housing are also discussed in the WRE report summarised in Section 4.5.6.

1 WRMPs summarised in Section 4.5.3 (Anglian Water's WRMP) and Section (4.5.4Cambridge Water's WRMP).

Evidence presented in the Stage 1 study shows that Huntingdonshire is in an area of serious water stress and there is sufficient justification for the tighter water efficiency target currently allowed for under building regulations of 110l/p/d. The direction of travel for water resources in the UK is to go further than this and achieve tighter standards. The Government's Environmental Improvement Plan (EIP) shows a target of 100l/p/d is being considered in water stressed areas, and in some areas, LPAs are now considering water neutrality. Whilst this is not current policy, it is likely that a tighter standard than the 110 l/p/d will be adopted in Building Regulations during the lifetime of HDC's new Local Plan. In the Stage 2 IWMS, the options for achieving higher water efficiency standards in new build housing and non-household development will be outlined, including options to achieve or go further than water neutrality. The impact this would have on the baseline water balance presented in the Stage 1 study will be explored.

Wastewater - Section 4.6

Anglian Water are the primary sewerage undertaker for the whole of Huntingdonshire. Increased wastewater flows into the wastewater network due to growth in population can increase the pressure on existing infrastructure, increasing the risk of sewer flooding and where present increasing the risk of storm overflow operation. Headroom at Water Recycling Centres (WRCs) can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity.

The environment Act requires water companies to report and monitor storm overflows as well as reduce the harm caused to the rivers they discharge to. Within Huntingdonshire there are thirty storm overflows and eighteen storm tanks overflows located on the sewer network and at WRCs (based on 2022 EDM dataset). Three overflows exceed the frequency of operations threshold for further investigation by the EA including Sawtry STW, Huntingdon (Godmanchester) STW and Ramsey STW. In the longer-term investment will be required to meet the 2050 target of 10 or fewer operations per year.

Within the development process, it is important that developers and other stakeholders such as HDC, the EA, Anglian Water and Cambridge Water work together to future proof homes as well as new developments, specifically in water stressed areas. This may include the incorporation of rainwater harvesting and greywater recycling which can lead to the conservation of potable water resources.

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. Redevelopment of brownfield sites with previously combined sewerage systems offer the potential to separate surface water from foul and reduce discharges from sewer overflows.

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. A headroom assessment was carried out comparing the current discharge from each WRC in Huntingdonshire to its permit value, taking into account growth already planned.

There are 33 WRCs within or serving communities in Huntingdonshire. Of these, 29 are expected to serve committed growth within the period of the adopted Local Plan (see Section 4.7.1).

Ten WRCs (Alconbury, Brampton (Cambs), Easton (Cambs), Elton, Huntingdon (Godmanchester), Molesworth, Old Weston Main Street, Oldhurst, Somersham and St Neots) are close to, or likely to exceed their permit due to committed growth. Further development in these catchments would require an increase in their flow permit and potentially upgrades to treatment processes. A further two WRCs (Needingworth and St Ives) have less than 10% headroom remaining and may not be able to serve significant growth without an increase in their flow permit. Five WRCs either do have a descriptive permit (no flow permit has been set), or there is no flow monitoring (smaller WRCs often do not have flow monitoring). An amber rating has also been given to these WRCs as they are unlikely to be able to serve significant growth. Typically, upgrades are only planned once there is certainty that development will take place in a catchment and new permit limits would be set by the EA.

Environmental - Section 4.8

The latest Water Framework Directive assessment data shows that all the watercourses in the study area have moderate or poor status overall status. The EA reasons for not achieving good (RNAG) dataset indicates that the water industry (sewage discharges) and agriculture and rural land management (livestock, arable and land drainage) are the main reasons for watercourses not achieving good status in this area. Another principal source of pollution is from urban and highway runoff. This can be managed through design of new development and transport infrastructure including nature-based solutions.

The overall, physio-chemical and invertebrate status of water bodies within Huntingdonshire have been gathered from the Environment Agency's Catchment Data Explorer[2]. Within the Huntingdonshire study area, 21 out of the 22 waterbodies have 'moderate' status under the WFD. The remaining one waterbody has 'poor' status (Colmworth Brook). Further information can be found in Section 4.8.6.

2 England | Catchment Data Explorer

It needs to be acknowledged that the environmental effects of water resources and water supply issues may stretch beyond the boundary of the LPA itself, such as water supply and therefore its environmental effects will come from outside of the LPA boundary.

Water Quality - Chapter 5

An increase in the discharge of effluent from Water Recycling Centres (WRCs) 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).

A sensitivity analysis was carried out using the EA's SIMCAT water quality model. Growth in population was simulated by increasing the discharge from each WRC by 10%. Where water quality downstream of a WRC in any given determinand deteriorates by 10% or more in response to a 10% increase in effluent flow, the sewer catchment can be said to be “more sensitive” to changes in effluent flow, and therefore growth. Where the response is less than 10% the watercourse can be said to be "less sensitive".

The sensitivity analysis suggests that ammonia concentrations in watercourses within Huntingdonshire may be sensitive to increases in the discharge of treated wastewater.

Water balance - Chapter 6

A baseline water balance is presented in Chapter 6 showing the relationship between the three WRZs in Huntingdonshire and the proportion of water used by HDC in comparison to other LPAs. Stage 2 will examine the impact of various integrated water management actions (outlined in Chapter 8) on the baseline water balance.

Preliminary options assessment - Chapter 7 and 8

The potential for integrated water management options to deliver against a set of level objectives derived from the 25 Year Environment Plan, HDC Climate strategy and discussions with HDC were assessed using a Multi-Objective Decision Analysis (MODA) approach. The main conclusions from this assessment are:

- The scoring at this stage is unweighted, i.e., each objective is given equal weighting. This should be revisited at stage 2.
- The most beneficial options are green infrastructure, blue infrastructure and SuDs.

The option with the lowest overall score is leakage reduction. This should not be considered an indication that this is not a valuable option, simply that it is an option with narrowly focussed benefits. This result also highlights that other integrated water options would be more beneficial than higher leakage reduction.

1 Introduction

1.1 Terms of Reference

JBA Consulting was commissioned by Huntingdonshire District Council (HDC) to undertake an Integrated Water Management Study (IWMS). Phase 1 of the IWMS incorporates a Level 1 Strategic Flood Risk Assessment (SFRA) and Stage 1 Water Cycle Study (WCS). Phase 2, if required following the outcomes of Phase 1, will include a more detailed Level 2 SFRA and Stage 2 WCS.

Phase 1 is presented over two reports: one for the Level 1 SFRA and one for the Stage 1 WCS. However, each study is not considered in isolation and references to the Level 1 SFRA are apparent throughout this report, where applicable.

The purpose of an IWMS is to form part of a comprehensive and robust evidence base for the local plan to aid in coordinating development and management of water to help in the sustainable building of developments mentioned in the Huntingdonshire local plan.

Unmitigated future development and climate change can adversely affect the environment and water infrastructure capacity. An IWMS 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 Integrated Water Management

The Chartered Institution of Water and Environmental Management (CIWEM) define Integrated Water Management (IWM) as:

"…the coordinated development and management of water, land and related resources in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems".

(CIWEM, 2011)

IWM is focussed on creating a water management strategy beyond water itself and observing the interdisciplinary actions between energy, carbon, waste, biodiversity, agriculture, and ecosystem services.

IWMSs emphasise new skills and technologies focusing on restoring ecosystems, mitigating floods, and working towards long term adaptation and planning in water management. This is achieved by taking a holistic approach and considering concepts such as the circular economy and Nature Based Solutions (NBS).

1.3 Benefits of IWM

Integrated Water Management (IWM) is known to combine multiple agendas such as cutting carbon emissions and biodiversity net gain. This can help save money, time, and engage a wider range of stakeholders. By engaging stakeholders, it can help with long term planning, resources, and create new innovative ideas producing a broader view of water management.

Benefits of IWM include:

- thinking beyond water into other topics such as carbon, waste, and biodiversity
- giving a wider perspective looking at the advantages of managing the wider water system
- can lead to cost savings
- can be used to restore ecosystems
- allowing the opportunity for new skills to manage the environment
- encourages a wider involvement of all stakeholders putting in place options for the long-term

(CIWEM, 2011)

Overall, IWM is broader than just water management. It considers benefits to communities by creating opportunities for sustainable living such as reducing consumption of resources and considering factors such as biodiversity net gain and carbon neutrality.

1.3.1 Best practice in IWM

The UK Government guidance on Water Cycle Studies and Integrated Water Management points to the Construction Industry Research and Information Association (CIRIA) guidance: "Delivering better water management through the planning system".

The guidance explains the role of effective strategies and local plan policies that should be underpinned by effective engagement and evidence. The guidance also demonstrates how the application of critical success factors, combined with good policies can deliver good water management outcomes.

Four stages to IWM are outlined (reproduced from CIRIA C787):

Baseline

Define the water management baseline conditions, including opportunities and challenges related to physical situations, existing infrastructure, and environmental constraints. This should include:

- Environmental context and constraints
- Constraints of existing water and wastewater infrastructure
- Flood risk parameters

- Opportunities created by regeneration
- A review of proposed housing and employment numbers

Water balance

Based on the extent of the expected development, the water balance (or water cycle) for baseline (current) and future conditions (post development) is determined, to show how water flows in and out of the area will change with time, and how different inflows and outflows of water can be used and managed efficiently within the development. Components of the water cycle flows include:

- Rainfall
- Surface water runoff from roofs and other impermeable surfaces
- Evapotranspiration
- Infiltration
- Potable and non-potable water consumption
- Greywater (wastewater from hand basins, baths, and showers)
- Blackwater (wastewater from kitchen and laundry use - generally with a higher level of contamination).

Options appraisal and strategy development

This stage of the IWMS integrates the outputs of the baseline assessment with the calculated water balance to identify the IWMS objectives and develop a range of effective measures that can be applied across the area covered by the IWMS. These are:

- Establish options through a review of a range of water management and flood risk measures that can be implemented in combination to meet the IWMS objectives; and
- develop a preferred strategy for water and flood risk management through analysis of a range of option scenarios or combination of measures.

Strategy delivery and testing

The final stage sets out a high-level delivery plan and approach for delivering the preferred option. It provides recommendations on infrastructure delivery, funding mechanisms, and roles and responsibilities of key stakeholders in implementing the IWMS.

The plan identifies how the options identified for the IWMS area could be effectively procured, constructed, and maintained, and which parties might be best placed to deliver these. It should show how the benefits for the IWMS area are derived in terms of:

- Satisfying planning and regulatory requirements;
- optimising costs for the works;
- certainty of delivery of required works to meet the overall programme;

- And placing risk and associated responsibility with the party best placed to manage this effectively.

1.4 Water Cycle Studies

Planning Practice Guidance on Water Supply, Wastewater and Water Quality[3] describes a water cycle study as:

"a voluntary study that helps organisations work together to plan for sustainable growth. It uses water and planning evidence and the expertise of partners to understand environmental and infrastructure capacity. It can identify joined up and cost-effective solutions, that are resilient to climate change for the lifetime of development.

The study provides evidence for Local Plans and sustainability appraisals and is ideally done at an early stage of plan-making. Local authorities (or groups of local authorities) usually lead water cycle studies, as a chief aim is to provide evidence for sound Local Plans, but other partners often include the Environment Agency and water companies."

The Environment Agency's guidance on WCS recommends a phased approach:

Stage 1: Scoping study, identifies if the water infrastructure capacity could constrain growth and if there are any gaps in the evidence you need to make this assessment. The scoping study will identify:

- The area and amount of proposed development;
- the existing evidence;
- main partners to work with; and
- evidence gaps and constraints on growth.

Stage 2: Detailed study, to provide the evidence to inform an integrated water management strategy. It will identify the water and flood management infrastructure that will mitigate the risks from too little or too much water. It will also identify what you need to do to protect and enhance the water environment.

As a WCS is not a mandatory document, Local Planning Authorities are advised to prioritise the stages of the WCS to integrate with their Local Plan programme.

3 Water supply, wastewater and water quality, GOV.UK, 2019

1.4.1 Good water management in the wider area

As seen in Figure 1.1, WCS are influenced by national frameworks, regional plans, WRMPs, DWMPs and Local Plans. WCSs use the information from these plans to help inform recommendations to LPAs and, where appropriate within the plan-making cycles, to influence the water company's plans.

Within this framework, IWMS water management is assessed at a local scale such as at the Local Planning Authority (LPA) level, and catchment scale where water resource zones extend across boundaries. Although it is acknowledged that Huntingdonshire is just one of the pieces of the overall puzzle of regional water management, an assessment of the whole region is better carried out by stakeholders that often work at a regional level, such as those working with national frameworks or regional plans.

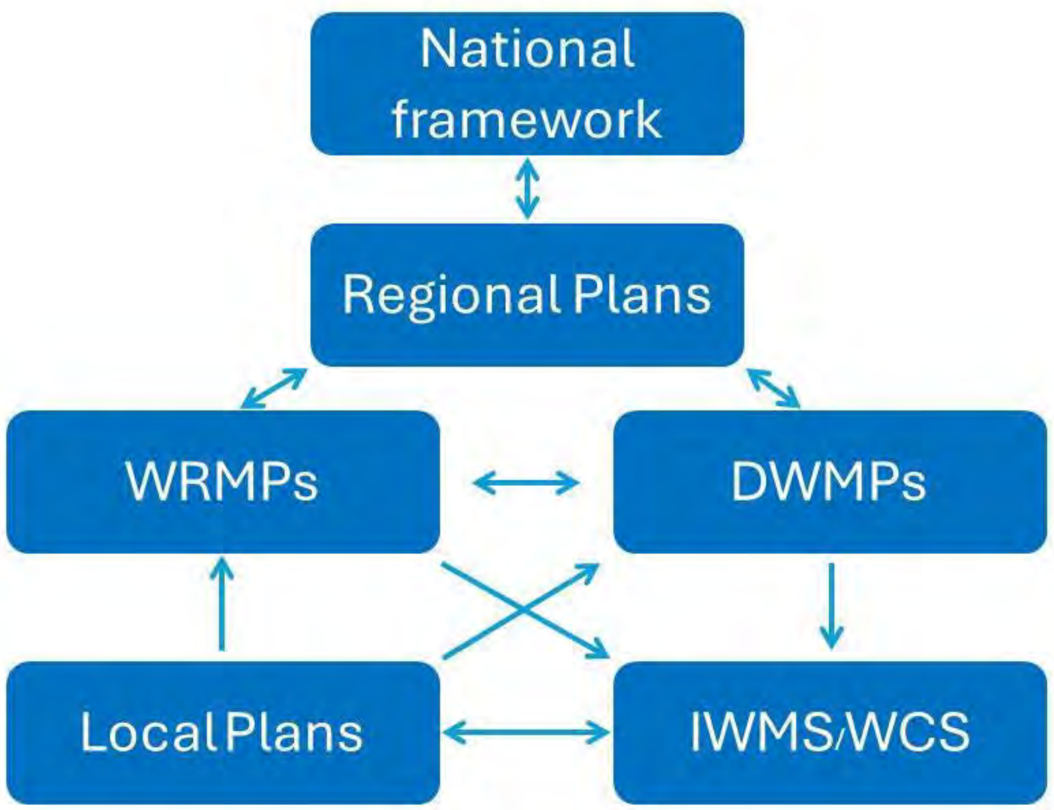

Figure 1.1 Water resource planning hierarchy

1.5 Structure of the IWMS

Section 2 - Vision for growth

This section outlines how Huntingdonshire is expected to grow during the plan period. It goes on to define a set of high-level objectives to be born in mind when considering measures within an IWMS.

Section 3 - Legislative and policy framework

Relevant national, regional, and local policies relating to environmental and water management are that should be considered by the LPA, water companies and developers. Key extracts from these policies relating to water consumption targets and mitigating the impacts on the water from the new development are summarised.

Section 4 - Baseline

Section four will set out the baseline information for the study area. This shows how Huntingdonshire fits into the wider area and includes information on:

- geology
- surface water
- groundwater
- protected sites
- flooding
- water resources
- wastewater

Programmes and plans such as the Water Industry National Environment Programme (WINEP), River Basin Management Plans (RBMP), and water company Water Resource Management Plans (WRMPs) and Drainage and Wastewater Management Plans (DWMPs) have been used in this report as a planning interface to inform decisions and outcomes. They have been presented in relation to Huntingdonshire across this section and section 5.

Section 5 - Water quality

An increase in the discharge of effluent from Water Recycling Centres (WRCs) due to development and growth in the area 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).

Water sensitivity and an environmental sites assessment has been undertaken to understand whether any environmental sites may be at risk from a deterioration in water quality.

Section 6 - Water balance

Understanding supply and demand of water in an area helps anticipate the effects of future growth. The same can be said for understanding the pressures of climate change, future water efficiency measures and water reuse.

Section six lays out the water balance of the study area. This is the amount of water available from the catchment versus the demand of the population. Information on baseline supply and demand is presented from the Anglian Water's 2019 Water Resource Management Plan (WRMPs) that covers 2020-45 and Cambridge Water's 2019 WRMP which also covers 2020-45. Other sources of water and loss of water are discussed such as evapotranspiration and rainfall.

Section 7 - Approach to quantifying integrated water management benefits in spatial planning

Multi-Objective Decision Analysis (MODA) is a method that allows decisions to be made whilst considering multiple factors, objectives, and trade-offs. This will compare options for water management and the high-level objectives discussed with HDC represented using radar diagrams. By using MODA to analyse options it can help present which options are most effective in helping reach the high-level objectives presented in section 2.4.

Section 8 - Preliminary options scoring

Section eight presents the results of the MODA as well as case studies that show how the options presented have been applied elsewhere.

Section 9 - Conclusions and recommendations for stage 2

An outline of stage 2 will be presented, this includes details of how further analysis of water resources, wastewater management and water quality will take place.

1.6 Stakeholders

1.6.1 Overview

Within the study area, many parties have an interest in how water is managed, are impacted by it, or are responsible for some aspect of it. The following section identifies these stakeholders and summarises their interest or responsibility. Engagement between stakeholders working in partnership allows the multiple benefits of IWM to be realised. The stakeholder analysis will be developed further in Phase 2.

1.6.2 Stakeholder Identification

Table 1.1 outlines the role of authorities responsible for water and wastewater management in Huntingdonshire. In addition to this, other stakeholders include:

- Local Planning Authority
- Developers
- Local community
- Local businesses
- Agriculture
- Internal Drainage Boards
- Middle Level Commissioners
- Lead Local Flood Authority
- Community Flood Action Groups

Table 1.1 Responsibilities of regulators and water companies within Huntingdonshire

Name	Key Responsibilities
Environment Agency	The EA are the environmental regulator in the UK with responsibilities for water quality, flood risk and administering licences for water abstraction. They are a statutory consultee for many developments plan documents and for some planning applications. They advise on environmental and infrastructure capacity issues across the water cycle.
Natural England	Natural England are the Government's advisors on the natural environment, which they have a responsibility to protect and enhance. In a IWMS they may provide information on the conservation objectives, and guidance on, the protection of designated sites.
Anglian Water	Anglian Water is the sewerage undertaker and the main water supplier for the district. As a water supplier for the district, they have a statutory duty under the Water Industry Act to maintain an efficient and economical system of water supply within its area and supply households (and businesses for domestic use) with a reliable and sufficient supply of water.

Name	Key Responsibilities
	Sewerage undertakers have a duty under the Water Industry Act to provide, improve and extend a system of public sewers (for both domestic and trade flows) so as to cleanse and maintain those sewers (and any lateral drain) to ensure that the area that they serve is effectually drained. There is also a duty to make provision for the emptying of those sewers, normally through sewage treatment works or where deemed unavoidable through discharges direct to watercourses.
Cambridge Water	Cambridge Water is the water supplier to the east of the district and some small areas to the south of the district boundary. As a water supplier for the district, they have a statutory duty under the Water Industry Act to maintain an efficient and economical system of water supply within its area and supply households and businesses with a reliable and sufficient supply of water.

2 Vision for growth

2.1 Huntingdonshire Local Plan

At the time of writing, Huntingdonshire is commencing the new Local Plan cycle. The emerging Local Plan will replace Huntingdonshire District Council's existing Local Plan covering the period 2011 to 2036[4]. Pre-submission of the new Local Plan is expected to take place early in 2027. A number of potential development sites have been identified as potential development allocations. The IWMS will be used as an important element of the evidence base in the development of HDC's new Local Plan.

HDCs overall housing need for the new Local Plan period (2021 – 2046) is estimated to be 28,500 at an annual delivery rate of 1,140 per annum.

2.2 Components of development forecast

2.2.1 Overview

For the purpose of the assessments within the IWMS, a baseline growth forecast is defined for development in Huntingdonshire over the Local Plan period. This can then be used to assess the remaining capacity of water infrastructure once all planned growth has been developed.

The baseline growth forecast used in this study is made up of the following components:

- Outstanding allocations from adopted Local Plan (2011 to 2036)
- Commitments (permitted or approved applications that are yet to be completed)
- Windfall
- Neighbouring authority growth (when investigating capacity of wastewater infrastructure)

2.2.2 Land Availability Assessment

The Huntingdonshire District Council Land Availability Assessment (LAA) is an important piece of evidence in preparing local plans and identifies possible sites for future housing and economic development. It also contains an assessment of development potential, suitability, likelihood, and timing of development. It does not determine whether a site should be allocated; this decision remains part of the local planning process.

4 Huntingdonshire Local Plan to 2036, Huntingdonshire District Council, 2019

2.2.3 Growth in Huntingdonshire

As detailed in Section 2.1 the current Local Plan covers the period from 2011 to 2036. To assess the impact of longer term growth on water infrastructure and the environment, existing growth commitments and allocations from the adopted Local Plan (2011 to 2036) need to be understood, see overall growth in Table 2.1 and overall commitments in Figure 2.1. HDC provided:

- Housing commitments
- Business commitments
- Outstanding housing allocations from adopted Local Plan
- Outstanding employment allocations from adopted Local Plan

Within the Huntingdonshire 2011-2036 plan, a minimum goal of at least 20,100 new homes (both market and affordable) was identified to meet forecast population growth between 2011 and 2036[4].

Table 2.1 Overall growth in Huntingdonshire 2011-2036

Type of Growth	Number of Houses	Employment floorspace (m^2)
Residential Allocations	11,830	N/a
Residential Commitments	2,227	N/a
Residential Completions	8,571	N/a
Business Allocations	N/a	425,524
Business Commitments	N/a	109,556.6
Business Completions	N/a	116,879.4

Commitments and completions based on data correct as at 31 March 2022.

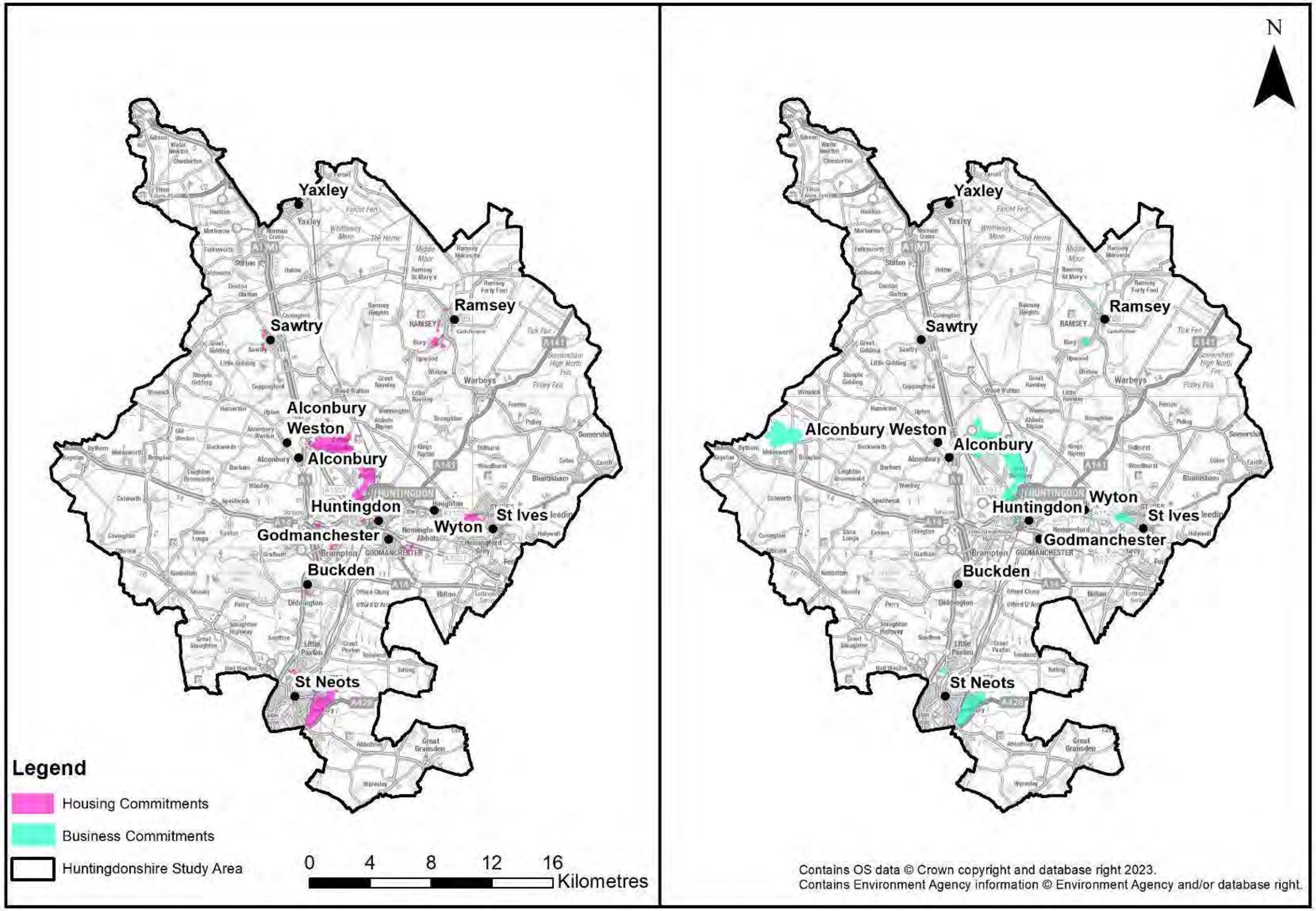

Figure 2.1 Commitments within the Huntingdonshire study area

2.2.4 Windfall

Windfall sites are sites that have not been specifically identified in the Local Plan and unexpectedly become available. HDC provided an estimate of 120 dwellings per year to account for windfall growth and 35 dwellings a year for rural exception sites. By its nature, it is not known where windfall growth will occur, however in general, windfall growth will occur on land within or well related to existing built-up areas where other growth is planned. In order to account for windfall within the assessments in this study, an estimate was made of the contribution from windfall in each WRC catchment. This was based on actual windfall data by parish provided by HDC for the period 2011 to 2022. It was assumed that the rate of windfall development in each parish would continue during the remaining local plan period, and this is summarised in Table 2.2. It should be noted that this is an estimate based on historic data and is not a plan to build a set number of houses within those catchments.

Table 2.2 WRC estimated total windfall growth 2023-2045

Water Recycling Centre (WRC)	Estimated total windfall growth (2023-2045)*	Estimated total windfall growth (2023-2045) (rural exception sites)*
Alconbury	79	23
Brampton (Cambs)	40	12
Buckden	68	20
Catworth-Hostel	18	5
Convington	5	1
Easton (Cambs)	70	20
Elton	18	5
Great Gidding	14	4
Hail Weston	18	5
Holme	44	13
Huntingdon (Godmanchester)	444	129
Kimbolton	56	16
Kings Ripton	6	2
Leighton Bromswold	1	0
Molesworth	34	10
Needingworth	21	6
Old Weston Main Street	28	8
Oldhurst	220	64
Paxton	21	6
Peterborough (Flag Fen)	166	49

Water Recycling Centre (WRC)	Estimated total windfall growth (2023-2045)*	Estimated total windfall growth (2023-2045) (rural exception sites)*
Ramsey	261	76
Sawtry	69	20
Somersham (Cambs)	208	61
St Ives	217	63
St Neots	335	98
Stibbington	21	6
Tilbrook	23	7
Upwood	44	13
Waresley	61	18
Wyton (RAF)	1	0
TOTAL	**2,642**	**769**

*Rounded to whole number of houses

2.3 Growth outside Huntingdonshire

2.3.1 General approach

Where growth within a neighbouring Local Planning Authority Area (LPA) may be served by infrastructure within or shared with Huntingdonshire, the neighbouring LPA was contacted as part of a duty to cooperate the request to provide information on expected growth within the Water Recycling Centres (WRC) catchment areas which serve HDC during the adopted Local Plan period.

Forecast housing growth (from allocations up to 2036 and commitments) for each WRC shared with HDC is summarised in Table 2.3. It should be noted that these figures are the total number of houses and employment land within each WRC catchment should all identified sites be delivered. It therefore represents a worse-case scenario for wastewater demand.

Table 2.3 Summary of growth in neighbouring authorities served by infrastructure within or shared with Huntingdonshire (up to 2036)

Neighbouring Authority	Data Source	WRC	Employment land (m^2)	Residential (number of dwellings)
Peterborough City Council	Requested directly via email	Peterborough (Flag Fen) Stibbington	N/A	3831 3

Neighbouring Authority	Data Source	WRC	Employment land (m^2)	Residential (number of dwellings)
Bedford Borough Council	Requested directly via email	St Neots	633	23
Greater Cambridge (Cambridge City and South Cambridgeshire)	Requested directly via email	Papworth Everard	1,191	N/A
North Northamptonshire	N/A	No shared infrastructure identified	N/A	N/A
Central Bedfordshire Council	NA	No shared infrastructure identified	N/A	N/A
Fenland District Council	N/A	No shared infrastructure identified	N/A	N/A

2.3.2 Ox-Cam Arc

The Ox-Cam arc is an area stretching from Oxfordshire to Cambridgeshire covering a total of five counties including Cambridgeshire. Originally conceived by a coalition of Regional Development Agencies in 2003, the Arc concept has gone through several iterations, initially focussed around a now defunct Oxford to Cambridge Expressway. In 2023, the Ox-Cam Arc became a "pan-regional partnership", enabling locally led delivery and a "bottom up" approach.

The Ox-Cam arc is one of the most water stressed areas in the country with high levels of unsustainable abstraction. Subsequently, water resource management is highly important to enable future growth. The Environment Agency have prepared an IWM Framework for the Ox-Cam Arc[5] to create the best outcome for the water environment. This is designed to be delivered in three phases with the first phase published in 2022. The emphasis in phase 1 was the development of a baseline, identifying which questions and issues the framework should address setting the basis for options appraisal and prioritisation of interventions.

Phase 2 aims to deliver workstreams and activities that will allow a framework to be designed that will enable integrated water management to be delivered. No significant

5 Ox-Cam Integrated Water Management Network, The Environment Agency's approach to groundwater protection, Environment Agency, 2022

outputs from phase 2 have been published yet, but this will be monitored during the HDC stage 2 IWMS.

To obtain this goal, there were three overarching objectives stated in the Ox-Cam IWM Framework report:

- Nature recovery
- Rethinking natural resources
- Green growth

These objectives have been considered when putting in place the high level objectives for this IWMS in Section 2.4. Carrying out these objectives incorporates water resources, wastewater, flooding, and the environment.

2.4 High level objectives

2.4.1 Overview

HDC is currently in the process of reviewing its Local Plan. Integrated Water Management has been identified as a key component of the evidence base to support the review.

The HDC cabinet agreed in October 2021 to adopt the aspiration of a net zero Huntingdonshire by 2040, and the adoption of the OxCam Arc environmental principles as the basis for renewing HDCs strategy for the environment.

A set of objectives specific to the IWMS were developed from the 25 Year Environment Plan, HDC Climate strategy and discussions with HDC**.** These objectives can then be used throughout the study to ensure that recommendations within the IWMS can be used to help inform the emerging Local Plan and achieve multiple benefits where possible. The following set of objectives were agreed with HDC:

- Achieve net zero by 2040
- Healthy water environment
- Increase biodiversity and natural capital
- Resilience to climate change
- Enabling healthy places
- Using natural resources wisely
- Promote sufficient water and wastewater capacity to serve new development
- Reduced risk of flooding
- Delivery of viable housing
- Opportunities for local skills and employment

2.4.2 Achieve net zero by 2040

With the national government's Net Zero 2050 Strategy, and HDC's objective to be a Carbon Zero Council by 2040, driving down the carbon associated with both construction and operation of new homes and places of employment is an important focus of the Local Plan. Carbon neutrality in a IWMS focusses on the water use of an area, how new developments may affect this and how a local plan can reduce whole-life carbon emissions. Water use from houses and drainage are the main two ways carbon neutrality can be incorporated into an IWMS.

Potential methods to incorporate carbon neutrality in new developments through water management are:

- Water efficient fittings - These can reduce the need for water and thus reduce the carbon used to heat water.
- SuDS - Especially where developments have been constructed from natural materials, carbon costs can be lower than conventional drainage.

It is worth highlighting that when working towards carbon neutrality there is a preference towards gravity driven water transportation instead of pumped systems.

There are also trade-offs between resilience and carbon. For example, rainwater harvesting and greywater recycling can have higher carbon costs than mains water and reducing overall water use.

2.4.3 Healthy water environment

A healthy water environment is one in which flows and water levels are close to natural levels, there are low levels of pollutants and minimal physical modifications. This creates healthy habitats for aquatic flora and fauna, as well as clean and safe water for recreational activities such as bathing and fishing.

The health of water bodies in England is suffering due to a combination of reduced flows due to abstraction, physical modification and water pollution as well as climate change. All this contributes to pressures on biodiversity.

Pollution can be from multiple sources including agriculture, discharge from wastewater treatment works, storm overflows and urban runoff. Unmitigated development can exacerbate these pressures with an increase in population meaning higher water demand and therefore abstraction, and increased discharges of treated wastewater.

There are opportunities within an IWMS to manage water demand, and to manage pollution from new development.

2.4.4 Increase biodiversity and natural capital

Natural Capital is defined in Section 6.6 of the UK Government's Green Book (2022)[6] as including:

6 The Green Book, UK Government, 2022

"certain stocks of the elements of nature that have value to society, such as forests, fisheries, rivers, biodiversity, land and minerals. Natural capital includes both the living and non-living aspects of ecosystems".

The 25 Year Environment Plan[7] adopts a natural capital approach towards environmental improvement by supporting better decision making leading to benefits including reduced long-term flood risk, increases in wildlife and long-term prosperity.

Biodiversity is key in enabling a natural capital approach. England is identified as one of the most nature-depleted countries in the world (Defra, 2023). Under the Environment Act 2021, Local Authorities within England are tasked with preparing Local Nature Recovery Strategies (LNRS) by March 2025. These will, as a minimum, map local habitats and set out biodiversity priorities. Huntingdonshire district will be covered by the Cambridgeshire and Peterborough LNRS, being led by the Cambridgeshire and Peterborough Combined Authority.

Biodiversity Net Gain (BNG) is a pathway to help nature recovery. The Environment Act 2021 requires all planning permissions granted in England (except for small sites) to achieve 10% BNG from January 2024. This will be required on small sites from April 2024. BNG will be recorded, with landowners, developers and similar stakeholders being able to buy and sell BNG credits to offset biodiversity degradation elsewhere. The biodiversity metric can be used to calculate the BNG credits a development or site produces. This is done by using the credits calculator on the government website. The calculator considers habitat size and quality of habitat as well as its ecological importance. The point of these credits is to help biodiversity increase, despite changing use of land elsewhere.

A net gain in biodiversity can be achieved by creating habitat and green spaces within developments to increase flora and fauna. As mentioned previously, healthy places can help increase green infrastructure, which can benefit net gain in biodiversity.

2.4.5 Resilience to climate change

Climate resilience is the ability to recover, or to mitigate vulnerabilities related to climate change such as droughts and heatwaves. This can be worked towards by increasing water efficiency, diversifying water sources, and raising awareness to individuals about behaviour changes that can be made.

Whilst there are significant uncertainties about how climate change will impact future water resources, low-cost, "no-regrets" decisions can be adopted in Local Plans which will contribute to improved resilience. For example, water efficient fixtures and fittings and diversifying water resources by adopting rainwater harvesting or greywater reuse can reduce peak demand on water supply systems and on abstraction from the environment.

7 25 Year Environment Plan, UK Government, 2018

2.4.6 Enabling healthy places

Healthy Places is a concept introduced by Public Health England to build and design spaces that benefit the natural environment as well as the communities that use them[8]. Healthy places can also help the growth of green and blue infrastructure, walking neighbourhoods and areas that will increase flood resilience. Subsequently, those living in the area benefit from the incorporation of physical activity into everyday life. As in the Ox-Cam IWM Framework, wellbeing has been included in this report in the form of enabling healthy places.

Healthy Places are to be implemented to approach issues in the UK such as poor mental health and health inequalities. An IWMS aims to coordinate multiple benefits to improve socio-economic and environmental issues such as low biodiversity and suffering mental and physical health. By enabling healthy places, both socio-economic benefits such as amenities for communities and environmental benefits such as biodiversity net gain and habitat creation can occur in tandem.

8 Public PHE Healthy Places, UK Government, 2021

2.4.7 Using water resources wisely

Responsible and sustainable water resource management is essential in futureproofing future water supplies.

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 from achieving a "Good Status" under the WFD.

The Environment Agency has undertaken an assessment of water stress across the UK[9]. 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." The EA define the Anglian and Cambridge Water regions, as well as all central, southern and eastern England as under Serious water stress.

Water stress can be reduced by reducing the demand for water through measures such as retrofitting existing houses with water saving devices and incorporating water efficiency measures into newbuilds.

2.4.8 Promote sufficient water and wastewater capacity to serve new development.

New homes and businesses need a supply of clean water and provision for the removal of wastewater. The Local Plan, using the principles of good IWM, has an opportunity to maximise the use of existing capacity in the system, and plan growth to ensure infrastructure is in place prior to occupation of development.

A healthy environment relies on clean and plentiful water. If not properly collected and treated, wastewater has the potential to cause harm to the water environment. The UK Government's Environmental Improvement Plan[10] identifies the need to improve wastewater infrastructure including a reduction in storm overflows and wastewater treatment works upgrades.

Within the development process, it is important that developers and other stakeholders such as HDC, the EA, Anglian Water and Cambridge Water work together to future proof homes as well as new developments, specifically in water

9 Water stressed areas, UK Government, 2021

10 Environmental Improvement Plan: First Revision of the 25 Year Environment Plan, UK Government, 2023

stressed areas. This may include the incorporation of rainwater harvesting and greywater recycling which can lead to the conservation of potable water resources.

2.4.9 Reduced risk of flooding

Excess water runoff and heavy rainfall are both linked to an increase in risk of flooding. Within Section 4.4, more information about the types of flooding Huntingdonshire is at risk of is mentioned. Flood Risk in Huntingdonshire is discussed further in Chapter 4 of the SFRA.

Management of surface water using Sustainable Drainage Systems (SuDS) is a requirement of the National Planning Policy Framework (NPPF) and will get extra impetus with the plan to implement schedule 3 of the Flood and Water Management Act (FWMA), which at the time of writing is expected to be in 2024, making Lead Local Flood Authorities (LLFAs) SuDS Approval Bodies (SABs) able to adopt and maintain new SuDS. Schedule 3 of the FWMA is further discussed in Appendix A of the SFRA. SuDS can help to improve water quality as well as manage water runoff with swales and permeable paving. Green Infrastructure such as Green Roofs and Walls can absorb rainwater and help to reduce the risk of flooding in urban areas. By managing flood water using Natural Flood Management (NFM), SuDS and directing flood water back to groundwater sources, the additional pressure can be decreased. Green Infrastructure such as permeable gardens and tree cover have similar benefits as Green Roofs and Walls but are lower carbon.

2.4.10 Delivery of viable housing

Viable homes, in this context, means affordable and well-built homes.

HDC's current Local Plan[4] identifies a significant requirement to a range of housing to meet the forecast population growth between 2011 and 2036 including housing suitable for older people, smaller households and a key emphasis on the provision of more affordable homes.

Key objectives of the Local Plan are:

- To maintain a good supply of suitable land for growth in sustainable locations and focusing on previously developed land, offering sites of a variety of sizes and types to meet a range of market demands.
- To promote high quality, well designed, locally distinctive, 'Flood Risk' sustainable development that is adaptable to climate change and resilient to extreme weather.

In considering affordability in this report, we consider the whole-life costs of water and drainage services in homes and employment spaces, whereas conventional approaches are based on capital costs at the time of purchase. SuDS have been demonstrated to have, in most cases, lower whole-life costs than conventional drainage, however this assumes they are located within public amenity spaces and so do not reduce the number of dwellings achievable on a site. Water efficiency, in particular where the consumption of hot water is reduced, can provide significantly lower household bills to residents.

Viability should also encompass deliverability and long-term maintenance. New assets delivered by or adopted by water companies have a well-defined pathway to being funded and maintained. This is less certain with assets such as SuDS and rainwater harvesting systems, although there are opportunities here for adoption by water companies and LLFAs (once Schedule 3 is enacted, which at the time of writing is due to be implemented in 2024).

2.4.11 Opportunities for local skills and employment

HDC's current Local Plan[4] recognises the importance of maintaining a supply of employment land and premises in building a strong, competitive economy. The need for targeted growth in specific sectors including advanced manufacturing, creative sectors, construction and utilities and 'Health & Care & Lifesciences' is identified within the Huntingdonshire Economic Growth Plan 2020-25[11].

HDC recognise the importance of allocating land for economic development and in safeguarding and enhancing areas of established employment land. HDC will support proposals for business development (class 'B') within Established Employment Areas or adjoining land which can be integrated into an Established Employment Area. This is current policy and has to be in compliance with other policies within the plan.

11 Huntingdonshire Economic Growth Plan 2020-2025

3 Policy and legislation

3.1 Introduction

The following sections introduce several national, regional, and local policies that must be considered by the Local Planning Authority (LPA), water companies and developers during the planning stage. Key extracts from these policies are presented as well as links to the full text. Whilst care has been taken to ensure that the information presented in this report was up to date at the time of writing, policy and guidance can change rapidly and the reader should ensure that the most up to date information is sought.

3.2 Plan-making

The National Planning Policy Framework (NPPF)[12] was originally published in 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

Local Plans are the primary mechanism by which plan-led spatial planning is implemented in England. Local Plans must be prepared by Local Planning Authorities (LPAs) and include:

- Strategic policies which set out the "overall strategy for the pattern, scale and design duality of places", including for the provision of infrastructure, transportation and community facilities.
- Non-strategic policies, which "set out more detailed policies for specific areas, neighbourhoods or types of development. This can include allocating sites, the provision of infrastructure and community facilities at a local level."

Under the Localism Act[13] new rights were provided 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. Neighbourhood Plans can make non-strategic policies, aligned to the strategic policies of the Local Plan. As neighbourhoods draw up their proposals, Local Planning Authorities are required to provide technical advice and support to communities.

12 National Planning Policy Framework, Department for Levelling Up, Housing and Communities, UK Government, 2023

13 Localism Act, UK Government, 2011

3.3 Water and the Planning System

3.3.1 National Planning Policy Framework and water

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."
- Paragraph 180e: "…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".

3.3.2 Planning Practice Guidance overview

Planning Practice Guidance (PPG) was originally issued in 2014 by the Department for Communities and Local Government, with the intention of providing guidance on the application of the NPPF. The individual guidance documents are updated periodically. The following guidance documents are particularly relevant to a WCS:

- Water Supply, Wastewater and Water Quality[14]
- Housing - Optional Technical Standards[15]
- Flood Risk and Coastal Change[16]
- Climate change[17]

3.3.3 PPG - Water Supply, Wastewater and Water Quality

Two key passages from the PPG (Para 002) provide an overview of what needs to be considered by plan-making authorities, and provide a basis for the work contained in a WCS or IWMS:

14 Water supply, wastewater and water quality, UK Government, 2019
15 Housing: optical technical standards, UK Government, 2015
16 Flood risk and coastal change, UK Government, 2022
17 Climate Change, UK Government, 2019

"Early discussions between strategic policy-making authorities and water and sewerage companies can help to ensure that proposed growth and environmental objectives are reflected in company business plans. Growth that requires new water supply should also be reflected in companies' long-term water resources management plans. This will ensure that the necessary infrastructure is funded through the water industry's price review."

"Strategic policy-making authorities will also need to consider the objectives in the government's 25 Year Environment Plan to reduce the damaging abstraction of water from rivers and groundwater, and to reach or exceed objectives for rivers, lakes, coastal and ground waters that are specially protected."

A summary of the advice for plan-makers and for planning applications is contained below but it is recommended that the full text is reviewed.

Plan-making considerations - Infrastructure (Para 005)

- Identification of suitable sites for new or enhanced infrastructure, including the location of existing and proposed development.
- Consider whether new development is appropriate near to water and wastewater infrastructure (for example due to odour concerns).
- Phasing new development so that water and wastewater infrastructure will be in place when needed. Infrastructure should also be in place before any environmental effects occur on designated sites of importance for biodiversity.

Plan-making considerations - Water quality (Para 006)

- 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.
- Whether measures to improve water quality, (e.g., SuDS schemes) can be used to address water quality in addition to flood risk.

Plan-making considerations - Wastewater (Para 007)

- The sufficiency and capacity of wastewater infrastructure.
- The circumstances where wastewater from new development would not be expected to drain to a public sewer (such as via a package treatment sewage treatment works or septic tank).
- The capacity of the environment to receive effluent from development without preventing statutory objectives being met.

Early engagement with the LPA, the EA, and relevant water and sewerage companies can help establish whether any particular water and wastewater issues need to be considered.

Considerations for planning applications - Water supply (Para 016)

Water supply planning would normally be addressed through the LPA's strategic policies and reflected in the water companies WRMPs. Water supply is therefore unlikely to be a consideration for most planning applications. However, some exceptions might include:

- Large developments not identified in plans that are likely to require a large volume of water; and/or
- significant works required to connect the water supply; and/or
- where a plan requires enhanced water efficiency in new development as part of a strategy to manage water demand locally.

Considerations for planning applications - Water quality (Para 016)

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

- Involve physical modifications to a water body such as flood storage areas, channel diversions and dredging, removing natural barriers, construction of new locks, new culverts, major bridges, new barrages or dams, new weirs, and removal of existing weirs; and/or
- indirectly affect water bodies, for example:
    - As a result of new development such as the redevelopment of land that may be affected by contamination, mineral workings, water and wastewater treatment, waste management facilities and transport scheme including culverts and bridges.
    - Result in runoff into surface water sewers that drain directly, or via a combined sewer, into sensitive waterbodies e.g., waterbodies with a local, national or international habitat designation.
    - Through a lack of adequate infrastructure to deal with wastewater.
    - Through a lack of adequate infrastructure to deal with wastewater where development occurs in an area where there is strategic water quality plan e.g., a nutrient management plan, River Basin Management Plan, Water Cycle Study, Diffuse Water Pollution plan or sewerage undertakers' drainage strategy which set out strategies to manage water quality locally and help deliver new development.

3.3.4 PPG - 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 must 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.

The evidence for adopting the optional requirements is outlined in section 4.5.9. Viability is reviewed in section 3.4.4.

3.3.5 PPG - Flood Risk and Coastal Change

The UK government has recently put in place new wording for Planning Practice Guidance (PPG) for Flood Risk and Coastal change[18].

LPAs and developers can investigate measures to control the risk of flooding affecting the sites. Discussions early in the planning process with relevant flood risk management authorities, SFRAs and any programme of flood and coastal erosion risk management schemes will aid in identifying such control measures.

The main updates to be noted from August 2022[19] are:

- Natural Flood Management (NFM)
- Surface water flood risk
- Using multifunctional SuDS
- Application of the sequential and exceptional tests
- Safeguarding land of future flood risk management
- Supporting transition in unsustainable locations

3.3.6 PPG - Climate Change

This guidance advises how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Planning can help increase resilience to climate change impact through the location, mix and design of development. There is a statutory duty on local planning authorities to include policies in their Local Plan to tackle climate change and its impact.

3.3.7 Levelling-up and Regeneration Act 2023

The Levelling-up and Regeneration Act received Royal Assent in 2023 and aims to support the Government's commitment to reducing geographical disparities between different parts of the UK. Within this Act are several parts relating to the water environment.

18 Flood Risk and Coastal Change Planning Practice Guidance; Ministry of Housing, Communities & Local Government, 2022

19 Flood risk and coastal erosion, Town and Country Planning Association (TCPA), 2021

Part 7 relates to nutrient pollution standards. Where the Secretary of State considers that a habitats site that is wholly or partly in England is in an unfavourable condition by virtue of pollution from nutrients in water comprising phosphorus or compounds, or nitrogen or compounds, the Secretary of State may designate the catchment area for the habitats site as a phosphorus or nitrogen sensitive area.

It requires sewerage undertakers in England to upgrade phosphorus or nitrogen significant plants in its sewerage system by 2030 in order to meet phosphorus or nitrogen pollution standards.

A phosphorus or nitrogen significant plant is defined as one that discharges treated effluent into a sensitive catchment area and is not exempt in relation to the pollution standard.

The phosphorus pollution standard is 0.25mg/l unless otherwise defined.

The nitrogen pollution standard is 10mg/l unless otherwise defined.

3.4 Water and design

3.4.1 Building regulations

The Building Regulations (2010) Part G was amended in early 2015 to 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[20] (see 3.3.4).

The Environmental Improvement Plan[10] (discussed in 3.7.2) contains a commitment to consider a new standard for new homes in England of 105 litres per person per day (l/p/d) and 100 l/p/d where there is a clear local need, such as in areas of serious water stress. Whilst this new standard is only under consideration, it demonstrates the direction of travel for water efficiency standards, and it is highly likely that this or a similar standard will be adopted.

3.4.2 Building Research Establishment

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[21], and commercial, leisure, educational facilities, and mixed-use buildings by the Building

20 Sanitation, hot water safety and water efficiency, UK Government, 2010
21 Home Quality Mark, BRE, 2023

Research Establishment Environmental Assessment Methodology (BREEAM) UK New Construction Standard[22].

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 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".

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

3.4.3 Energy and Water

17% of the UK's domestic energy usage is for water heating[23]. 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.

The Government is currently analysing the results of a 2019 consultation on a Future Homes Standard that will involve changes to Part L (conservation of fuel and power) of the Building Regulations for new dwellings. 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 the whole-life carbon cost of developments. The new Future Homes Standard is expected in 2025.

3.4.4 Viability

The evidence for the costs of meeting the optional 110l/p/d water efficiency target in new homes indicate that the costs are minimal:

- A 2014 study into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £12 (at 2023 prices) for a four-bedroom house[24].

22 BREEAM UK New Construction, BRE, 2018
23 Energy Saving Trust, 2022
24 Housing Standards Review, EC Harris, 2014

- The Committee on Climate Change report - UK Housing: Fit for the Future - stated that the cost of "requiring all homes in England to be built to 110 l/p/d is possible under Part G of regulations and would be no additional cost[25]."
- Heating water accounts for 18% of energy used in the home[26]. This would cost a 2-3 person, 3-bed household an average of £352 per year in energy at 2023 costs[27]. Water efficiency is therefore not only viable but of positive economic benefit to both private homeowners and tenants.

There is less evidence available on the costs of going below 110l/p/d. The Sussex North Water Neutrality Strategy[28] found that the additional cost to meet 85l/p/d using water efficient fittings would be between £349 and £431 per dwelling, or £1,049 to £1,531 where white-goods appliances would not otherwise have been installed in the dwelling (2022 prices).

3.5 The Water Industry

3.5.1 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.

The water industry is primarily regulated by three regulatory bodies:

- **Economic regulation:** Office of Water Services (Ofwat) are the economic regulator. They have a statutory duty to protect the interests of consumers, ensuring water companies carry out their functions (customer service standards,

25 UK housing: Fit for the future, Committee on Climate Change, 2019

26 Energy Consumption in the UK, Department for Energy Security & Net Zero, 2022

27 What's the average gas and electricity bill in Great Britain?, British Gas, 2023

28 Sussex North Water Neutrality Strategy: Part C - Mitigation Strategy, JBA Consulting, 2022

environmental rules, drinking water standards etc) and can finance them. Part of this role is setting the limits on pricing of water and sewerage services.

- **Environmental regulation:** The Environment Agency are the environmental regulator. They are responsible for monitoring the impact of the water industry (as well as others) on the environment and issuing permits for abstraction of water and discharge of wastewater.
- **Drinking water regulation:** Finally, the Drinking Water Inspectorate (DWI) implement standards for drinking water and can take enforcement measures against water companies if those standards are not met.

3.5.2 Funding of the water industry

The water industry works on a five-year cycle called the Asset Management Plan period or AMP periods. Every five years a water company submits a Business Plan to Ofwat for a Price Review. 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 are operating efficiently, and that the company is meeting its obligations. It then sets the allowable price increase for consumers based on the retail prices index, the business plan, and taking into consideration affordability for consumers. The current AMP period is AMP 7 (2020-2025), and the price of water for this period was set by Ofwat late in 2019 in a process referred to as Price Review 19 (PR19). The new price came into effect in April 2020. This system gives stability in pricing. Within this price review process there may also be incentives and penalties on the water company for exceeding or failing to meet targets.

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.

The Water Industry National Environment Programme (WINEP) is a set of actions that are defined by the EA and given to all water companies operating in England for completion during a particular AMP period. The aim of the programme is to support the objectives in the Water Framework regulations, Habitats Regulations as well as other environmental objectives. Examples of typical actions could include investigations into the sustainability of an abstraction, a reduction in an abstraction to support river flows, or new permit limits at a wastewater treatment works.

3.5.3 Planning for Water

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.

Anglian Water[29] and Cambridge Water's[30] final WRMPs are reviewed in detail for the study area in sections 4.5.3 and 4.5.4 respectively. WRMP24 drafts have also been published by both water companies and are mentioned in their respective WRMP sections.

29 Water Resources Management Plan, Anglian Water, 2019
30 Water Resources Management Plan, Cambridge Water, 2019

Drought Plan

Linked to the WRMP is a water company's drought plan. This is a requirement under the Water Industry Act 1991 (as amended by the water Act 2003). A water company must state how it will maintain a secure water supply and protect the environment during dry weather and drought. The plan will contain:

- Drought triggers - these are points where a water company will take action to manage supply and demand. They are based on monitoring of rainfall levels, river flows, groundwater levels and reservoir stocks.
- Demand management actions - how a water company will reduce demand for water during a drought. Actions that save water before taking more water from the environment must be prioritised. These could include:
    - reducing leakage;
    - carrying out water efficiency campaigns with customers;
    - reducing mains pressure; and
    - restricting water use, for example through temporary use bans which limit hosepipe and sprinkler use.
- Supply management actions - how a water company will maintain water supply during a drought. Actions that have the least effect on the environment must be prioritised. This could include:
    - carrying out engineering work to improve its supply;
    - transferring water in bulk from other water companies;
    - using drought permits and drought orders to abstract more water;
    - using desalination - permanent or temporary plants; and
    - using tankers to supply customers with water directly.
- Extreme drought management actions - the actions it could take in an extreme drought. These could delay the need to use emergency restrictions standpipes and rota cuts.
- Communicating during a drought - a water company must set out how it will communicate in a clear and timely way during a drought with customers, partners or other stakeholders.
- Environmental assessment, monitoring and mitigation. A drought plan must include:
    - an environmental assessment;
    - an environmental monitoring plan for each supply management action; and
    - details of mitigation measures the company plans to take for each supply management action.
- End of a drought - a water company must explain how it will identify when a drought is over or ending and the actions it will take during this stage, communicate this information to customers, and review its performance.

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 (WRE) group which covers Huntingdonshire. An advisory group consisting of their regulators (Environment Agency and Ofwat) and Defra regularly attend meetings of WRE.

WRE published a Regional Water Resources Plan in 2023[31], their planning process informed the next round of company WRMPs to be published in 2024.

3.5.4 Planning for Wastewater

21st Century Drainage

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 (Water UK, 2018) sets out how the industry intends to approach these goals. Companies were required to publish finalised DWMPs in 2023 to inform their business plans for the 2024 Price Review.

Drainage and Wastewater Management Plans (DWMPs)

DWMPs are consistently structured plans delivered at three spatial scales; company-wide, regional groupings and individual wastewater catchments. 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.

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

DWMPs aim to provide more transparent and consistent information on sewer flooding risks and the capacity of sewerage networks and treatment works, and this should be

31 The Regional Water Resources Plan, Water Resources East, 2023

taken into account in SFRAs, Water Cycle Studies, as well as in site-specific FRAs and Drainage Strategies.

Anglian Water's final DWMP, including interactive mapping, is published here (Anglian Water DWMP, May 2023) and is reviewed in detail for the study area in section 4.7.2.

3.5.5 Developer Contributions and connection charges

A significant part of water company business is the interface with developers to facilitate connection to the public water supply and sewerage systems, through their developer services functions. 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.

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.

OfWAT, the water industry's economic regulator, published revised rules covering how water and wastewater companies may charge customers for new connections[32]. These rules have applied to all companies in England since April 2018. 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.

Anglian Water publish their charging arrangements annually here and Cambridge Water publish there's here. These include incentives to encourage good design by developers, including:

32 Charging rules for new connection services, OfWAT, 2020

Anglian Water Incentives

- A 50% reduction in the 2023-24 sewerage infrastructure charge if a sustainable surface water discharge method (limited to rainwater harvesting / reuse, infiltration methods, discharge to an open surface waterbody, discharge to surface water sewer, highway drain or other drainage system at a restricted rate) is used as an alternative to a previous surface water connection to a foul or combined sewer.

Cambridge Water Incentives

- A 40% discount off the water infrastructure charge if properties are built to achieve 100 litres per person per day (l/p/d).

3.5.6 Water companies and the planning system

Water companies are currently not statutory consultees to planning applications, although they do monitor planning applications and respond to potentially significant applications, or where requested to do so by the LPA. Defra are intending to consult on making water companies statutory consultees for some applications[33].

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. There is no guarantee that surplus capacity in the network is sustainable. This is explored in more detail in section 4.8 and will be the subject of further analysis in Stage 2.

3.6 Flood Risk and Surface Water

3.6.1 Flood and Water Management Act 2010

The Flood and Water Management Act (FWMA) aims to improve both flood risk management and the way water resources are managed[34].

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

33 Plan for Water: our integrated plan for delivering clean and plentiful water, DEFRA, 2023

34 Flood and Water Management Act, 2010

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional, and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

Schedule 3 of the Act has not been enacted in England, but this is expected to be implemented in 2024. The enactment of schedule 3 will have the following implications for the planning process:

- Designation of local authorities as SuDS Approval Bodies (SAB) which have a duty to adopt new drainage systems.
- The cessation of the automatic right for new developments to connect to the existing sewer system.
- Developers must ensure that drainage systems are built as per the approved drainage plan that complied with mandatory national standards as outlined in the NPPF and the PPG.

3.6.2 Strategic Flood Risk Assessment (SFRA)

All LPAs are required, under NPPF, to prepare a SFRA, which forms a key part of the evidence base for their Local Plan. The SFRA must consider flood risks from all sources, collating up-to-date flood risk data and in some cases developing new flood risk modelling. The SFRA is used to inform the Sequential Test, by which Local Plan allocations should be sequentially selected to direct development towards areas of lower flood risk, taking into consideration the vulnerability to flooding of the proposed land use. Huntingdonshire District Council's most recent SFRA was completed in 2023 as part of this Phase 1 IWMS.

3.6.3 Surface Water Management Plan

Surface Water Management Plans (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. Cambridgeshire County Council have produced an LLFA wide SWMP which covers Huntingdonshire. The LLFA have also produced a detailed SWMP that covers St Neots (as detailed in Appendix A of the SFRA.

3.6.4 Sustainable Drainage Systems

From April 2015, Local Planning Authorities (LPA) have been given the responsibility for ensuring that sustainable drainage is implemented on developments of ten or more homes or other forms of major development through the planning system. The LPAs SuDS delivery and associated guidance is pending and may be subject to change.

Under the current 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[35] 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 was also 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[36]. 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 makes no reference to the other benefits of SuDS, for example water quality, habitat, and amenity.

Cambridgeshire County 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. Further information on surface water drainage can be found here (Surface Water Planning Guidance).

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 itself can be found 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 here.

35 Sustainable Drainage Systems, Pickles, 2014

36 Sustainable drainage systems: non-statutory technical standards, UK Government, 2015

Anglian Water provides guidance in their Sustainable Drainage Systems Manual[37]. Applications for SuDS adoptions should be made through their website[38].

As of April 2020, the new Design and Construction Guidance (DCG)[39] 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.

3.6.5 Design and Construction Guidance

The Design and Construction Guidance (DCG), part of a new Codes for Adoption covering the adoption of new water and wastewater 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 previous standards, up to and including Sewers for Adoption Version 7, included a narrow definition of sewers to mean below-ground systems comprising of gravity sewers and manholes, pumping stations and rising mains. This 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.

37 Towards Sustainable Water Stewardship - Sustainable Drainage Systems (SUDS) Adoption Manual, Anglian Water, 2023

38 Sustainable surface water drainage, Anglian Water, 2023

39 Sewerage Sector Guidance, Water UK, 2023

3.7 Environmental Protection and Biodiversity

3.7.1 The Environment Act 2021

The Environment Act[40] 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 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, more information available here).

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 the damage that water abstraction may cause on environment.
- Modernise the process for modifying water and sewerage company licence conditions.

Further to this, there is specific legislation (Chapter 4) 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.

Actions to achieve this are outlined in Defra's Storm Overflow Discharge Reduction Plan[41].

3.7.2 25-year Environment Plan

The Environmental Improvement Plan (EIP)[10] is the first revision of the 25-year environment plan (25YEP) published in 2018. It contains ten goals which are shown in Figure 3.1. Government must review and revise the plan, if needed, every five years to ensure continued progress against the ten 25YEP goals.

Of particular importance to IWM is Goal 3 - Clean and plentiful water.

40 Environment Act, UK Government, 2021
41 Storm Overflows Discharge Reduction Plan (publishing.service.gov.uk)

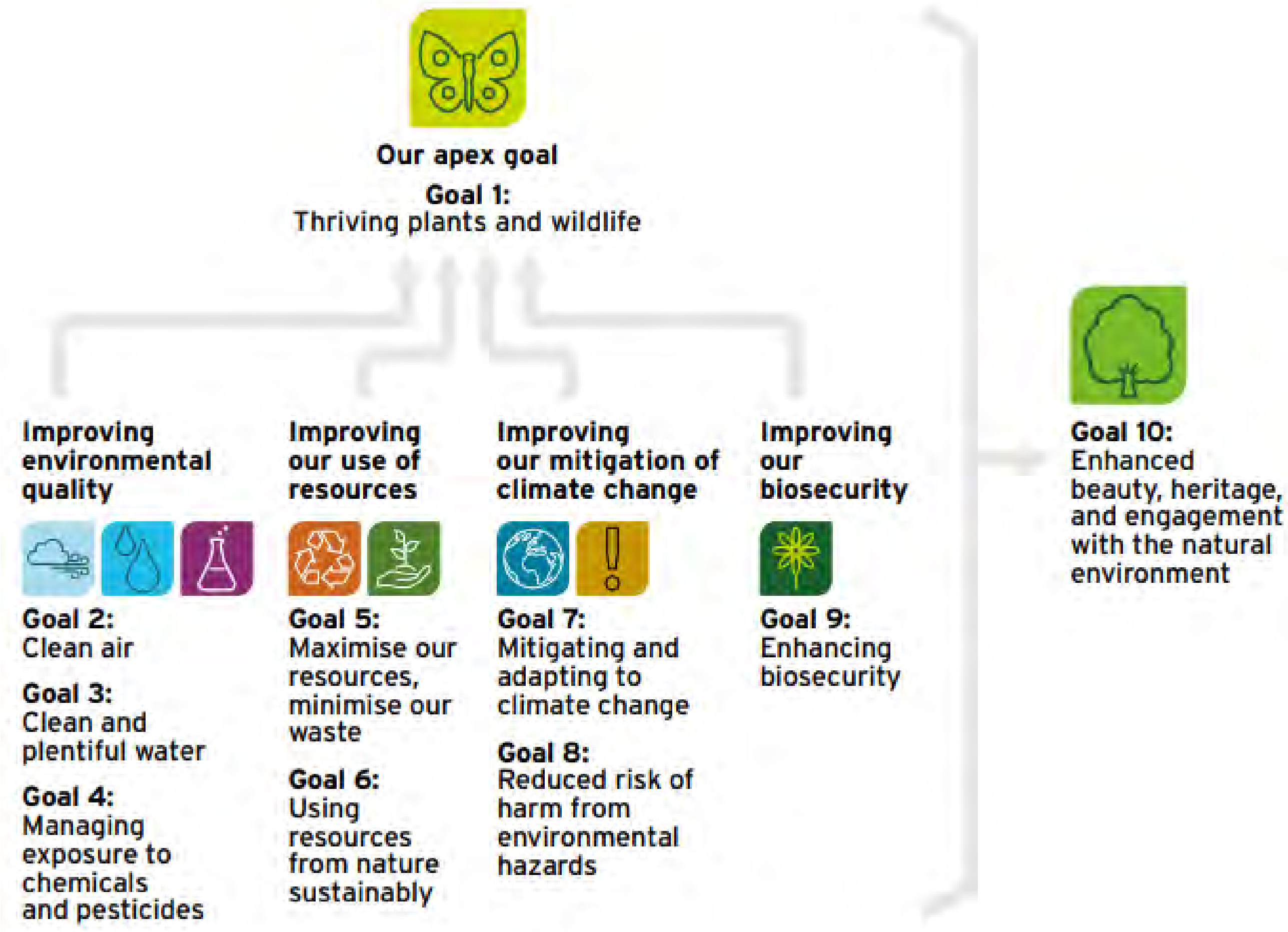

Figure 3.1 The 10 Environmental Improvement Plan goals[10]

Under Goal 3 - Clean and plentiful water, there are eight sets of targets and commitments relating to different aspects of the water environment:

- Reduce nitrogen, phosphorus, and sediment pollution from agriculture into the water environment by at least 40% by 2038, compared to a 2018 baseline, with an interim target of 10% by 31 January 2028, and 15% in catchment containing protected sites in unfavourable condition due to nutrient pollution by 2028.
- Reduce phosphorus loadings from treated wastewater by 50% by 2028 and 80% by 2038 against a 2020 baseline.
- Halve the length of rivers polluted by harmful metals from abandoned mines by 2038, against a baseline of around 1,500km (approximately 930 miles.
- Reduce the use of public water supply in England per head of population by 20% from the 2019-20 baseline, 2038, with interim targets of 9% by 2027 and 14% by 2032, and to reduce leakage by 20% 2027 and 30% by 2032.
- Restore 75% of our water bodies to good ecological status.
- Require water companies to have eliminated all adverse ecological impact from sewage discharges at all sensitive sites by 2035, and at all overflows by 2050.

- Target a level of resilience to drought so that emergency measures are needed only once in 500-years.

To deliver these goals, the EIP outlines action across these areas:

- Improving wastewater infrastructure and water company environmental performance.
- Reducing pressures on the water environment from agriculture.
- Enabling the sustainable use of water for people, business and the environment
- Tackling pressures from chemicals and pollutants.
- Restoring natural function and iconic water landscapes.
- Joined-up management of the water system.

Progress towards delivering the EIP will be monitored annually.

3.7.3 Defra Plan for Water

Defra's Plan for Water[42] provides further detail on the actions towards achieving Goal 3 of the EIP23. It promotes an integrated approach to water management as the foundation of the plan. Whilst many of the actions contained within the Plan for Water are outside of the responsibilities of areas of influence of the LPAs, the following summarises those actions that LPAs should have regard to:

- Require standardised sustainable drainage systems (SuDS) in new housing developments in 2024, subject to final decisions on scope, threshold, and process following consultation in 2023.
- Designate all chalk catchments as water stressed and high priority under the sewer overflows reduction plan, driving action to improve water management by stakeholders such as the EA and water companies.
- The plan reflects the predicted 4 billion litre per day (4,000 ml/d) gap between supply and demand across England and contains measures to both boost supply and reduce demand. Of interest to LPAs is the plan to reduce demand (outlined below) which will address half of the gap.
- A key component in reducing demand for water is improving water efficiency and there is a target under the Environment Act to reduce the use of public water supply in England per head of population by 20% by 2038.A road map on water efficiency in new developments and retrofits has been developed with ten actions to improve water efficiency:
    - **Action 1** - Implement schedule 3 to the Flood and Water Management Act 2010. This will consider rainwater harvesting in developing the statutory SuDS National Technical Standards.

42 Policy paper: Plan for Water: our integrated plan for delivering clean and plentiful water, DEFRA, 2023

- **Action 2** - Review the Water Supply (Water Fittings) Regulations 1999, the Water Supply (Water Quality) Regulations 2016 and/or any other relevant legislation to address wasteful product issues with toilets and enable new water efficient technologies.
- **Action 3** – Develop clear guidance on 'water positive' or 'net zero water' developments and roles for developers and water companies.
- **Action 4** – Review water efficiency options in planning, building regulations and through voluntary schemes for non-household buildings.
- **Action 5** – Work with Ofwat to ensure the water industry can play a central role in retrofitting water efficient products in households, businesses, charities and the public sector.
- **Action 6** – Work across government to integrate water efficiency into energy efficiency advice and retrofit programmes.
- **Action 7** - Review the Building Regulations 2010, and the water efficiency, water reuse and drainage standards including considering a new standard for new homes in England of 105l/p/d and 100 l/p/d where there is a clear local need.
- **Action 8** –Mandatory water efficiency labelling scheme.
- **Action 9** – Investigate dual pipe systems (rainwater harvesting) and water reuse options for new housing development as part of the review of the planning framework.
- **Action 10** – Enable innovative water efficiency approaches in buildings, including technologies and approaches to funding and maintenance.

3.7.4 Biodiversity Net Gain

Biodiversity net gain (BNG) is designed to contribute to the recovery of nature while developing land. The principle is that the natural environment is in measurably better state after development than it was before. The Environment Act 2021 requires all planning permissions granted in England (except for small sites) to achieve 10% BNG from January 2024. This will be required on small sites from April 2024.

3.7.5 Storm Overflow Reduction Plan

The Environment Act placed a legal duty on water companies to progressively reduce the adverse impacts of discharges from storm overflows. The storm overflow reduction plan[43] sets the following targets:

- By 2035, water companies will have: improved all overflows discharging into or near every designated bating water; and improved 75% of overflows discharging to high priority sites.

43 Storm overflows discharge reduction plan, DEFRA, 2023

- By 2050, no storm overflows will be permitted to operate outside of unusually heavy rainfall or to cause any adverse ecological harm.

There is also an expectation that water companies ensure their infrastructure keeps pace with increasing external pressures, such as urban growth and climate change, without these pressures leading to greater numbers of discharges.

3.7.6 The Water Framework Directive (WFD) and Water Environment Regulations

Introduction

The European Union Water Framework Directive (WFD) 2000 is currently transposed into English and Welsh law by the Water Environment Regulations (HM Government, 2017). They apply to all waterbodies (watercourses, canals, lakes, estuaries and coastal waters), with the objective of meeting Good Ecological Status (GES) or, where heavily modified, Good Ecological Potential (GEP) To meet GES or GEP, a water body must achieve a good or high score for all elements - in the case of surface water, these are biological, physico-chemical, specific pollutants and hydromorphology (Figure 3.2). UK policy remains to meet GES or GEP for all waterbodies by 2027.

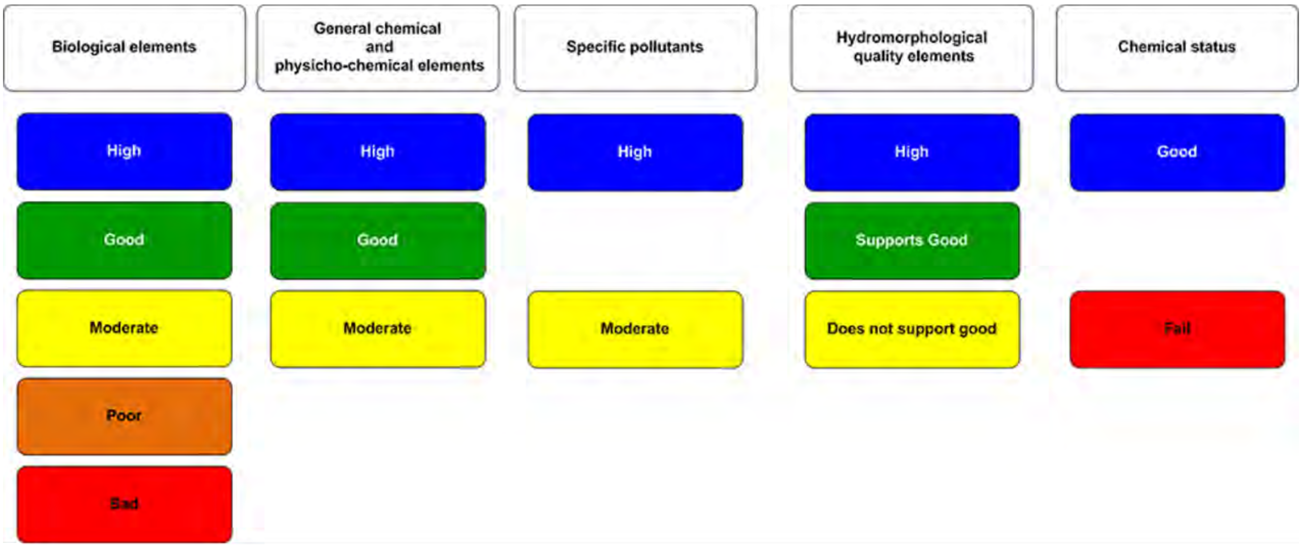

Figure 3.2: Status classification for surface water[44].

Chemical Status is separately assessed. The Water Framework Directive and the EA recognise a group of ubiquitous chemicals which are persistent, bioaccumulative or toxic (uPBT), and without which over 90% of England's waterbodies would achieve Good Chemical Status. Mercury, PFOS and PBDE are the most ubiquitous causes of failures. Due to the persistent nature of these chemicals, the date for getting all waterbodies to Good Chemical Status is set for 2063.

44 Catchment Data Explorer, DEFRA and Environment Agency, 2023

River Basin Management Plans

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. Huntingdonshire falls within the Anglian RBD[45]. The third cycle RBMPs were published 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 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:

- Preventing deterioration of the status of surface waters and groundwater.
- Achieving objectives and standards for protected areas.
- Aiming to achieve good status for all water bodies.
- Reversing any significant and sustained upward trends in pollutant concentrations in groundwater.
- Cessation of discharges, emissions and losses of priority hazardous substances into surface waters.
- Progressively reducing the pollution of groundwater and preventing or limiting the entry of pollutants.
- Local Planning Authorities (LPAs) must have regard to the Water Framework Directive as implemented in the RBMPs. It is of primary importance when assessing the impact of additional wastewater flows on local river quality.
- Alongside the RBMP documents, the data behind them can be explored further using the Catchment Data Explorer[44] and map viewer[46].

Protected Area Objectives

The Water Environment Regulations specify 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:

45 Anglian river basin district river basin management plan, Environment Agency, 2022
46 Draft river basin management plan: maps, Environment Agency, 2023

- 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.

3.7.7 Conservation of Habitats 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 which was aimed at protecting plants, animals and habitats that make up the natural environment. The regulations were 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 (SCI) *.
- 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.

*An SCI is a site established under the Habitats Regulations. They are sites considered to contribute towards the conservation of Species and habitats of particular importance[47].

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.

47 site of Community importance — European Environment Agency (europa.eu)

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 ruled 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.

The implementation of the Conservation of Habitats Regulations have had particular significant implications in two areas related to water and planning:

- Nutrient Neutrality. Natural England (NE) has identified a number of catchment areas where Habitats Sites are in unfavourable condition due to eutrophication (an excess of the nutrients phosphorous and/or nitrogen in water). NE have advised that developments in these catchments must demonstrate that they do not cause harm, and that one way to do this is to introduce mitigation measures in the catchment area which offset the additional nutrients emitted as a result of the development, an approach known as nutrient neutrality. [There are no parts of the study area which are currently within a nutrient neutrality catchment area, however NE may designate additional areas in the future.
- Water Neutrality. Natural England (NE) has issued a position statement that it cannot be concluded with sufficient certainty that groundwater abstractions in the Arun Valley, West Sussex are causing no adverse effect on Habitats Sites. NE have advised that developments in Sussex North Water Resource Zone must demonstrate that they do not cause harm, and that one way to do this is to introduce mitigation measures in the zone which offset the additional water consumed as a result of the development, an approach known as water neutrality. [There are no parts of the study area which are currently within a water neutrality zone, however NE may designate additional areas in the future.]

Both nutrient and water neutrality designations have resulted in significant impacts on the granting of planning permission in the designated areas, but do not currently have an impact in Huntingdonshire.

3.7.8 Wildlife and Countryside Act

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[48].

The Government's 25-year Environment Plan 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).

3.7.9 Ramsar

The Convention on Wetlands of International Importance, more commonly known as the Ramsar convention, aims to protect important wetland sites. Member countries 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"[49].
- In the UK, Ramsar Sites are designated by 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). Additionally, the NPPF states that Ramsar sites should be given the same protection in the planning process as sites designated under the EU Habitats Directive.

3.7.10 Bathing Water Regulations

The Bathing Water Directive was first published in 2006 and are currently transposed into English and Welsh law through the Bathing Water Regulations 2013. The aims of the directive are the protection of public health whilst bathing, standardisation of

48 Wildlife and Countryside Act, UK Government, 1981
49 Wise use of wetlands, Ramsar Convention Secretariat, 2010

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. The Environment Agency are required to monitor water quality at these sites regularly (usually weekly) throughout the Bathing Water season, 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.

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.

In contrast to some other European nations, the UK has not previously designated stretches of river as bathing waters, however five new inland bathing waters have been designated since 2021, and across England there are numerous campaigns by NGOs and members of the public to designate other stretches of river. Defra has published guidance on applying for bathing water status, including a requirement for at least 100 bathers per day during the season[50]. Within the Huntingdonshire study area there are no designated bathing waters, however there may be undesignated areas where people swim.

3.7.11 Environmental Permitting Regulations

Environmental permitting is a process used to manage and regulate activities which may cause harm to the environment. The Environmental Permitting Regulations[51] were introduced in order to streamline a wide-ranging number of environmental permitting laws under one set of regulations. These include permits for emissions to air, water and land, and cover a range of industrial sectors and waste management streams.

50 Designate a bathing water: guidance on how to apply, UK Government, 2023

51 The Environmental Permitting (England and Wales) Regulations, UK Government, 2016

Of particular relevance to this study are the regulations for permitting sewage effluent discharges to surface waters and groundwaters, known as water discharge activities[52] (Environment Agency, 2022).

- The regulations are used to permit discharges from water company and private wastewater treatment works, and for sewer overflows.
- The Environment Agency will usually object to applications for a new private Package Treatment Plan (PTP) or septic tank where it is feasible to connect the development to a public sewerage system. A general rule of 30m per dwelling is used to define a reasonable distance from the site boundary to a public sewer. Hence a development of 10 homes should connect to a public sewer within 300m of the boundary, unless there are significant barriers, such as a river or motorway.
- Where an existing or new development treats its own wastewater, a PTP must be installed if the discharge is directly to surface water. Where the discharge is to ground, a PTP or septic tank may be used, but must be connected to a suitably designed drainage field.

3.7.12 Groundwater protection

Under the regulations, the EA have published a set of position statements on protecting groundwater from various activities[53]. 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.

The EA also maintain a set of maps of Source Protection Zones (SPZs) to help identify high risk areas within which pollution prevention measures should be implemented. The SPZs show the risk of contamination to public water supplies from activities that may cause pollution in the area, the closer the activity, the greater the risk:

- **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

52 Discharges to surface water and groundwater: environmental permits, UK Government, 2022

53 The Environment Agency's approach to groundwater protection, Environment Agency, 2018

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.

3.8 Summary of key new and emerging policy and legislation

The policy and legislation covering the water environment, water and wastewater services and planning is wide and frequently changing. The new and emerging policy and legislation below have been identified as particularly important for consideration in the development of the Local Plan:

- Schedule 3 of the Flood and Water Management Act is expected to be enacted in England in 2024. This will designate Lead Local Flood Authorities as SuDS Approval Bodies (SABs) with a duty to adopt new SuDS and removing the automatic right to connect to public sewers.
- Defra have signalled their intention, with the Plan for Water, to review the water efficiency standards for new homes, including consideration of a new national 105l/p/d standard and 100l/p/d where there is a clear local need.
- All development sites will be expected to demonstrate at least a 10% net-gain in biodiversity from 2024.
- The designation of specific catchments in England as requiring to demonstrate Nutrient Neutrality under the Conservation of Habitats Regulations has led to significant limitations to development in these areas, as well as the development of offsetting schemes to enable nutrient-neutral development. In 2023 the government unsuccessfully attempted to remove development restrictions in these areas, so further developments might be expected in the near future.
- Similarly, the availability of water resources, and the impact of new water demand on the environment, has led to restrictions on granting planning permission in Sussex North WRZ and a requirement to demonstrate water-neutral development in Cambridge Water WRZ. It is anticipated that LPAs will be increasingly required to demonstrate that there will be sufficient water resources to supply development without causing further harm to the environment through the life of their Local Plans.

4 Baseline

4.1 Study area

The Local Planning Authority (LPA) area of Huntingdonshire District Council is shown in Figure 4.1. Whilst the map shows the LPA boundary of HDC, a wider study area has been considered taking into account the surface water and groundwater catchments. The majority of the study area is within the water supply area of Anglian Water. Cambridge Water is the water supplier to the east of the district and some smaller areas to the south of the district boundary. Anglian Water provide wastewater services to the entire study area.

4.2 Huntingdonshire in the wider area

4.2.1 Overview

This section provides an understanding of how Huntingdonshire fits into the wider catchment. By understanding the position of Huntingdonshire in the catchment, it can help in understanding how best to implement an IWMS.

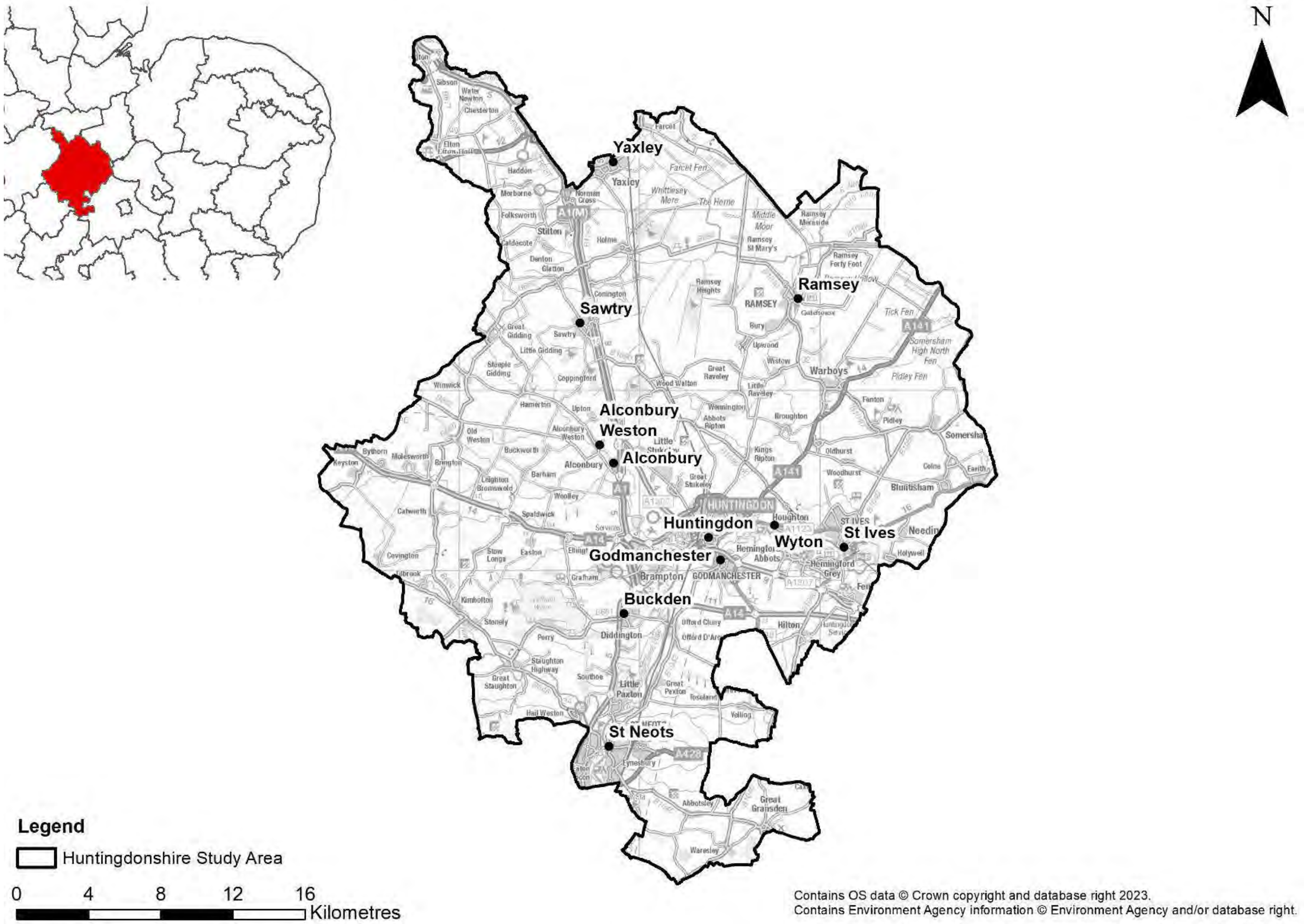

Figure 4.1 Huntingdonshire study area

4.2.2 River basin district

Waterbodies in the UK are divided up into catchments following the hierarchy below in Figure 4.2.

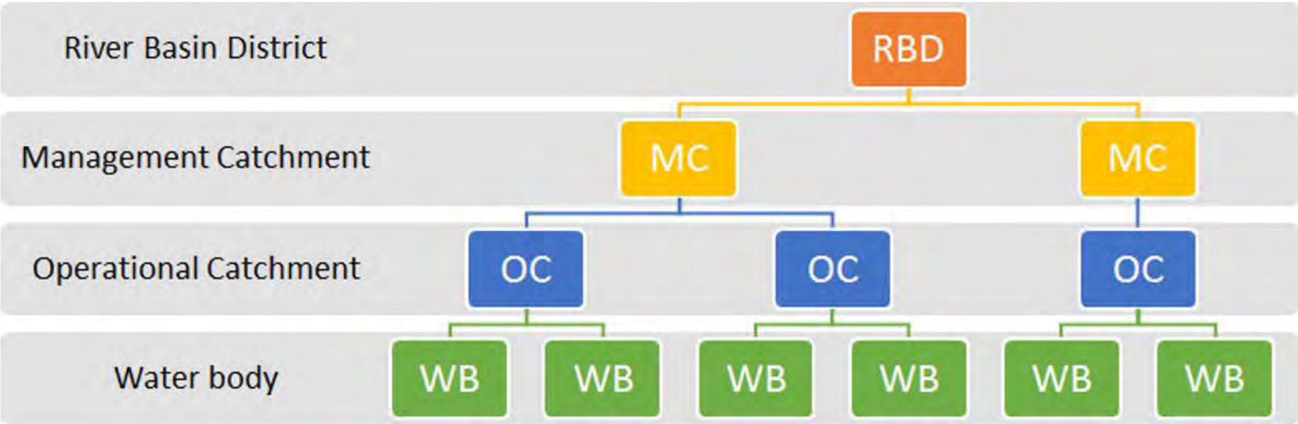

Figure 4.2 WFD catchment hierarchy

Huntingdonshire is within the Anglian River Basin District (RBD) as shown in Figure 4.3.

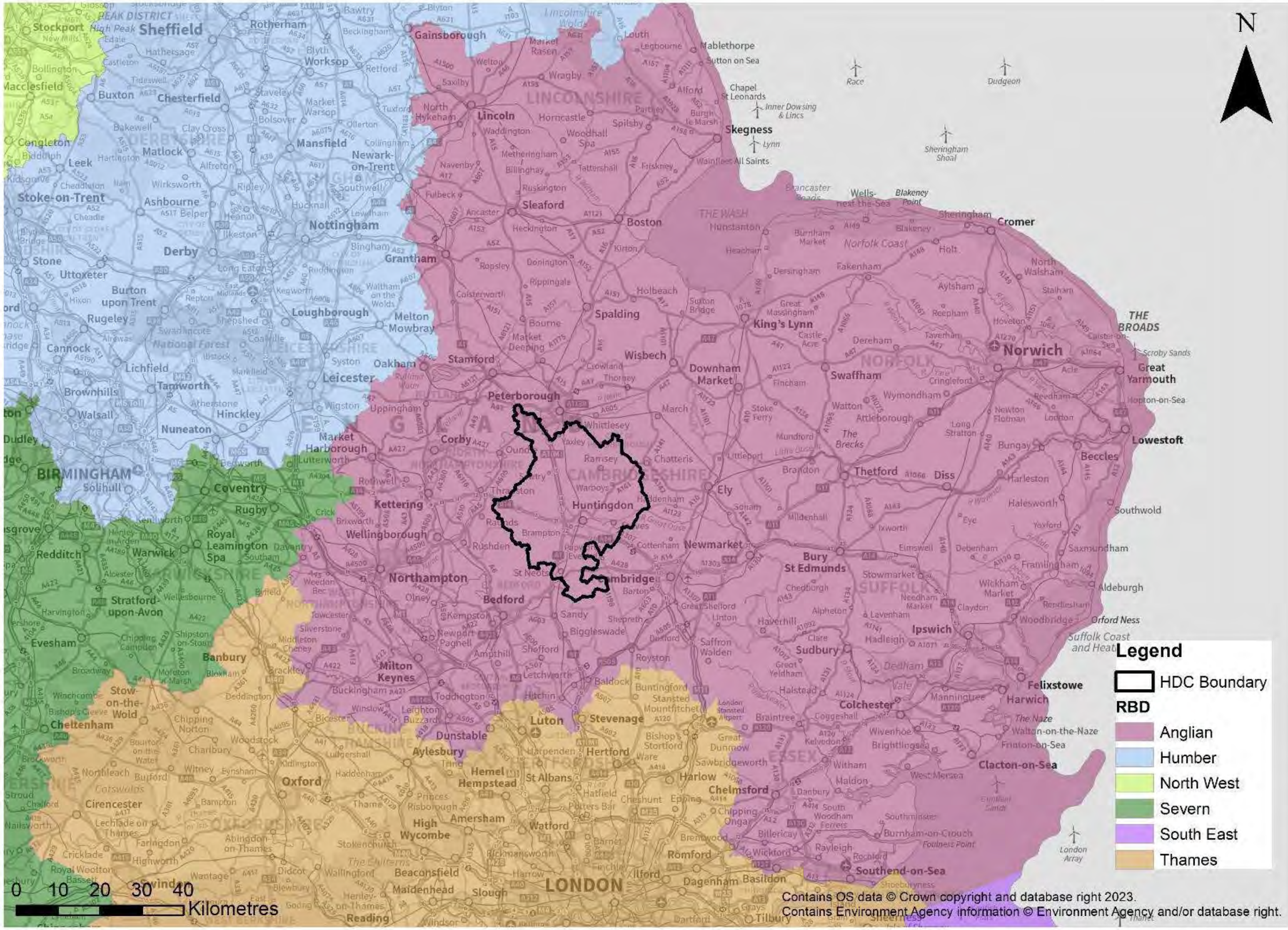

Figure 4.3 Location of Huntingdonshire in the Anglian River Basin District (RBD)

4.2.3 Management Catchments

Four management catchments are present within Huntingdonshire as shown in Figure 4.4:

- Cam and Ely Ouse
- Nene
- Old Bedford
- Middle Level and Upper and Bedford Ouse

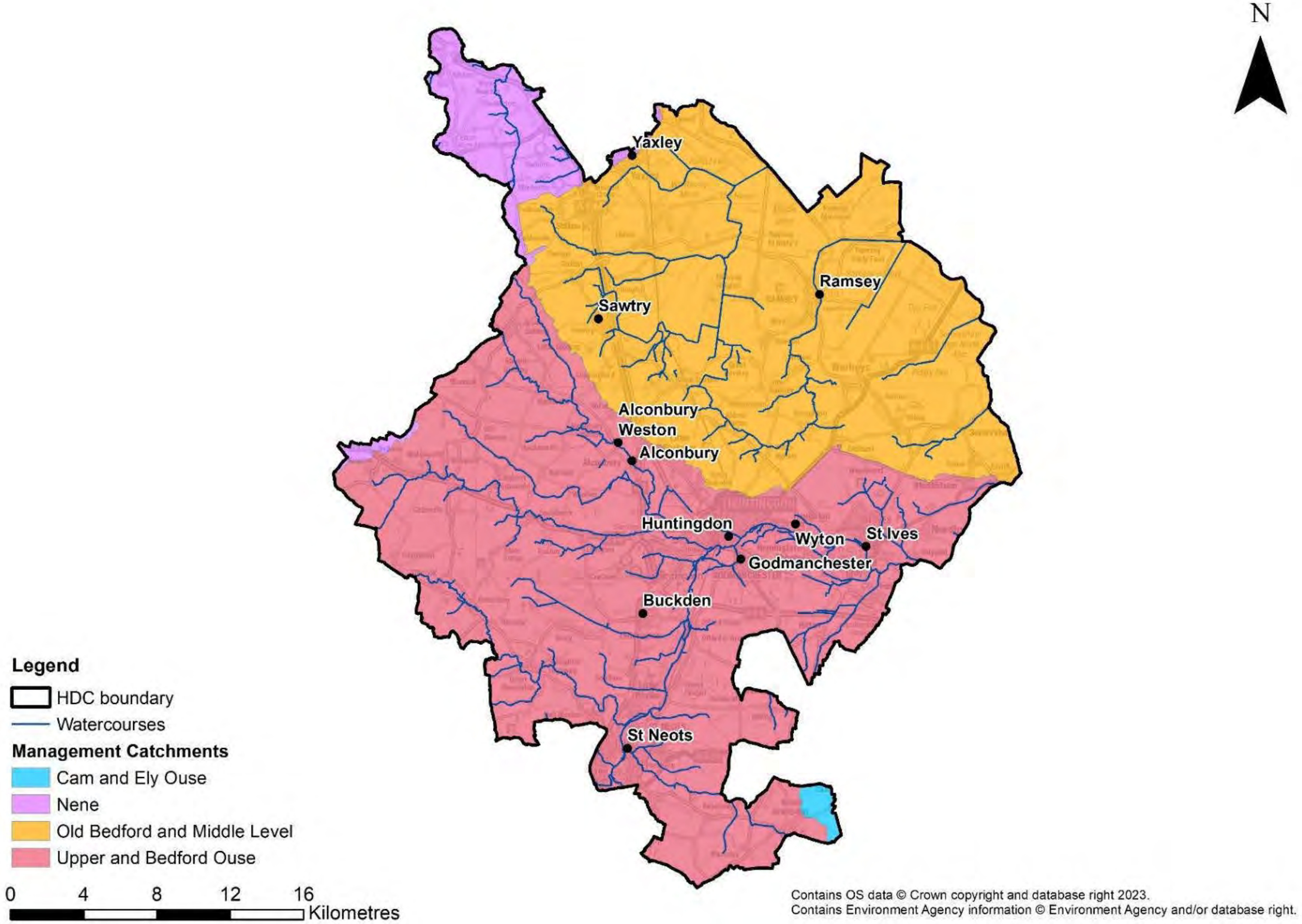

Figure 4.4 Management catchments covering Huntingdonshire

4.2.4 Surface waterbodies

Figure 4.5 shows the main watercourses within the study area[54] to include Main Rivers and Ordinary Watercourses.

The River Great Ouse enters Huntingdonshire from the south and flows through St Neots towards the centre of the district before flowing in an easterly direction as it passes through the towns of Huntingdon, and St Ives before crossing the boundary into East Cambridgeshire. Other main watercourses include the Ramsey High Lode which drains into the Middle Level Catchment and Alconbury Brook and the River Kym both tributaries of the River Great Ouse

Most rivers in the catchment are classified as Heavily Modified Water Bodies (HMWB) because of the structures implemented to control flows[55].

Information on the status of waterbodies in the study area can be found on the Environment Agency's Catchment Data Explorer[56].

54 Revised draft drought plan 2022 - Appendix 1 Water Resource Zone characteristics, Anglian Water, 2022

55 Water for life and livelihoods, Part 1: Anglian river basin district - River basin management plan, UK Government, 2015

56 Catchment Data Explorer: https://environment.data.gov.uk/catchment-planning/

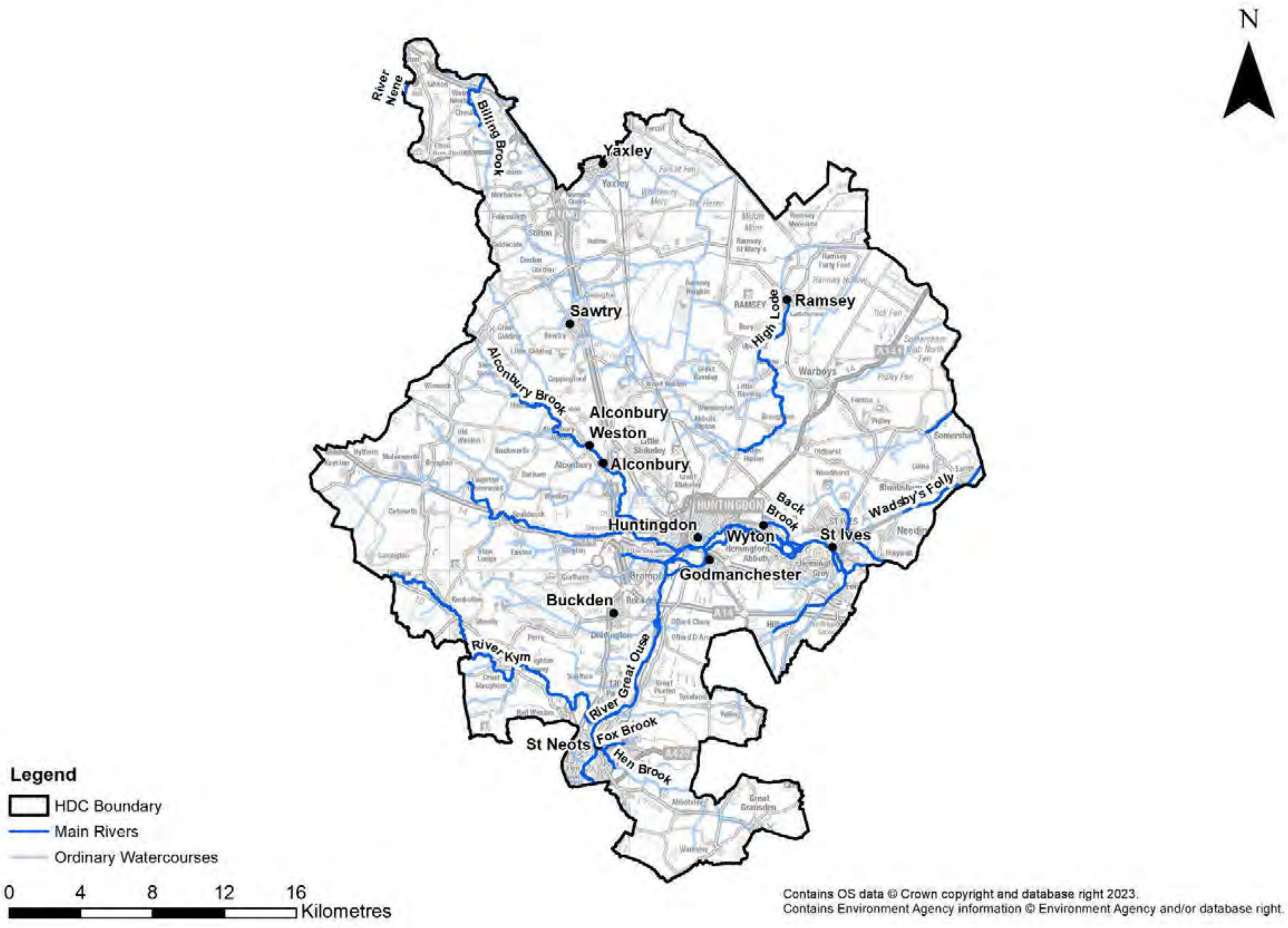

Figure 4.5 Significant watercourses within Huntingdonshire

4.3 Geology

4.3.1 Geology overview

The geology of a catchment can be an important influencing factor in the way that water runs off the ground surface. This is primarily due to variation in the permeability of the surface material and bedrock stratigraphy. Figure 4.6 shows the bedrock geology of the Huntingdonshire study area. The area is largely dominated by mudstone, siltstone and sandstone of the Jurassic period with a small pocket of Oolitic limestone to the north-west of the district.

Figure 4.7 shows superficial (at the surface) deposits are predominantly till with fenland peat deposits dominating the landscape to the north.

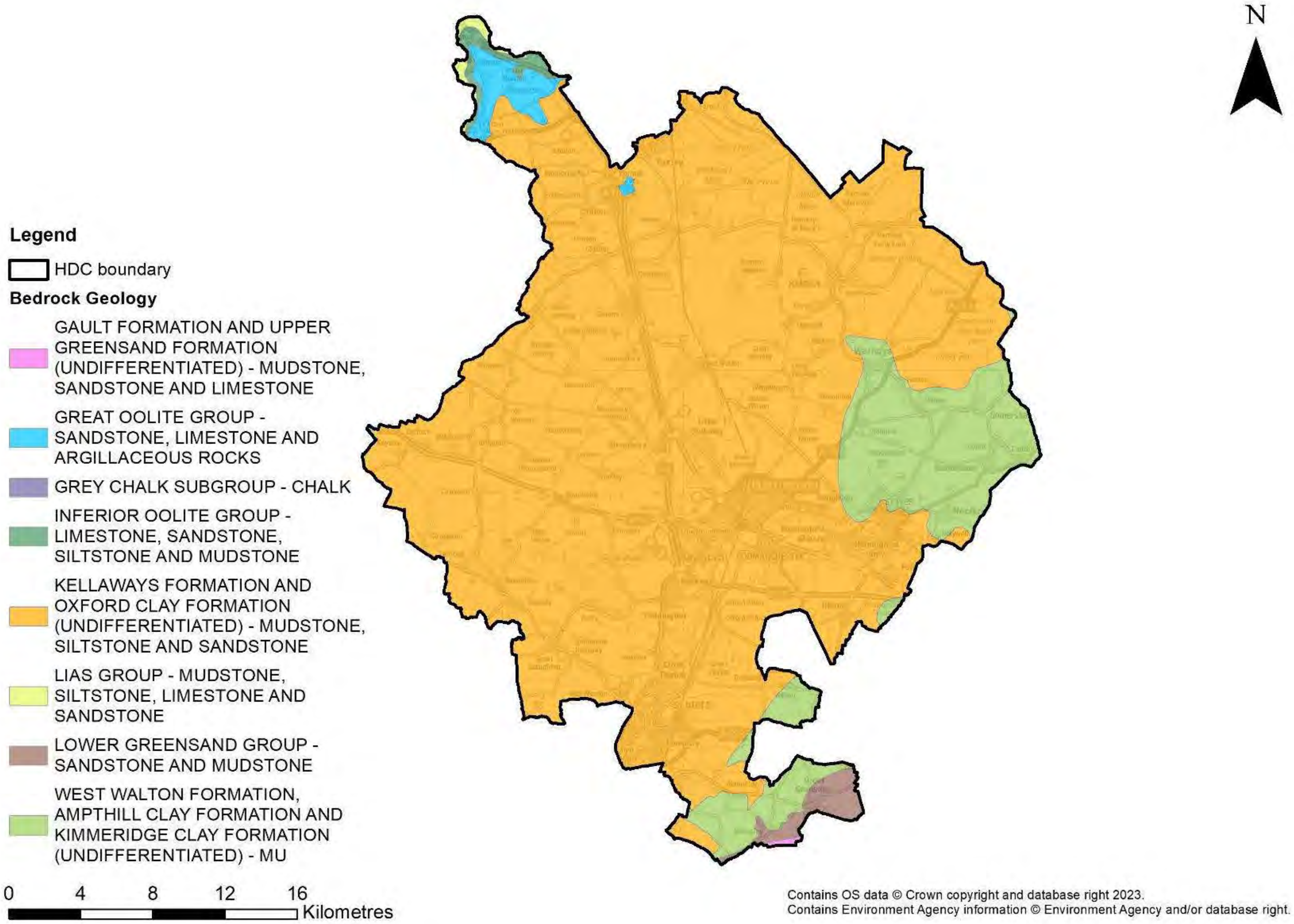

Figure 4.6 Huntingdonshire Bedrock Geology

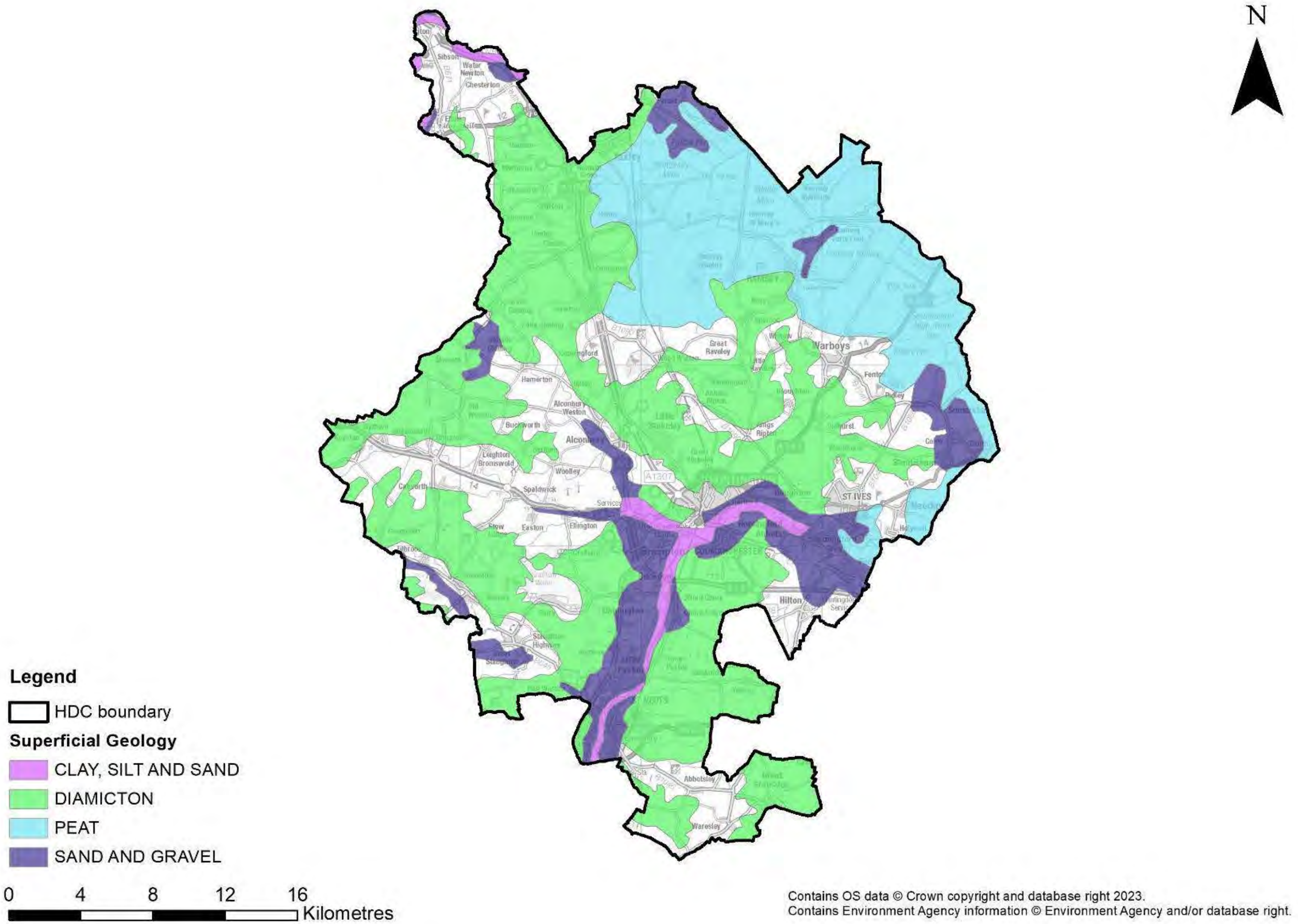

Figure 4.7 Huntingdonshire Superficial (at surface) Geology

4.3.2 Groundwater

Given the preponderance of the Kellaway Formation and Oxford Clay formation, the majority of the district is not underlain by significant aquifers, there are four groundwater sources within the Huntingdonshire study area as shown in Figure 4.8.

To the north-west of the study area there are two groundwater sources namely the Nene Mid Lower Jurassic Unit and Northampton Sands. To the south of the study area there are two further groundwater bodies known as the Cam and Ely Ouse Woburn Sands and the Upper Bedford Ouse Woburn Sands.

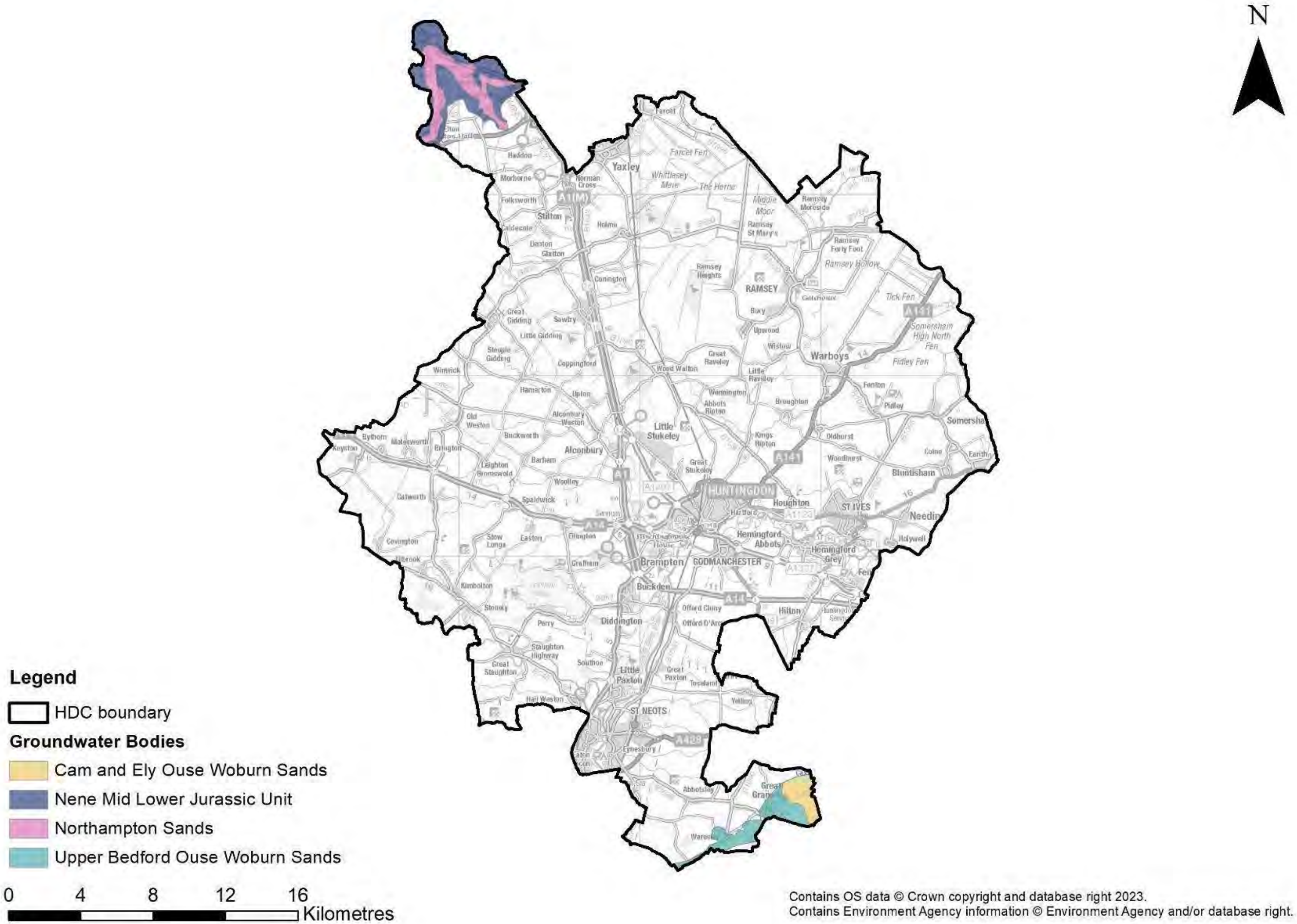

Figure 4.8 Groundwater in Huntingdonshire

4.3.3 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 (see section 3.7.12) (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,
- how it prioritises responses to incidents.

The EA have published a position paper outlining its approach to groundwater protection which includes direct discharges to groundwater, discharges of effluents to ground and surface water runoff[57]. 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

57 The Environment Agency's approach to groundwater protection, Environment Agency, 2018

satisfied that it is not reasonable to make a connection to the public foul 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 that 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 permit (subject to an assessment of risk). 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, 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 for sustainable drainage systems[58] – these should be used in conjunction with the NPPF and PPG,
- and use a SuDS management treatment train (see section 8.4).

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

Source Protection Zones in Huntingdonshire

The Source Protection Zones (SPZs) that are present in the study are shown in Figure 4.9. There are four small areas of SPZs within Huntingdonshire. The largest SPZ is located to the south-east of the town of Huntingdon in the east of the district. There are some smaller SPZs including an area to the north-west of St Neots and those alongside the district boundary to the south at Waresley and to the south-east of Great Gransden.

58 Sustainable drainage systems: non-statutory technical standards, UK Government, 2015

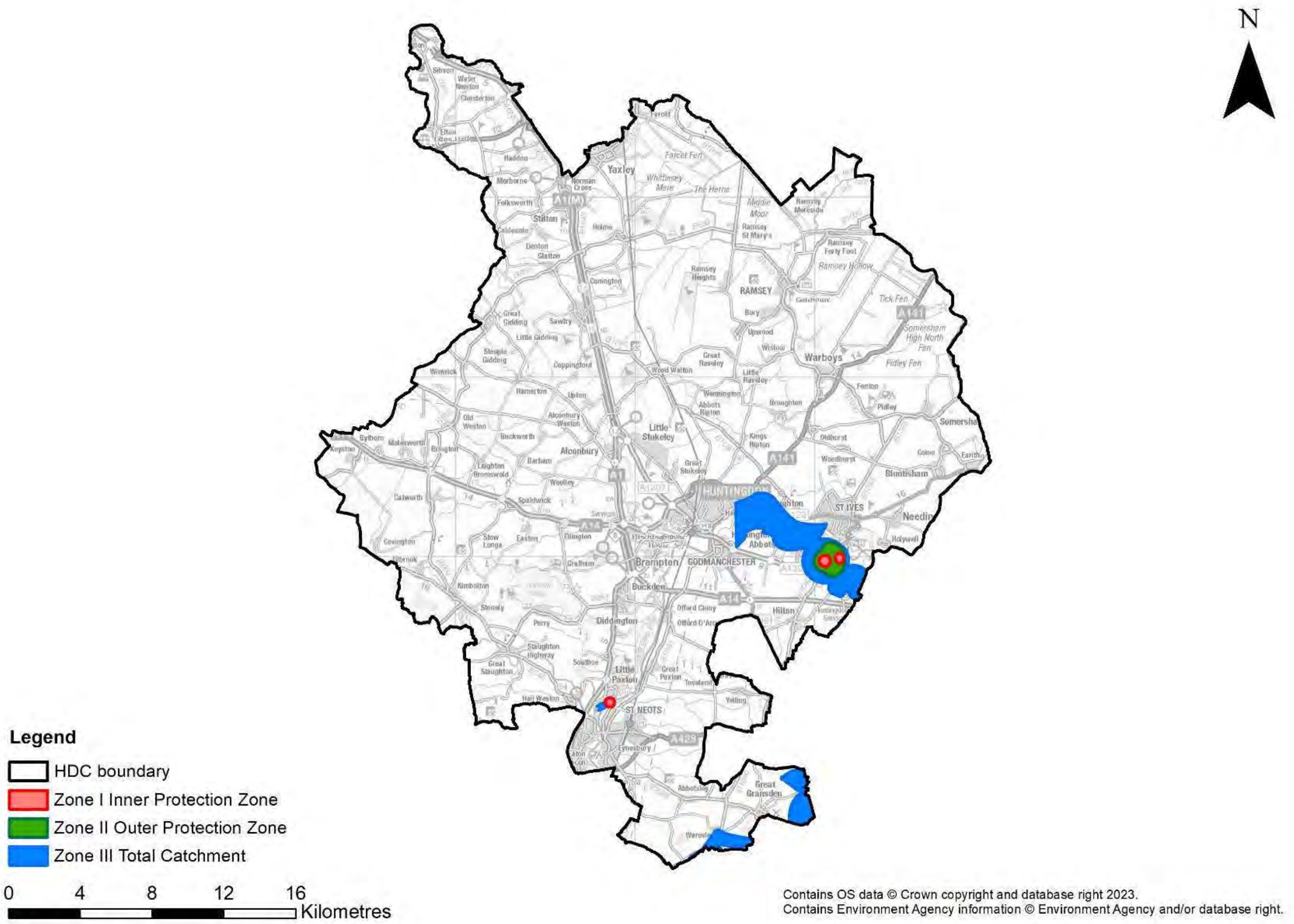

Figure 4.9 Source Protection Zones in Huntingdonshire

4.4 Flooding

Depending on the proximity to watercourses, topography and geology, risk of flooding can vary. The Anglian River Basin District Flood Risk Management Plan[59] has identified that the Huntingdon area is a Flood Risk Area (FRA) due to the risk of surface water flooding.

Within the stage 1 Strategic Flood Risk Assessment (SFRA), which has been completed as part of the IWMS, a number of flood risks have been identified. These are detailed in Chapter 4 of the SFRA and summarised in Table 4.1 below:

Table 4.1 Flood risk to Huntingdonshire from JBAs stage 1 SFRA

Flood type	Sources of flood type in Huntingdonshire
Rivers	The primary flood risk from rivers in Huntingdonshire is associated with the River Great Ouse and its tributaries. Key areas at risk of flooding are St Neots, Huntingdon, Godmanchester, Wyton, St Ives, Alconbury and Alconbury Weston.
Surface Water	Surface water flooding mainly follow topographical flow paths as well as existing watercourses or dry valleys. Huntingdon is designated as an FRA due to surface water flooding.
Sewer	According to the Anglian Water historic sewer flooding data, the largest number of recorded sewer flooding incidents have occurred in St Neots, Huntingdon and St Ives.
Groundwater	The areas with the highest risk of groundwater flooding include Godmanchester, Wyton, St Ives and St Neots.
Reservoirs	There is a risk of reservoir flooding in and around the study area. Inspection and maintenance required under the Reservoir Act means that the risk of flooding is relatively low.

4.5 Water Resources

4.5.1 Water Resource Management Plans summary

Water Resource Management Plans (WRMPs) are 50-year strategies that water companies are required to prepare, with full updates every five years. WRMPs are required to assess:

- Future demand (due to population and economic growth).
- Future water availability (including the impact of sustainability reductions).

59 Anglian River Basin District Flood Risk Management Plan 2021 to 2027, The Environment Agency's approach to groundwater protection, Environment Agency, 2022

- 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 next 50 years.
- 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.

The EA have commented there is no guarantee that any surplus capacity in the network is sustainable. The dWRMP24 may yet not demonstrate that surplus supplies are sustainable.

4.5.2 Water resource zones

Huntingdonshire is covered by three WRZs including Anglian Water's Ruthamford North and Ruthamford South WRZs and Cambridge Water's Company Wide Zone as shown in Figure 4.10. All of the WRZs covering Huntingdonshire also serve other LPA areas.

Anglian Water

Anglian Water provides both water supply and wastewater management to 27,500 km^2 of the east of England and manages the provision of water to 4.3 million people through 28 Water Resource Zones (WRZs).

Anglian Water's supply is split 50/50 between surface water and groundwater. Surface water is supplied by 8 raw water reservoirs and 8 direct supply rivers intakes. The other 50% supplied by groundwater is made up by 200 water sources and 400 boreholes varying from 10m-500m depths. The WRMP identifies this 50/50 split as complex, with rock type often effecting the chemical composition of the water meaning tailored water management is necessary.

The majority of Huntingdonshire is covered by Ruthamford North and Ruthamford South WRZs. The Ruthamford North WRZ covers a total area of 2,894 km^2 and is based on the supply systems for Peterborough, Northampton, Wellingborough, Corby, Daventry and Kettering. The zone is supplied solely from surface water, with abstractions from the Rivers Nene and Welland filling Pitsford Water and Rutland Water reservoirs respectively. The Ruthamford South WRZ covers an area of 1,419 km^2 and is based on the supply systems for Bedford and Huntingdon and is supplied from surface water, with a direct abstraction on the River Great Ouse going to

Grafham Water reservoir. There is also a small groundwater contribution from the abstraction in the Woburn Sands aquifer.

Abstractions by water companies are limited by abstraction licences, which were set based on assumptions about sustainability at the time they were written. Investigations into future sustainability of water resources, based on modelling conducted by the EA has produced an assessment of the reductions required in deployable output of individual water resources to ensure long term sustainability. Early identification of these reductions will allow replacement water supply resources to be identified.

Cambridge Water

Cambridge Water supplies water through one WRZ. The region is supplied by 26 groundwater sources which are linked to a highly integrated pipe network. Storage reservoirs are linked with large diameter mains, booster stations and remotely controlled valves to allow the transfer of water throughout the supply area.

The network is comprised of five supply zones. Cambridge Zone is the largest of these in terms of supply and demand. Under normal conditions, sources which supply water directly into this zone provide more water than is needed within this zone to meet demand allowing for surplus water to be transferred to the other four zones that make up the WRZ as required. Supply zones to the north of the area rely solely on this transfer. Other supply zones have direct input from sources and only rely on transfer from Cambridge zone at times of peak demand or outage. Some zones are highly flexible in terms of transfer options and connectivity, with a number of options to transfer water in and out. Small bulk water supplies (< 1Ml/d) are transferred to/from neighbouring water suppliers to/from Cambridge Water. Water supplies are maintained during resource shortage situations through transfer between service reservoirs.

The EA have expressed concerns about the sustainability of Cambridge Water's WRMP which is explained in 4.5.4.

Cambridge Water supply areas to the east of Huntingdonshire and some small areas to the south adjacent to the district boundary.

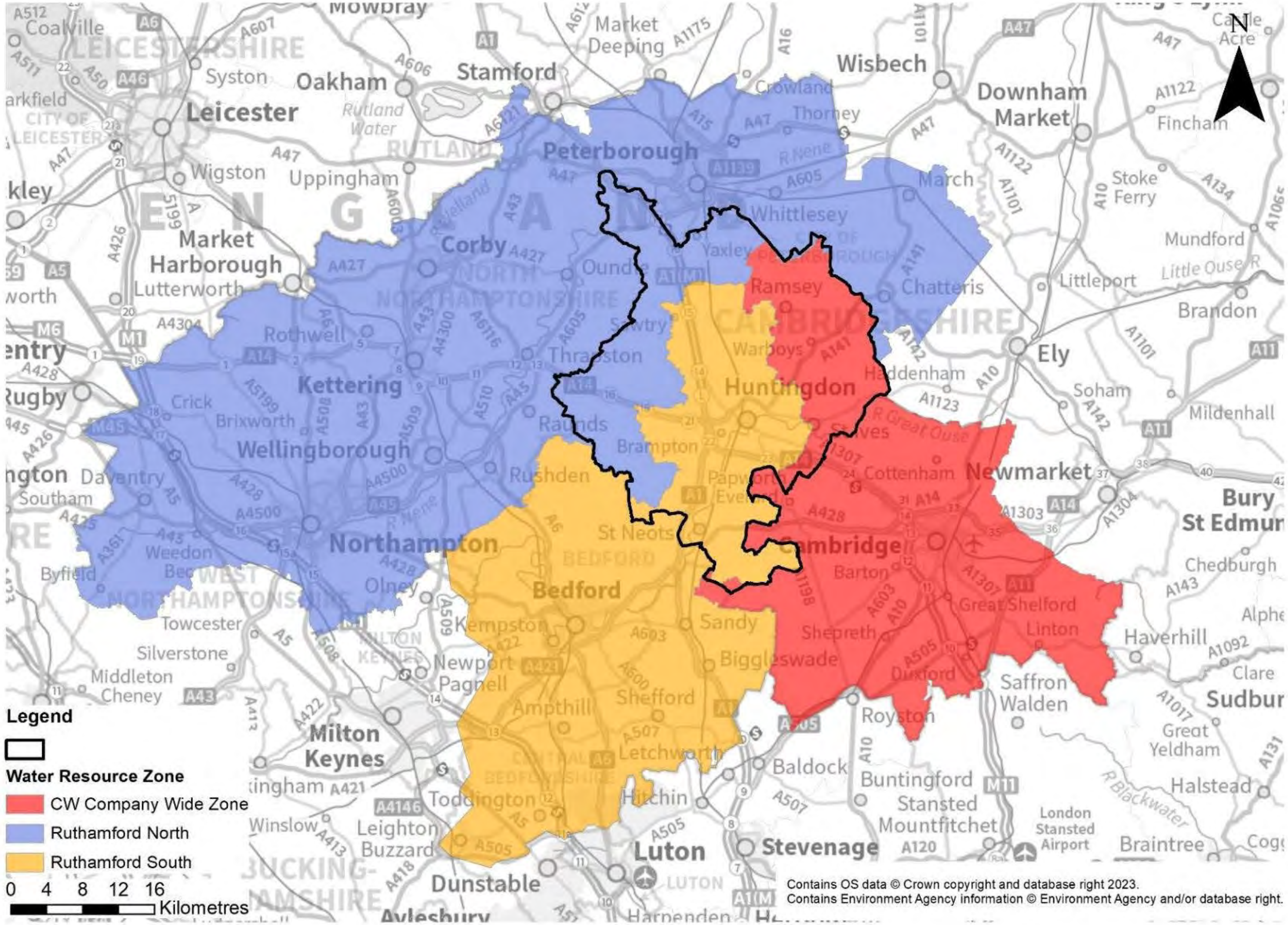

Figure 4.10 Huntingdonshire WRZ

4.5.3 Anglian Water's WRMP

Anglian Water's WRMP was published in 2019, covering the period 2020-2045[60]. Anglian Water are in the process of developing their WRMP24 for the period 2025-2050; this study references the revised draft[61], with the final version expected to be published in 2024. Within the current WRMP attention was mainly focussed on:

- Demand management, including the installation of smart meters and leakage reduction.
- Increase interconnecting pipes and investment in the supply of water to increase the amount of water availability.
- Increasing resilience of the public water supply against climate change especially drought.

Within Anglian Water's revised draft WRMP24 (dWRMP24)[61], an initial surplus of 22 Ml/d was reported for their supply area overall. In the future, factors such as population growth, climate change and drought will impact the future availability of water resources. The predicted supply and demand balance in 2050, with no intervention, shows that both Ruthamford North will have a supply demand balance of between -89 Ml/d and Ruthamford South of between -19 Ml/d[62] using the Dry Year Annual Average (DYAA) measure. Both WRZs are expected to achieve a supply-demand balance in the final plan.

Anglian Waters 'best value plan' is designed to address the full range of challenges across the plan period using a blend of demand management (37%), reservoirs (36%) and other supply options (27%). It includes Water Treatment Works (WTWs) upgrades (Ruthamford South) as well as greywater reuse. Rainwater harvesting and new surface water abstraction and reservoir (near the River Cam). New transfers from Ruthamford North are also discussed.

Anglian Waters Strategic Resource Options (SROs) consist of the Fen and the South Lincolnshire reservoirs, which will be raw water storage reservoirs to contain surplus water from the environment. The River Great Ouse and River Delph will supply the Fens reservoirs, with a supply rate of between 300 Ml/d and 400 Ml/d depending on flow availability. This will provide a deployable output of 87 Ml/d, 50% of which will be transferred to Cambridge Water.

60 Water Resources Management Plan, Anglian Water, 2019

61 Revised Draft WRMP24: Our Water Resources Management Plan 2024, Anglian Water, Anglian Water, 2023

62 Zone-specific data is taken from the December 2022 zonal summaries, as updated summaries were not published with the updated dWRMP24 issued in August 2023. Draft WRMP24 Water Resource Zone summaries, Anglian Water, 2022

The South Lincolnshire Reservoir SRO will abstract from the River Witham at a rate of 400 Ml/d, again depending on flow availability. The abstractions for the South Lincolnshire Reservoir will be supported by the River Trent with a supply of 300 Ml/d when needed. Overall deployable output from this reservoir will be 166 Ml/d, with all of it going to Anglian Water.

According to Anglian Water, both SROs will supply 43% of the water needed to maintain a supply-demand balance. These reservoirs will require a Development Consent Order (DCO) which is thought to be scheduled for 2025. Subsequently, the benefits of these reservoirs will not be felt until at least the mid-2030s.

Anglian Water have invested in leakage reduction and linking up reservoirs in the west region to improve resilience. The replacement of pipes linked to the above investments will ultimately improve water efficiency and therefore resilience as well. In June, 2023 Anglian Water published a position statement on non-domestic water demands that put forward that new or expanding business' requiring over 0.05 Ml/d of potable water for production (equivalent to ~190 new dwellings) will need to maximise process efficiency to be considered for supply. This is to ensure future demand availability for domestic water demand as well as domestic growth laid out in Local Plans.

4.5.4 Cambridge Water's WRMP

Cambridge Water's WRMP was published in 2019, covering the period 2020-2045[63]. Cambridge Water are in the process of developing their WRMP24 for the period 2025-2050[64].

Key elements of the current WRMP include:

- To achieve leakage reduction through pressure management and active leakage control.
- Increased metering including the installation of additional water meters and the introduction of smart meters.
- Increased water efficiency including rainwater harvesting and grey water recycling within new sites.
- To work collaboratively with key stakeholders in the WRE including Anglian Water and Affinity Water to ensure the long-term resilience of water supplies.
- To meet WFD and RBMP objectives through collaborative partnership with the EA.

Cambridge Water identify a number of challenges within its draft WRMP24, which have the potential to impact on future water supplies. Future challenges include

63 Water Resources Management Plan, Cambridge Water, 2019

64 Cambridge Water Draft Water Resources Management Plan 2024, Cambridge Water, 2023

population growth accompanied by increased housing demand, environmental considerations to ensure abstractions do not cause environmental deterioration and measures to improve the status of the environment alongside the need to meet customer expectations in relation to demand management approaches.

CW submitted their draft WRMP to the Environment Agency in October 2022. The EA then completed a review of the plan and provided their representation in May 2023. The representations showed that EA are concerned Cambridge Water will not be able to meet the demand for water in its area without increasing the risk of deterioration in the status of waterbodies. The EA recently objected to planning applications for large developments in South Cambridgeshire based on the impact of CW's abstractions. In principle this objection would also apply to large developments within the CW WRZ in Huntingdonshire (the east of the HDC area), as well as South Cambridgeshire and the Greater Cambridge area.

The EA's concerns relate to both water demand and future supply options and be summarised as follows:

- In the short-term CW is reliant on demand management and drought measures to prevent an increase in the volume of water abstracted and prevent a deterioration in the status of waterbodies.
- CW's track record of not achieving planned demand savings has led the EA to be concerned that the planned reduction in per capita consumption will also not be achieved.
- The dWRMP does not show how the company will apply drought measures in practice to manage demand.
- The EA are disappointed that the roll out of smart metering is planned to take more than ten years, slower than other larger programmes in England. The EA expect smart metering at a faster pace with the full roll-out completed by 2030 or earlier.
- The company should consider an alternative pathway or plan trigger points in case it cannot deliver its forecast demand reductions.
- The company does not present any significant viable alternatives to demand management until 2030 when a transfer from Anglian Water may be available, and 2036/37 when the proposed Fens Reservoir[65] is due to be delivered. There is uncertainty about the deliverability of both schemes.
- CW do not provide the confidence that it will be ready to use the transfer from AW and provide sufficient water treatment to put the water into supply.

65 The Fens Reservoir is a Strategic Resource Option (SRO), which is being developed in partnership with Anglian Water. The Fens Reservoir will provide multiple benefits to the area including agricultural, habitat, amenity and recreational, and in meeting licence reductions to meet future environmental needs.

- CW has no alternative plan if either of these schemes are delayed or cannot be delivered. This presents an unacceptable risk to security of supply and the environment.

CW have since provided their response to the EA and other stakeholder's comments as part of their consultation process and issued a revised draft WRMP (rdWRMP).

In their response they state that the planned transfer from Anglian Water is no longer being considered and a different transfer from Grafham Water is now proposed. However, this is not available until 2032 at the earliest. They are therefore applying for IROPI (Imperative Reasons of Overriding Public Interest) to delay a proportion of the licence cap (from 2030 to 2032) which aims to reduce abstraction from their groundwater sources in order to maintain customer supply until the transfer is available.

The rdWRMP also now includes an adaptive planning pathway and an acceleration of the smart metering programme to be achieved via Defra funding.

Since the draft Stage 1 IWMS report was written, the EA and Defra completed a review of CW's Statement of Response and rdWRMP in December 2023. The updated CW Statement of Response[66] and rdWRMP[67] were published in February 2024 in response to the recommendations received. A review of CW's rdWRMP alongside the EA's advice report should be carried out in a Stage 2 IWMS.

66 Revised Draft Water Resources Management Plan 2024, Statement of Response, February 2024 Revision, Cambridge Water

67 Revised Draft Water Resources Management Plan 2024, February 2024 Revision, Cambridge Water

4.5.5 Impact of climate change

Climate change impact modelling has been carried out within the Environment Agency 2017 climate change assessment methodology. Multiple WRCs have been identified as vulnerable and impacted by climate change. Within Anglian Water's draft WRMP24 climate change is said to decrease current water supply by 10 Ml/d. The Cambridge Water climate change assessment indicated a total impact on deployable output of 10-16%.

4.5.6 The Water Resources East Plan

As mentioned in section 3.5.3, water resource planning is taking an increasingly regional focus. 85% of abstraction in WRE goes towards public water supply. The other 15% is used by:

- Agriculture
- the paper/ pulp industry
- food and drink
- chemicals
- other industry.

Of these sectors, Huntingdonshire's' main growth sectors for water demand are energy and agriculture[68].

Between now and 2025, the WRE emerging plan focuses on developing future actions such as desalination research and development and reservoir design and planning. In the shorter term, water company demand and water leakage control are mentioned.

From 2025-30 keeping bills affordable and increasing household water efficiency are the main themes. For 2030 onwards a continued focus on water efficiency is mentioned as well as wider water re-use and green energy goals.

4.5.7 Abstraction Licensing Strategy

As discussed in Section 4.2.3 four management catchments are present within Huntingdonshire. The Environment Agency's Abstraction Licensing Strategies which cover this area are summarised below:

Cam and Ely Ouse Abstraction Licensing Strategy (ALS)[69]

The Cam and Ely Ouse ALS covers an area of approximately 3,664 km^2. Across the ALS there are 17 Assessment Points (AP) which are significant points in the river, such as where rivers join, water channels or where gauging stations are located.

68 The Emerging Water Resources Regional Plan for Eastern England: Non-Technical Summary, Water Resources East, 2022

69 Cam and Ely Ouse abstraction licensing strategy (ALS), UK Government, 2020

Across the ALS there are 11 APs where consumptive abstraction is available less than 30% of the time and six where the consumptive abstraction is available at least 30% of the time.

There are three Groundwater Management Units (GWMU) in this ALS area:

- Chalk
- Greensands
- Unproductive including localised Sands and Gravels

There is no water available for new consumptive licenses associated with any of the GWMU within the Cam and Ely Ouse ALS area.

Nene Catchment ALS[70]

The Nene Abstraction Licensing Strategy (ALS) covers the Nene catchment in the Anglian River Basin District. The River Nene rises in Northamptonshire and flows through Northampton, Peterborough, Wisbech and Sutton Bridge before discharging into the Wash. Across the ALS there are 16 Assessment Points (AP). 10 of these APs have gauging stations. All APs in the ALS area are subject to Hands Off Flow (HOF) licensing constraints. The Nene Downstream Boundary AP is "level managed" therefore, additional Hands-Off-Level (HoL) restrictions apply. The water resources across the ALS area have consumptive abstraction available less than 30% of the time with the exception of the Nene Downstream Boundary which has consumption abstraction available at least 30% of the time.

There are no significant groundwater resources in the Nene ALS area, therefore groundwater abstractions are limited.

There are three GWMUs in this ALS area:

- Lincolnshire Limestone
- Secondary Aquifers
- Sands and Gravels

The Lincolnshire Limestone source has no water available for new consumptive licenses. However, providing there is no hydraulic connectivity with the Lincolnshire Limestone or surface water features there may be the opportunity for consumptive abstraction from Secondary Aquifers and Sands and Gravels.

70 Nene Catchment Abstraction Licensing, The Environment Agency's approach to groundwater protection, Environment Agency, 2021

Old Bedford including Middle Level ALS[71]

The Old Bedford including Middle Level ALS catchment comprises an area of approximately 921km^2 stretching from the village of Stilton in the west, to the village of Sutton in the east, and from Upwell in the North, to the edge of Huntingdon in the south. Brackley in the South to Letchworth in the East and Earith in the North. The catchment comprises the Ouse Washes, Counter Drain, Hundred Foot and the Middle Level rivers and drains and is predominately below sea level. The majority of the water courses are artificial drains with the movement of water principally relating to pumping and drainage operations. The catchment abstraction management strategy (CAMS) area is split into three main drainage systems or Level Dependent Management Units (LDMU) to include:

- Middle Level
- Counter Drain
- Hundred Foot

The availability of water for abstraction in this ALS is determined by a water level based strategy (i.e., availability for abstraction is based on the level of water at assessment points within the area), which is based on the relationship between the water available in the system, fully licensed and recent actual abstractions and environmental requirements. The water resource availability for this ALS area shows that consumptive abstraction licenses are available during the winter period but are not available during the summer period.

Upper Ouse and Bedford Ouse ALS[72]

The Upper Ouse and Bedford Ouse Abstraction Licensing Strategy (ALS) covers a 3,043km^2 area from Brackley in the South to Letchworth in the East and Earith in the North. Across the ALS there are 20 Assessment Points (AP). 11 of these APs have gauging stations. Apart from Earith and Brampton APs all other points are given a low flow condition to protect the public water abstraction at Offord and other Hands-Off-Flows (HOFs) may be applied. The water resources across the ALS have consumptive abstraction available less than 30% of the time.

There are three Groundwater Management Units (GWMU) in this ALS area:

- Upper Bedford Ouse Woburn Sands
- Upper Bedford Ouse Oolite
- Upper Bedford Ouse Chalk

The Upper Bedford Ouse Woburn Sands and Upper Bedford Ouse Chalk units have no water available for new consumptive licenses, whereas the Upper Bedford Ouse

71 Old Bedford including Middle Level abstraction licensing strategy, The Environment Agency's approach to groundwater protection, Environment Agency, 2017

72 Upper Ouse and Bedford Ouse, The Environment Agency's approach to groundwater protection, Environment Agency, 2017

Oolite is assessed case by case because of restricted water available linked to surface water status.

4.5.8 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.
- 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 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 for surface water availability

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	Fully Licensed flows fall below the Environmental Flow Indicator (EFI).

Water Resource Availability Colour	Implications for licensing
available for licensing	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. 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 the Cam and Ely Ouse, Nene, Old Bedford and Middle Level and Upper Bedford Ouse management catchments which cover the study area are summarised in Figure 4.11.

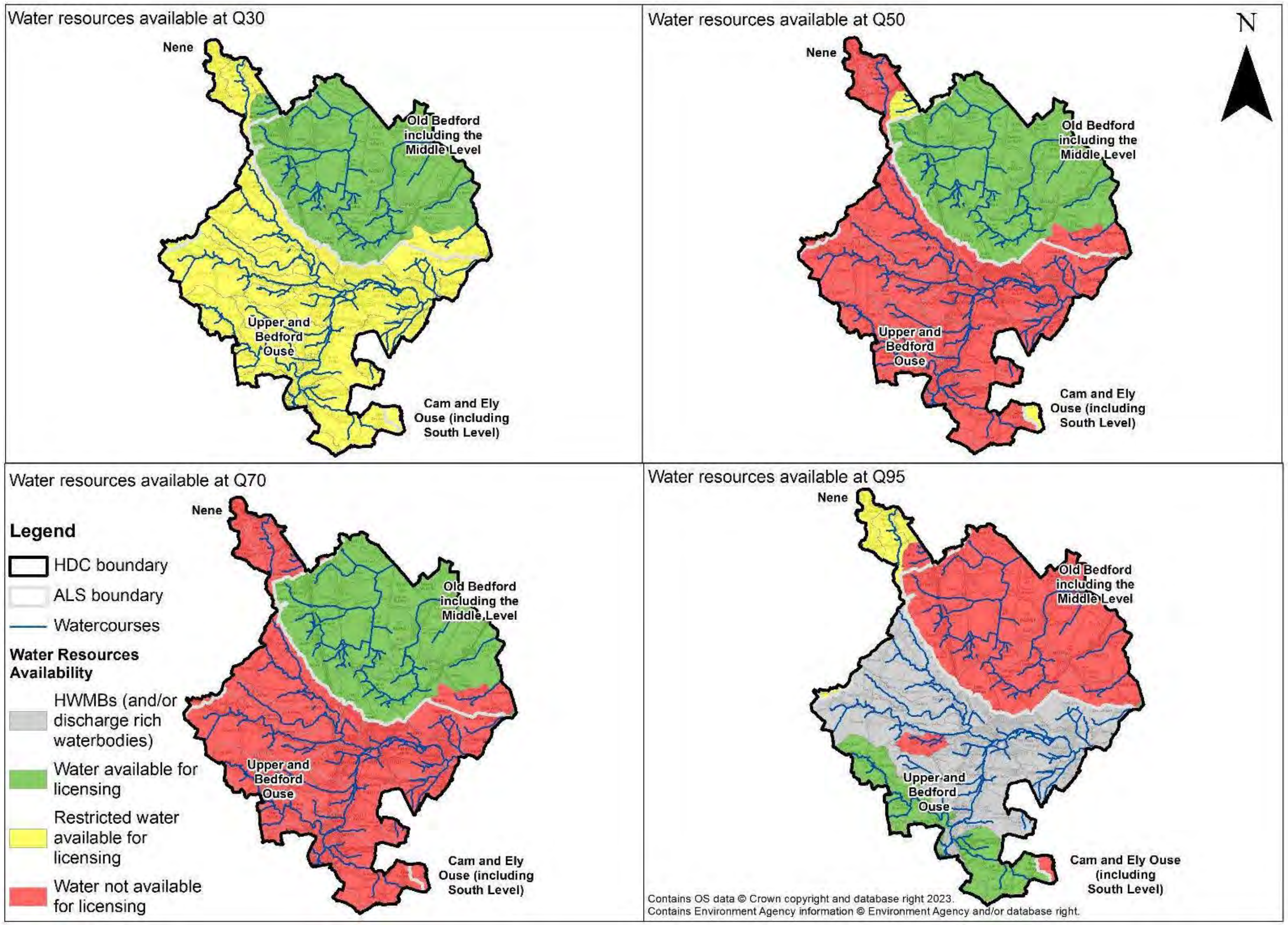

Figure 4.11 Water resources available in Huntingdonshire

4.5.9 Abstraction licencing implications for LPA and developers

The water availability assessment in 4.5.8 shows the limitations in the availability of water for new licences, and the restrictions on existing licences within HDC.

Any developers proposing to obtain their own source of water for use in construction (for example for dust suppression or vehicle washing) or have requirements for dewatering, either temporarily to allow construction, or long term to supply activities on the site or to prevent flooding of below ground features, should be aware of these restrictions.

Dewatering activities will generally require an abstraction licence and guidance is available from the EA[73]. There are two exceptions to this:

Small scale dewatering:

A six-month exemption may still apply when water is discharged to a soakaway immediately. When water from small scale dewatering is not discharged to a soakaway immediately, a six-month exemption will still apply when the abstraction is:

- less than 100 cubic metres per day and located more than 500 metres from a designated site or 250 metres from a spring, well or borehole.
- less than 50 cubic metres a day and located less than 500 metres from a designated site or 250 metres from a spring, well or borehole.

Emergency dewatering:

Operators can also abstract above volumetric licence restrictions when there is a threat to human beings, serious damage to the works, or serious damage to the environment.

4.5.10 Water efficiency standards for Huntingdonshire

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.

It has been established that the East of England is in water stress. The 2014 Detailed Water Cycle Study and Anglian Water and Cambridge Water's WRMPs promote water efficiency as a method of managing future demand. Water efficiency standards are referred to in Policy LP12 of HDCs current Local Plan which states that the water

73 Dewatering Abstraction Licencing Guidance, Environment Agency (2018). https://consult.environment-agency.gov.uk/environment-and-business/removing-previously-exempt-abstraction-activities/user_uploads/dewatering-application-advice-1.pdf

efficiency of new homes must comply with the optional Building Regulations standard of 110 litres per person per day as described in Part G of Schedule 1 to the Building Regulations 2010. Policies to reduce water demand from new developments, or to go further and achieve water neutrality in certain areas, should be defined to reduce the potential environmental impact of additional water abstractions both within and supplying water to Huntingdonshire, and help to achieve reductions in carbon emissions in the district.

Within Part G of the Building Regulations, the water efficiency target of 110l/p/d can be achieved either through the calculation method or the fittings approach. It is strongly recommended that the fittings-based approach is required. This approach provides clear flowrate and volume metrics for each fitting or appliance. This provides a greater confidence that the 110l/p/d target will be met once constructed. Insight gained from a recent Thames Water study of customers with smart meters showed that where the calculation method was applied, households did not achieve the intended performance levels.

Table 4.3 reproduces Table 2.2 of Part G which defined the maximum consumption for the following fittings:

Table 4.3 Maximum fittings consumption level (110l/p/d standard)

Water fitting	Maximum consumptions
WC	4/2.6 litres dual flush
Shower	8 l/min
Bath	170 litres
Basin taps	5 l/min
Sink taps	6 l/min
Dishwasher	1.25 l/place setting
Washing machine	8.17 l/kilogram

The Government's Environmental Improvement Plan published in January 2023[10] contains a roadmap for improving water efficiency in new developments and retrofits. This contains an action to review Building Regulations (2010) and consider a new standard for new homes in England of 105 l/p/d and 100 l/p/d where there is a clear local need, such as in areas of serious water stress. Whilst this is not current policy, it is likely that a tighter standard than the 110 l/p/d will be adopted during the lifetime of HDC's new Local Plan.

4.5.11 Water Supply Infrastructure

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 study is focused on the supply infrastructure. It is expected that developers should fund water company impact assessments which may include adding the development site to models of the 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[74]. This is particularly feasible within property owned or managed by the local authorities, such as social housing.

74 Water Efficiency Retrofitting: A Best Practice Guide, Waterwise, 2009

4.6 Wastewater Collection

4.6.1 Sewerage undertakers

Anglian Water (AW) are the sewerage undertakers for the study area. The role of the 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., soakaways or highway drainage.

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.

Headroom at Water Recycling Centres (WRCs) 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. Consents can also be tightened to prevent a deterioration in water quality due to growth, or to achieve environmental objectives.

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.

4.6.2 Storm overflows

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, see Figure 4.12, all of this flow passes through the sewer network and is treated at a wastewater treatment works.

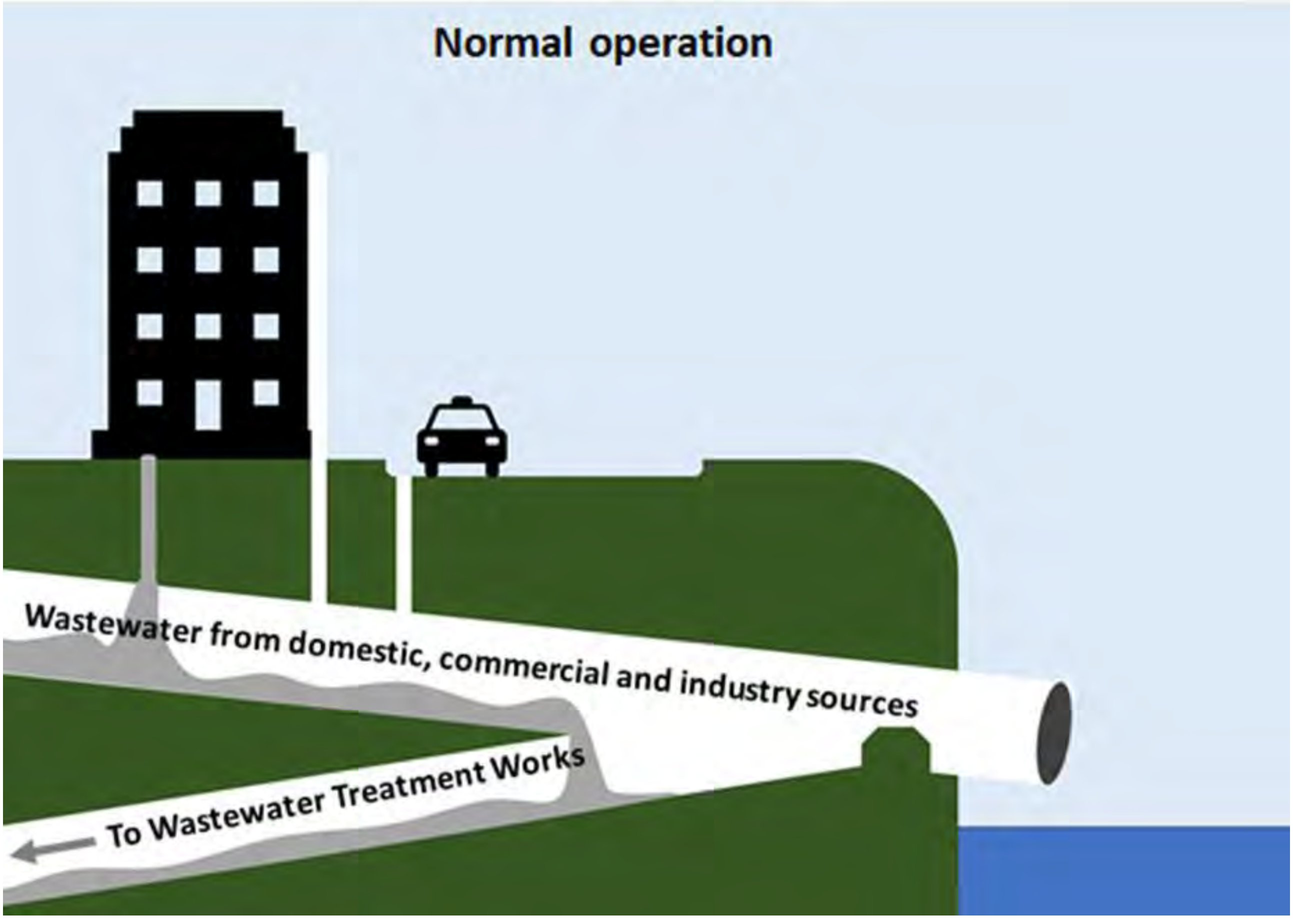

Figure 4.12 Storm overflow operation in normal conditions

In periods of exceptional rainfall, see Figure 4.13, 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 because of groundwater infiltration in the sewerage system – possibly in breach of their permit.

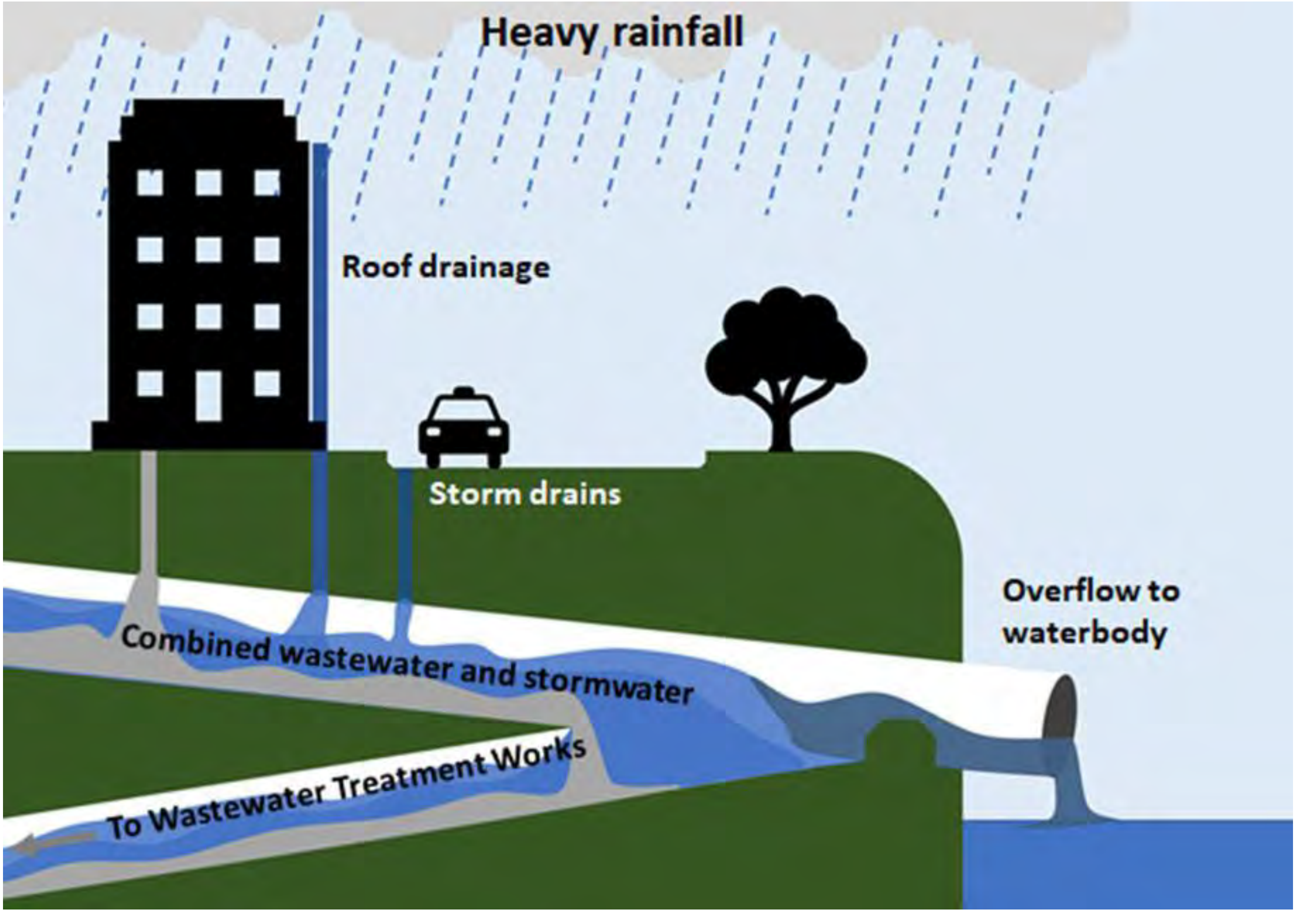

Figure 4.13 Storm overflow operation in exceptional rainfall

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 WRC 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.

4.6.3 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. Sewer overflows are operated under environmental permits issued by the Environment Agency. Currently, a spill frequency of >60 discharges in one year, or >50 discharges per year over 2 years, or >40/year over 3 years, is used to trigger an investigation[75]. The government's Storm Overflow Reduction Plan[76] has set a target to ensure that storm overflows only operate in unusually heavy rainfall events, and this has been defined as an average of 10 events or less per year by 2050. An important component

75 Storm Overflow Assessment Framework, The Environment Agency's approach to groundwater protection, Environment Agency, 2018

76 Storm overflows discharge reduction plan, UK Government, 2022

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[77]. This is called Event Duration Monitoring (EDM). The EDM dataset (which contains performance data on the 16,639 storm overflows across England monitored in 2022) has been used to provide information on storm overflows in Huntingdonshire.

There are 30 storm overflows and 18 storm tanks overflows located on the sewer network and at WRCs in Huntingdonshire (based on 2022 EDM dataset). The location of these is shown in Figure 4.14. Data from these overflows is summarised in Table 4.4.

One overflow exceeds the annual limit of 60 which would trigger an investigation – Sawtry STW. Two overflows exceed the two-year average limit of 50 which would trigger an investigation, Huntingdon (Godmanchester) STW and Ramsey STW. One overflow exceeds the three-year average of 40 – Oldhurst STW.

The overflows at Kimbolton STW and Upwood STW operated over 50 times in 2022. Whilst below the trigger for an investigation, in the longer term this may require improvement in order to meet the 2050 target of 10 or fewer operations per year.

Although most of the storm overflows do not exceed the annual, two-year or three-year average limit, it is important that development does not increase this frequency. Only three overflows meet the long-term target of no more than 10 spills per year, indicating that significant investment will be required within these catchments to achieve this target. 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 WRC.

There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow, for example where a brownfield development site is currently connected to a combined sewer, the drainage can be separated and surface water drained to ground or a watercourse. Where a surface water connection to a combined sewer cannot be avoided, a greenfield runoff rate from the site can be specified which can result in a betterment on existing brownfield sites. 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. Redevelopment of brownfield sites with previously combined sewerage systems offer the potential to separate surface water from foul and reduce discharges from sewer overflows.

77 Event duration monitoring – lifting the lid on storm overflows - Creating a better place, The Environment Agency’s approach to groundwater protection, Environment Agency, 2021

Table 4.4 WRC storm overflow frequency of operation and duration

Overflow	Permit reference	Number of operations in 2022	Duration of operation in 2022 (hours)	Number of operations in 2021	Duration of operation in 2021 (hours)	Number of operations in 2020	Duration of operation in 2020 (hours)
Brampton STW (Cambs)	AWCNF1025	15	43.25	4	64	N/A	N/A
Buckden STW	AWCNF11413	27	333	29	504.75	N/A	N/A
Catworth-Hostel STW	AWCNF10528	24	231.25	28	412.36	N/A	N/A
Elton STW	AWNNF13141	2	2.75	8	31.7	N/A	N/A
Huntingdon (Godmanchester) STW	AWCNF1106	5	35.5	104	2327.25	N/A	N/A
Kimbolton STW	AWCNF1293	50	575.25	26	358.25	N/A	N/A
Molesworth STW	AWCNF11400	22	296.75	4	44.5	13	166.25
Needingworth STW	AWCNF1149	8	28.5	47	613.75	N/A	N/A
Oldhurst STW	AWCNF1160	51	567.74	58	1135.75	49	633.5
Paxton STW	AWCNF11407	26	309.25	41	639.5	N/A	N/A
Ramsey STW	AWCNF1171	38	530	84	1355.5	N/A	N/A
Sawtry STW	AWCNF1187	71	1068	0	0	N/A	N/A
Somersham STW (Cambs)	AW1NF875	14	175.75	0	0	N/A	N/A
St Ives STW	AWCNF1203	27	420.5	0	0	N/A	N/A
St Neots STW	AW1NF909	1	0.25	0	0	N/A	N/A
Upwood STW	AW1NFA171	54	239.25	0	0	N/A	N/A
Waresley STW	AW1NF2543	13	150.75	8	54.5	N/A	N/A
Wyton - RAF STW	AWCNF11516	39	544.75	21	210	53	724

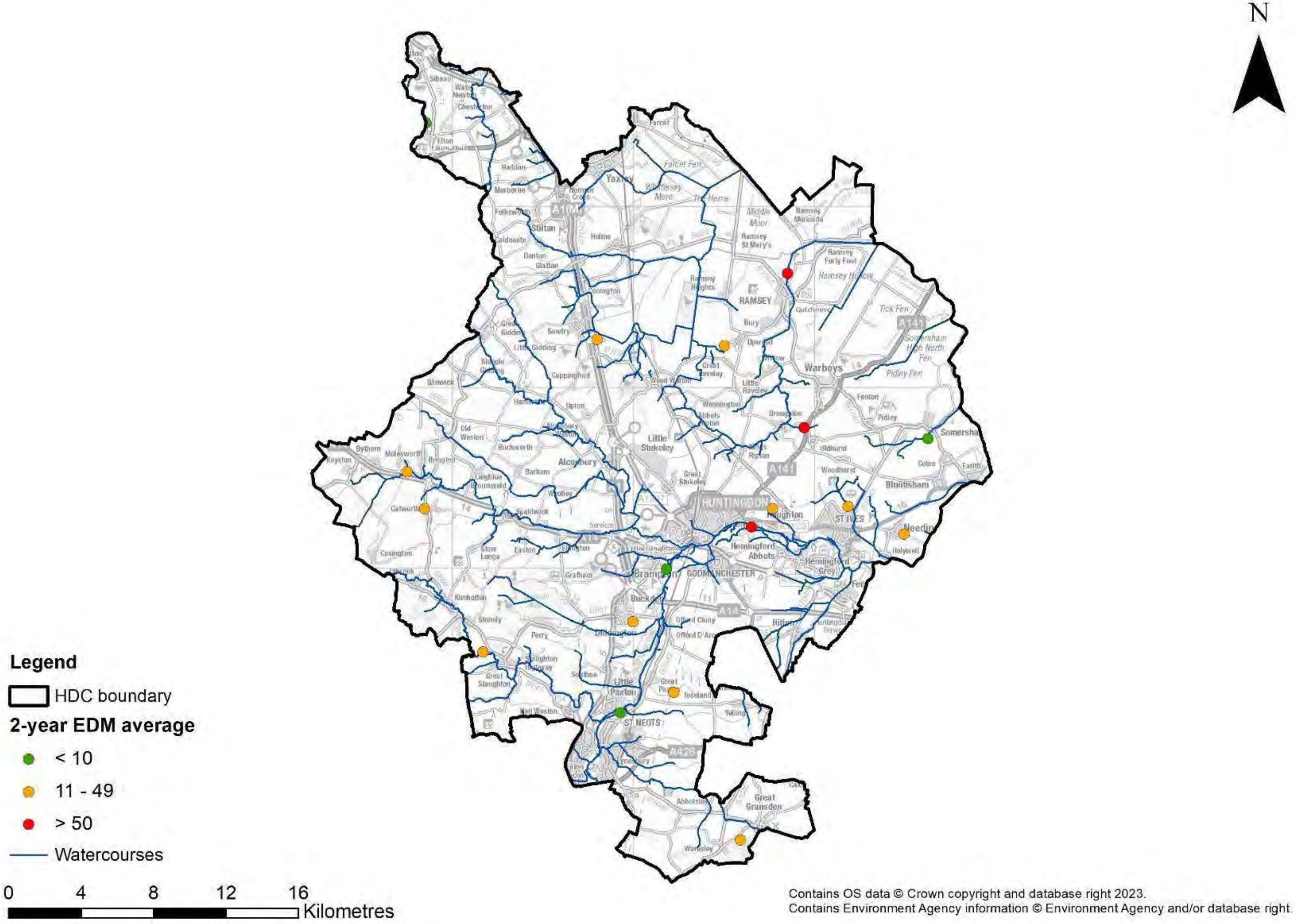

Figure 4.14 2-year average storm overflow operations from Event Duration Modelling (EDM) information

4.7 Wastewater treatment

4.7.1 Water Recycling Centres in Huntingdonshire

Anglian Water provide wastewater services for development in Huntingdonshire. Anglian Water use the term Water Recycling Centres (WRC) to refer to these services. WRCs may also be referred to as Wastewater Treatment Works (WwTW) or Sewage Treatment Works (STW) in other documents and data sources. However, for the purposes of this report, they will be referred to as WRCs. There are 33 WRCs that are within or currently serving communities in Huntingdonshire. 29 of these are expected to serve growth from commitments or adopted plans. The WRCs and catchments they serve are shown in Figure 4.15.

Sites already allocated in the adopted local plan, or already in the planning system (commitments) as well as an allowance for windfall, were assigned to a WRC using the sewerage drainage area boundaries provided by AW to set a baseline for WRC capacity. Actual connection of a development site to a particular WRC may be different and will depend on the capacity of the receiving works, and the local sewer network.

Very small developments in 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. There is therefore a localised risk to water quality if all of these small developments were to be served by septic tanks, especially where there are clusters of small-scale new development.

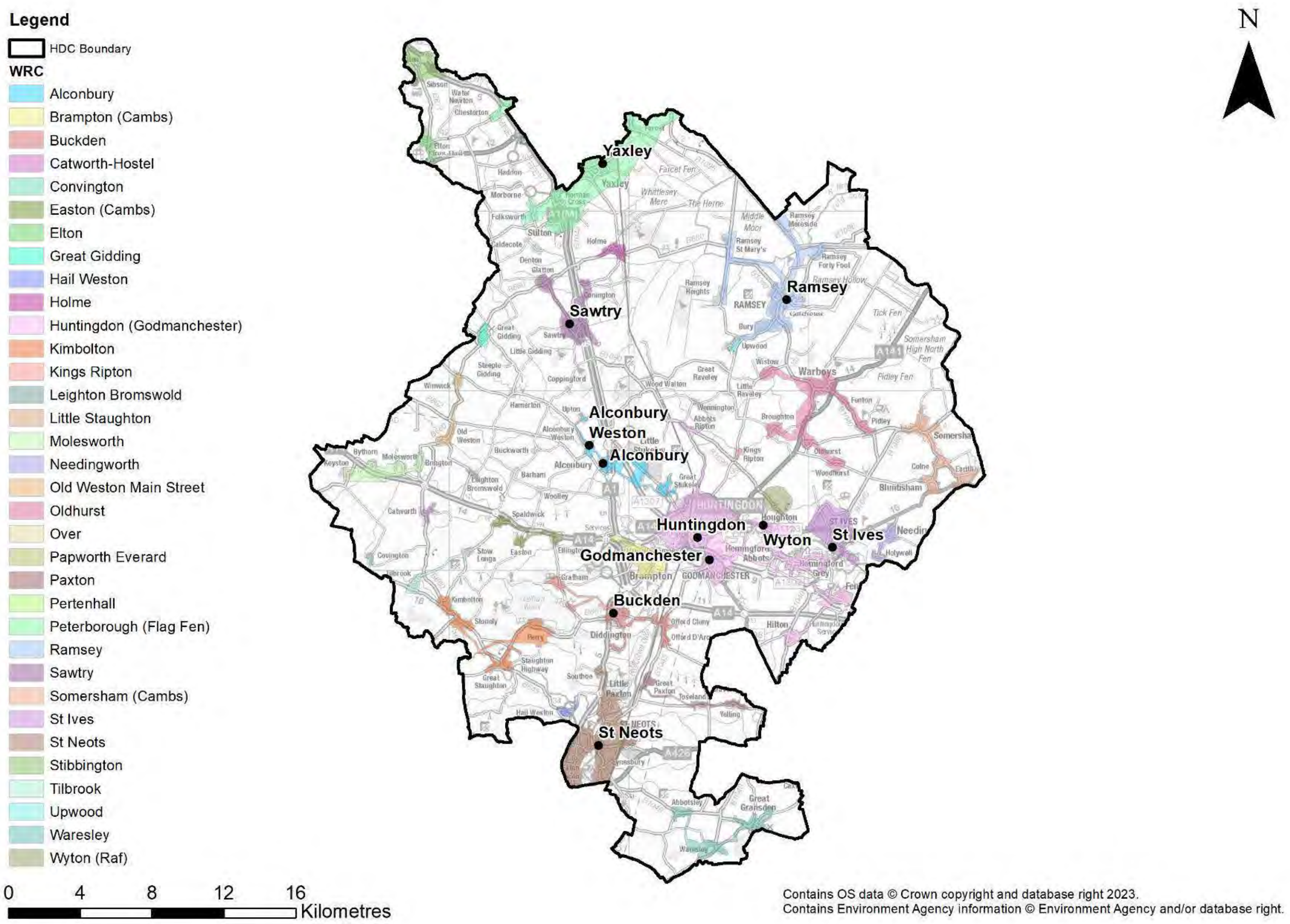

Figure 4.15 Water Recycling Centres in Huntingdonshire that serve growth

4.7.2 DWMP summary

Anglian Water's main objectives in their DWMP are:

- Increase in drought and flood resilience
- Enable sustainable economic and housing growth
- To be a carbon neutral business by 2030
- Cooperating with others to improve ecological quality

Within the DWMP, there is an overall theme of adaptation to future challenges such as climate change. This includes working towards increasing water recycling centres to diversify water resources.

AWs new DWMP was published in May 2023. Within the report an outline of how the growth in between 2025-50 will impact the company's WRCs as well as how they will adapt to this change.

A Baseline Risk Vulnerability Assessment (BRAVA) was carried out, assessing the planning objective laid out within the report. The results of this within the Anglian Upper and Bedford Ouse catchment include:

- Internal flooding from sewers within properties in 2050 - High risk
- Pollution in 2050- High risk
- Storm overflow spills in 2050- Medium risk
- Amenity of land within the catchment in 2050- Medium value
- Levels of Green Infrastructure within the catchment in 2050- Low risk

4.7.3 Sewerage System Capacity

New residential developments and new employment land add pressure to the existing sewerage systems. An assessment is required to identify the available capacity within the existing systems, 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 WRC.

It may be the case that an existing sewerage system is already working at its full capacity and further investigations have to 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.

4.7.4 Wastewater Treatment Works Flow Permit Assessment

Water companies monitor operational compliance and the EA monitor Environmental Permit (EP) compliance by the water company and undertake enforcement and prosecution when this passes the EAs expediency rules. Figure 4.16 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 WRC 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.

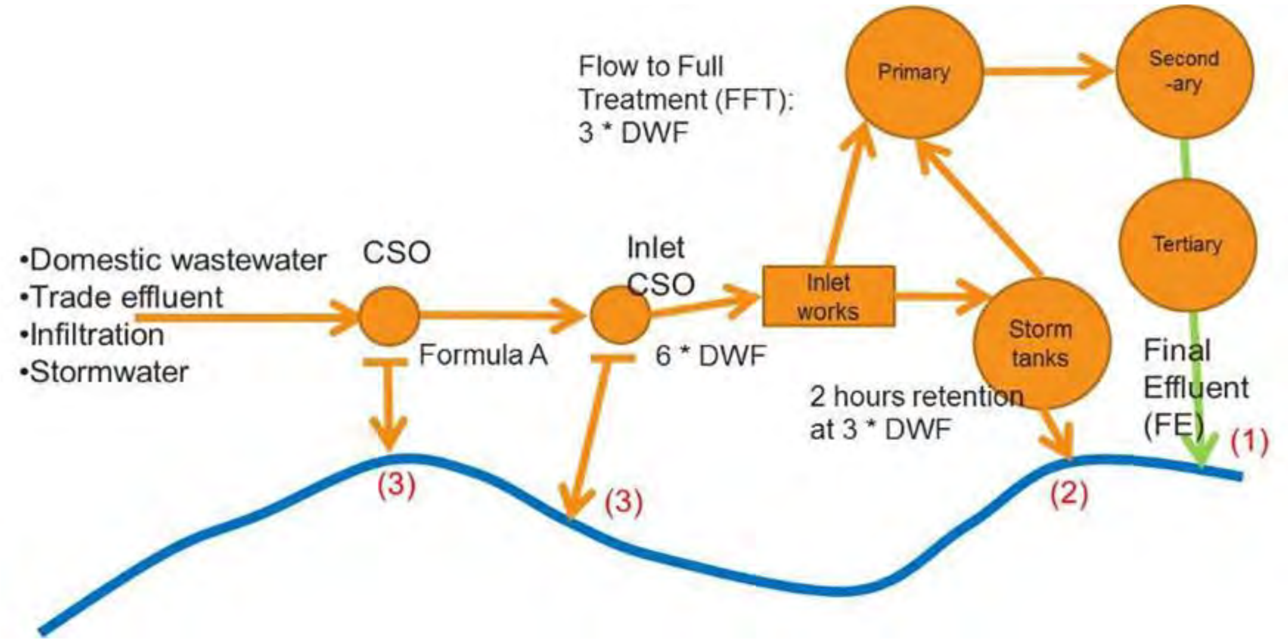

Figure 4.16 Overview of typical combined sewerage system and WRC discharges

The primary, secondary and tertiary stages mentioned in Figure 4.16, refer to the stages of treating effluent that comes into combined sewers. The definitions of these are as follows[78]:

78 pb6655-uk-sewage-treatment-020424.pdf (publishing.service.gov.uk)

- Primary: Where wastewater is held in tanks and filtered through sediment to remove settleable organic and inorganic solids.
- Secondary: Biological treatment that uses bacteria that 'digest' and break down organic substances. Examples include filter beds, aerated ponds or activated sludge.
- Tertiary: Also, known as 'polishing', at this stage treated wastewater goes through additional treatment to meet specific requirements for receiving waters such as reduction in Phosphate or Nitrate. This can be done through various chemical treatments or UV disinfection. This stage is carried out to protect sensitive water environments as well as bathing or shellfish waters.

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 WRCs 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 WRC 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).

WRC Environmental Permits also consent for maximum concentrations of pollutants, in most cases Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia (NH_4). 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 and that the water quality is improved over time. There is also 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 WRC. Where there is insufficient headroom at the works to treat these flows, this could lead to failures in flow consents.

AW provided data on the performance of their WRCs over the last four years (2019, 2020, 2020, 2022). From this, the 80th percentile exceedance flow statistic was calculated. This is current flow at each WRC.

Sites already in the planning system (commitments), adopted allocations, windfall and neighbouring authority growth were assigned to each WRC using the sewerage drainage area boundaries provided by AW. For each site, the future DWF was calculated using the occupancy rates and per-capita consumption values obtained from the Water Resource Management Plans, 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 WRC being assessed.

For employment sites, wastewater demand was estimated based on the predicted number of new employees. Floor space, employment use types, and employment densities were used to estimate the number of employees.

The predicted water demand from committed growth was then added to the current observed flow at each WRC and then compared to the permitted flow. An estimated remaining capacity for growth (before an increase in permit and/or upgrades are required) was then calculated. This is summarised in Table 4.5. A red-amber-green assessment of headroom was then applied to each WRC. Sites with more than 10% of their flow permit remaining were given a "green" score. Sites within 10% of their flow permit or exceeding their permit were given an amber score. Smaller WRCs with no flow monitoring or a descriptive permit were also given an amber score reflecting their limited capacity to accommodate growth. A WRC with an amber score may require an increase in its permit, and / or upgrades to treatment processes in order to accommodate further growth within the catchment. A red score would be applied where there were significant constraints to providing those upgrades. These scores are shown in Figure 4.17. Ten WRCs are predicted to exceed their permit limit (based on the 80th exceedance percentile) once committed growth is taken into account, and a further two are predicted to have less than 10% headroom remaining. Five WRCs either do have a descriptive permit (no flow permit has been set), or there is no flow monitoring (smaller WRCs often do not have flow monitoring). An amber rating has also been given to these WRCs as they are unlikely to be able to serve significant growth.

Permit compliance is assessed by the EA using the 90th exceedance percentile statistic which results in a lower value than the 80th percentile. This assessment should not be used to infer non-compliance.

Table 4.5 Headroom assessment for WRCs in Huntingdonshire

WRC	Current permit limit (Ml/d)	Observed 80%ile DWF (Ml/d) 2020-2022	Committed residential growth in catchment	Committed employment growth in catchment (m^2)	Approximate remaining headroom after committed growth (equivalent no. dwellings)	Is DWF flow forecast to exceed permitted flow over local plan period (JBA assessment)	RAG status
Alconbury AW1NF618	0.62	0.66	261	1,232	-503	Yes	Amber
Brampton (Cambs) AWCNF1025	1.5	1.93	402	5,987	-2,473	Yes	Amber
Buckden AWCNF11413	2.165	1.59	664	0	1,576	No	Green
Catworth-Hostel AWCNF10528	0.072	0.04	30	0	101	No	Green
Convington	N/A	N/A	9	0	N/A	Descriptive permit - unlikely to serve significant growth	Amber
Easton (Cambs) AW1NF991	0.25	0.25	123	13,472	-215	Yes	Amber
Elton	0.155	0.16	25	692	-60	Yes	Amber

WRC	Current permit limit (Ml/d)	Observed 80%ile DWF (Ml/d) 2020-2022	Committed residential growth in catchment	Committed employment growth in catchment (m^2)	Approximate remaining headroom after committed growth (equivalent no. dwellings)	Is DWF flow forecast to exceed permitted flow over local plan period (JBA assessment)	RAG status
AWNNF13141							
Great Gidding AWCNF1282	0.08	0.04	23	0	143	No	Green
Hail Weston AWCNF1285	0.12	0.08	28	97	135	No	Green
Holme AWCNF2069	0.16	0.10	88	358	150	No	Green
Huntingdon (Godmanchester) AWCNF1106	10.7	10.01	7,577	479,994	-11,507	Yes	Amber
Kimbolton AW1NF141	0.75	0.57	196	10,936	418	No	Green
Kings Ripton AWCNF9	N/A	N/A	8	0	N/A	Descriptive permit - unlikely to serve significant growth	Amber

WRC	Current permit limit (Ml/d)	Observed 80%ile DWF (Ml/d) 2020-2022	Committed residential growth in catchment	Committed employment growth in catchment (m^2)	Approximate remaining headroom after committed growth (equivalent no. dwellings)	Is DWF flow forecast to exceed permitted flow over local plan period (JBA assessment)	RAG status
Leighton Bromswold	0.045	N/A	1	0	N/A	No flow monitoring - unlikely to serve significant growth	Amber
Little Staughton AW1NF1389	0.225	N/A	3	75	N/A	No flow monitoring - unlikely to serve significant growth	Green
Molesworth AWCNF11400	0.106	0.09	60	28,567	-1,424	Yes	Amber
Needingworth AWCNF1149	0.55	0.45	188	241	209	No - but less than 10% headroom	Amber
Old Weston Main Street AWCNF11994	0.059	0.12	46	80	-327	Yes	Amber

WRC	Current permit limit (Ml/d)	Observed 80%ile DWF (Ml/d) 2020-2022	Committed residential growth in catchment	Committed employment growth in catchment (m^2)	Approximate remaining headroom after committed growth (equivalent no. dwellings)	Is DWF flow forecast to exceed permitted flow over local plan period (JBA assessment)	RAG status
Oldhurst AWCNF1160	1.015	1.02	654	18,202	-872	Yes	Amber
Papworth Everard AW1NF1003	1.607	1.11	0	1,191	2,087	No	Green
Paxton AWCNF11407	0.346	0.24	40	250	400	No	Green
Pertenhall AW1NF2724	0.129	N/A	1	0	N/A	No flow monitoring - unlikely to serve significant growth	Amber
Peterborough (Flag Fen) AW5NF5178	66.192	53.09	4,290	77,305	49,401	No	Green
Ramsey AWCNF1171	2.576	1.64	1,744	49,315	1,349	No	Amber
Sawtry	N/A	0.95	683	21,422	1,349	No	Amber

WRC	Current permit limit (Ml/d)	Observed 80%ile DWF (Ml/d) 2020-2022	Committed residential growth in catchment	Committed employment growth in catchment (m^2)	Approximate remaining headroom after committed growth (equivalent no. dwellings)	Is DWF flow forecast to exceed permitted flow over local plan period (JBA assessment)	RAG status
AW1NF245							
Somersham (Cambs) AW1NF875	1.45	1.60	650	9,010	-1,491	Yes	Amber
St Ives AWCNF1203	4.2	3.62	567	63,016	810	No - but less than 10% headroom	Amber
St Neots AWNNF2263	N/A	8.96	4,655	200,933	-10,294	Yes	Amber
Stibbington AW5NF315	0.29	0.22	34	2,301	193	No	Green
Tilbrook AWCNF12018	0.084	0.05	39	3,424	64	No	Green
Upwood AW1NFA171	0.223	0.15	64	0	234	No	Green
Waresley AW1NF2543	0.426	0.34	153	3,694	130	No	Amber
Wyton RAF	0.8	0.49	0	3,865	1,261	No	Green

Note: the committed residential growth in catchment includes neighbouring authority figures as well as HDC.

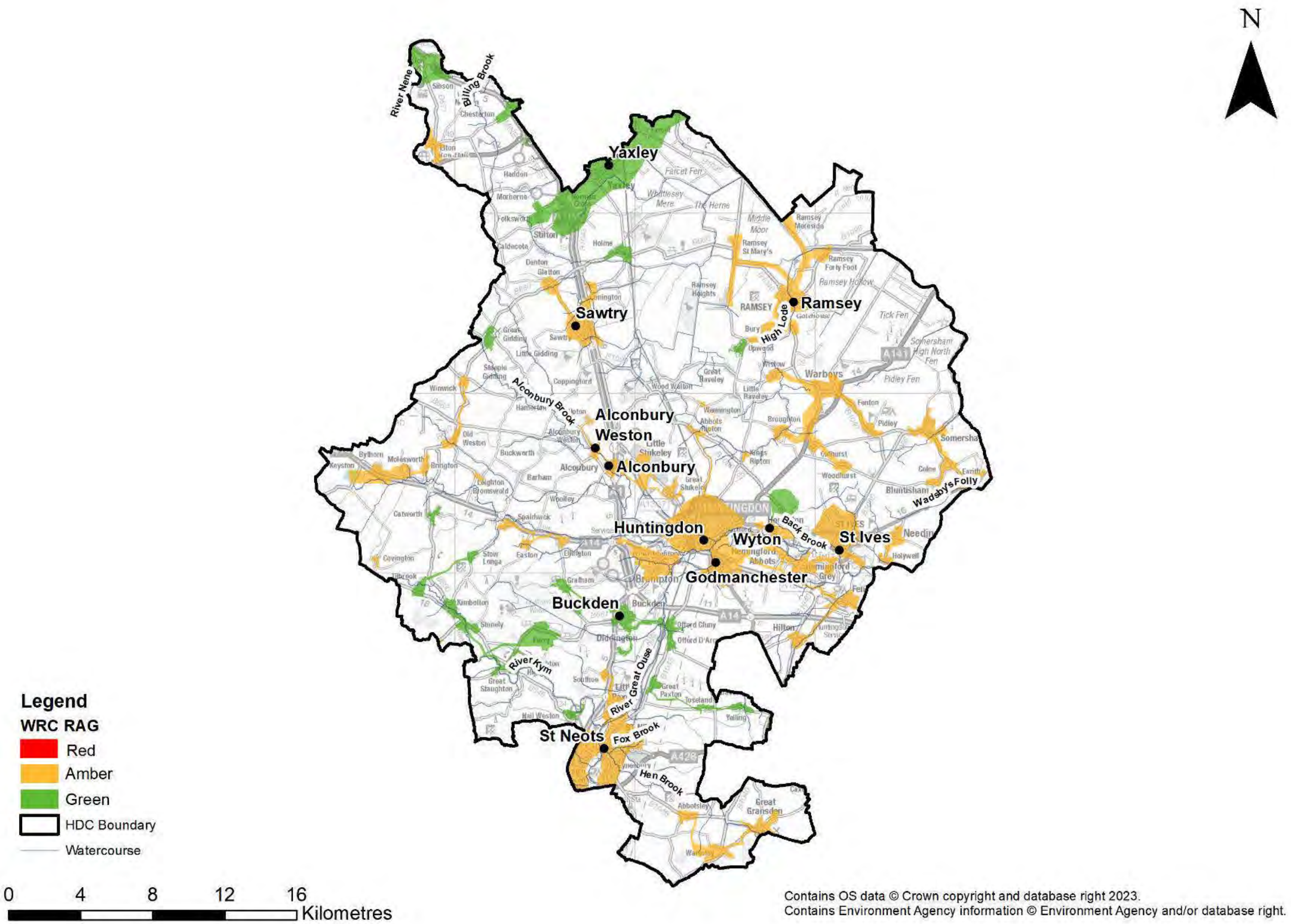

Figure 4.17 Headroom assessment for WRCs in Huntingdonshire

4.7.5 Nuisance odour from WRCs

Where new developments encroach upon an existing WRC, odour from that site may become a cause for nuisance and complaints from residents. Managing odour at WRCs can add considerable capital and operational costs, particularly when retro fitted to existing WRCs. 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 WRC and is encroaching closer to the WRC than existing urban areas. Anglian Water have advised 400m should be used as a buffer from WRC to development sites[79]. Anglian Water may, increase the size of this 'consultation zone' where a treatment works serves a population > 50,000. A relative risk is defined based on the size of the treatment works and the proximity of a development site, and a red-amber-green (RAG) scoring is applied[80] (See Table 4.6).

Table 4.6 Anglian Water asset encroachment RAG rating

Population served by STW (PE)	STW Category	Distance of proposed development from STW (metres)						
		50	100	150	200	250	300	400
0 - 1,000	1	Amber	Amber	Green	Green	Green	Green	Green
1,001 - 2,500	2	Red	Amber	Amber	Green	Green	Green	Green
2,501 - 5,000	3	Red	Red	Amber	Amber	Green	Green	Green
5,001 - 10,000	4	Red	Red	Red	Amber	Amber	Amber	Amber
10,001 - 50,000	5	Red	Red	Red	Red	Red	Red	Amber
50,001 - 100,000	6	Red	Red	Red	Red	Red	Red	Red
>100,001	7	Red	Red	Red	Red	Red	Red	Red

(Source: Anglian Water)

79 Asset encroachment, Anglian Water, 2023

80 Asset encroachment risk assessment methodology: guidance document, Anglian Water, Anglian Water, 2023

The above RAG ratings may be impacted by factors such as if the WRC is a primary handler of sludge or if the WRC has permanent odour control measures. These require an additional 15m to the buffer.

4.8 Environmental baseline

4.8.1 Introduction

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. In the context of a Water Cycle Study, the impact of development on the aquatic environment is assessed. This chapter considered both water quantity (impact of abstraction) and water quality (impact of wastewater discharge and runoff) on protected sites. Protected sites considered in this report are:

- Special Areas of Conservation (SAC) (and candidate SACs)
- Special Protected Areas (SPA) (and candidate SPAs)
- Sites of Special Scientific Interest (SSSI)
- Ramsar sites (and potential Ramsar sites)

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

4.8.2 Impact of abstraction

Abstraction of water within a catchment, either from groundwater or surface water sources, is necessary to provide a public water supply, for industrial processes and for agriculture. When the volume of water being abstracted becomes too high, it can cause environmental damage by reducing river flow, or lowering the water table.

Changes in river flow can impact sensitive ecosystems, for example trout require a clean gravel bed to lay their eggs. A reduction in river flow can cause sediment to build up, blocking the spaces the fish require to lay their eggs impacting their reproductive cycle. Changes in groundwater levels can also affect the flow regime in rivers and can cause drying of wetland sites.

The precise location of abstraction points for public water supply in England is not available for reasons of national security. Furthermore, water demand within a WRZ can be met by anywhere within that WRZ, or from a neighbouring WRZ if the transfer between WRZs is used to provide some of the water available for use. It is therefore not possible to trace an impact of an individual development site back to a particular water abstraction and therefore to an environmental impact. The assessments in this report therefore rely on information in the public domain.

Huntingdonshire is served by Anglian Water via their Ruthamford North, Ruthamford South WRZs and Cambridge Water via their Company Wide Zone. Abstraction either from surface water sources or from groundwater sources can occur anywhere within these zones. However, the impact of the abstraction could be felt outside of the WRZ within the same groundwater body, or downstream in surface waterbodies. In both cases this could be well outside the LPA boundary.

Groundwater Dependent Terrestrial Ecosystems

Figure 4.18 shows a schematic of how Groundwater Dependent Terrestrial Ecosystems (GWDTEs) were identified. Huntingdonshire is covered by three WRZs including Anglian Water's Ruthamford North and Ruthamford South WRZs and Cambridge Water's Company Wide Zone (see section 4.5.2). The schematic shows a LPA boundary within a single WRZ. Water abstracted anywhere within that WRZ could be used to serve growth within the LPA. In the diagram below, there are two abstraction points. Abstraction 1 could impact an area outside of both the LPA boundary and the WRZ. However, there are no protected sites within that groundwater body. Abstraction 2 also impacts an area both within and outside of the LPA boundary. Protected site A is within the WRZ, but may not be impacted directly by an abstraction. Protected site B is outside of the WRZ and outside of the groundwater body containing an abstraction and is therefore unlikely to be impacted by growth. Protected site C is within a groundwater body containing an abstraction. There is a risk that an increase in abstraction could impact the protected site.

The location of abstraction points within the study area is not known, and so the approach must be taken that GWDTE anywhere within the combined extent of the WRZ and groundwater bodies overlapping the WRZ could be impacted by an increase in abstraction.

A further check was done on whether abstraction may already be an issue in those GWDTEs. The Water Framework Directive (WFD) records "Significant Water Management Issues" (SWMIs) in each water body. These are the pressures on the water environment that put our ability to achieve the environmental objectives of the WFD most at risk.

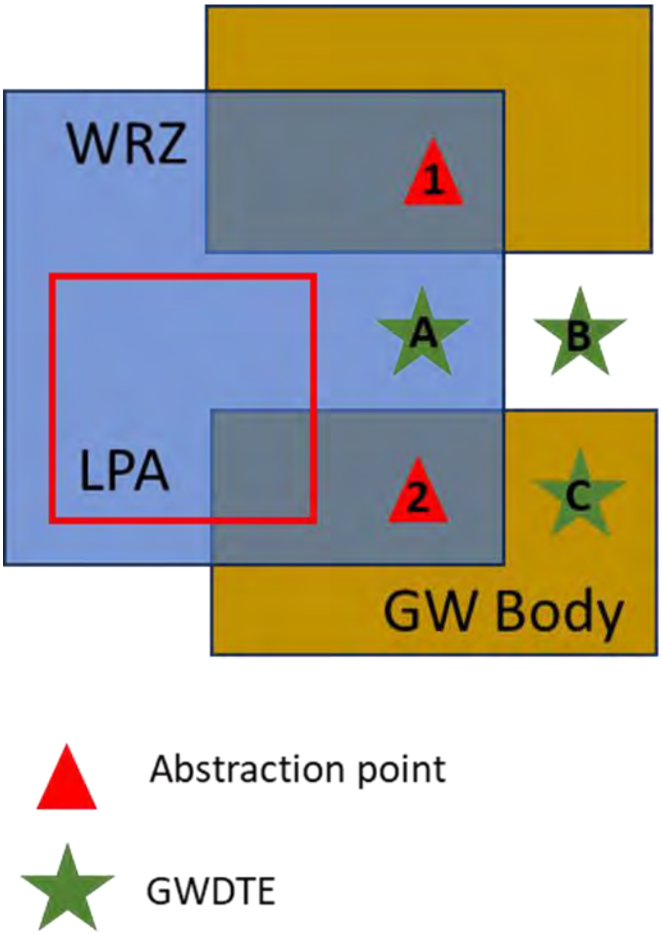

Figure 4.18 Definition of groundwater study area

The following procedure was followed:

- Define study area for Huntingdonshire - based on extent of WRZ and WFD Groundwater bodies that overlap with the WRZs.
- Identify Groundwater Dependent Terrestrial Ecosystems (GWDTE) within the study area using the EA's GWDTE dataset.
- Identify GWDTEs that are within groundwater bodies with flow identified as a Significant Water Management Issue (SWMI).

Surface water based ecosystems

Figure 4.19 shows a schematic of how protected sites on surface waterbodies were identified. As in the groundwater example, water could be abstracted from anywhere within the WRZ. Protected site A is downstream of an abstraction and so could be impacted by changes in river flow resulting from the abstraction. Protected site B whilst further downstream in the river basin, it is on a tributary not connected with the WRZ, abstraction is unlikely to have an impact. Protected site C is upstream of the abstraction so would not be impacted.

As with the groundwater abstractions, their location was not available as part of this study. The approach is therefore taken that any protected site directly on a waterbody that flows through or is downstream of the WRZ could be impacted by abstraction. Protected sites upstream or on tributaries that have not flowed through the WRZ are ignored.

In order to identify protected sites that 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 adjacent to a river or could be reasonably expected to receive surface water from a river.

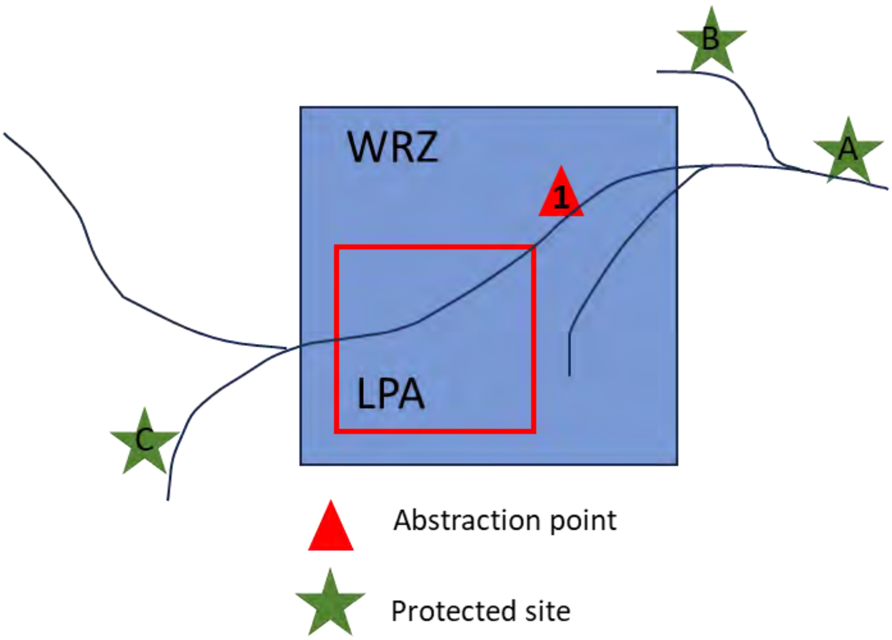

Figure 4.19 Definition of surface water study area

The following procedure was followed:

- Define study area for HDC - based on extent of WRZ and WFD Surface water bodies that overlap with the WRZs.
- Identify protected sites within the study area.
- Filter these based on their proximity to waterbodies within the study area defined using flood zone 2 as a proxy.
- Identify the protected sites within a catchment where flow is recorded as a significant water management issue.

4.8.3 Results

There are 170 Groundwater Dependent Terrestrial Ecosystems that are within a groundwater body that overlaps with the water resource zones serving HDC. These are listed in Appendix D. 94 of these are in groundwater bodies where flow is noted as a significant water management issue - either due to groundwater or surface water abstraction.

There are 87 SSSIs that are adjacent to waterbodies within the WRZs serving HDC (based on flood zone 2). These are listed in Appendix E. Four of these have flow (abstraction from surface water) identified as a significant water management issue.

Some of these SSSIs are also designated as Ramsar, SACs or SPAs. These are also indicated in Appendix E.

4.8.4 Water quality impact

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 WRC.

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, a number of sites together may pose a cumulative impact within the catchment.

Runoff from development sites should be managed by a suitably designed SuDS scheme. 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.

Pathways

Pollutants can take a number of 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. For the purpose of this study, it should be assumed at any protected site has the potential to be impacted by surface runoff from adjacent development sites. Linkages between development sites and protected sites will be explored further in Stage 2 once potential allocations are identified. The potential for a protected site to be impacted by pollution from WRCs via the river system will be explored by a screening exercise in stage 1 and water quality modelling in stage 2.

Receptors

A receptor in this case is a habitat or species that is adversely impacted by a pollutant. Both rivers and groundwater as well as being pathways, can also be considered to be receptors. Groundwater bodies are also given a status under the WFD which is reported in section 4.3.2. 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 3.7.7 to 3.7.9.

To identify protected sites that may be at risk from an increase in discharge from WRCs, Flood Zone 2 from the Risk of Flooding from Rivers and the Sea mapping was used to define an area that was either adjacent to a river or could be reasonably expected to receive surface water from a river. This method has limitations in that pathways between ordinary watercourses and protected sites may not be identified. A manual check will be performed in stage 2 before water quality modelling is undertaken. With excess wastewater in watercourses, flooding can disperse wastewater causing possible deterioration of protected areas such as SSSIs and Ramsar sites. Where a WRC was present in the catchment upstream of the protected site, it was considered that there was a risk of deterioration in water quality due to growth during the local plan period, and the first WRC upstream of the site is reported in the table (other WRCs must also be considered in future analysis). Where there were no WRCs serving growth upstream, risk of deterioration is considered to be low, and would not be shown by water quality modelling. 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. When screening for protected sites in the study area, a 5km buffer was used to identify sites external to the study area that could potentially deteriorate from excess wastewater discharges. In stage 2, protected sites down to the tidal extent of the Great Ouse where dilution is likely to make the impact from HDC negligible will be identified.

Priority Habitats are available to view on the DEFRA Magic Map website, which can be accessed here.

Screening results

There are 15 SSSIs that the screening process has identified located downstream of WRCs serving growth in Huntingdonshire, and at least partially within Flood Zone 2 which is used as a proxy for indicating that sites are hydraulically linked to the watercourse. 12 SSSIs are within the Huntingdonshire study area itself. These are displayed in Figure 4.20.

Three Ramsar sites (Woodwalton Fen, Nene Washes and Ouse Washes) were identified that had that potential to be impacted by growth in Huntingdonshire. Two of these are also designated as a Special Protection Area (SPA), Nene Washes and Ouse Washes. Five Special Areas of Conservation (SAC) were identified downstream of WRCs that serve growth within Huntingdonshire, three of these are within the Huntingdonshire study area.

The full list of sites identified is shown in Appendix A.

As well as SSSIs there are a number of Local Nature Reserves (LNR) in and around the study area. Four of these have the potential to be impacted as a result of growth within Huntingdonshire (Little Paxton Pits, Somersham, The Boardwalks and Grimeshaw Wood). Two of these are located within Huntingdonshire, Paxton Pits and Somersham. Paxton Pits is also an SSSI, and is a former gravel pit. Somersham combines lake, wetland, grassland and woodland habitats and was part of the former railway line from Cambridge to March. Although it is not a SSSI, it is a designated LNR meaning the council designated it and manages it.

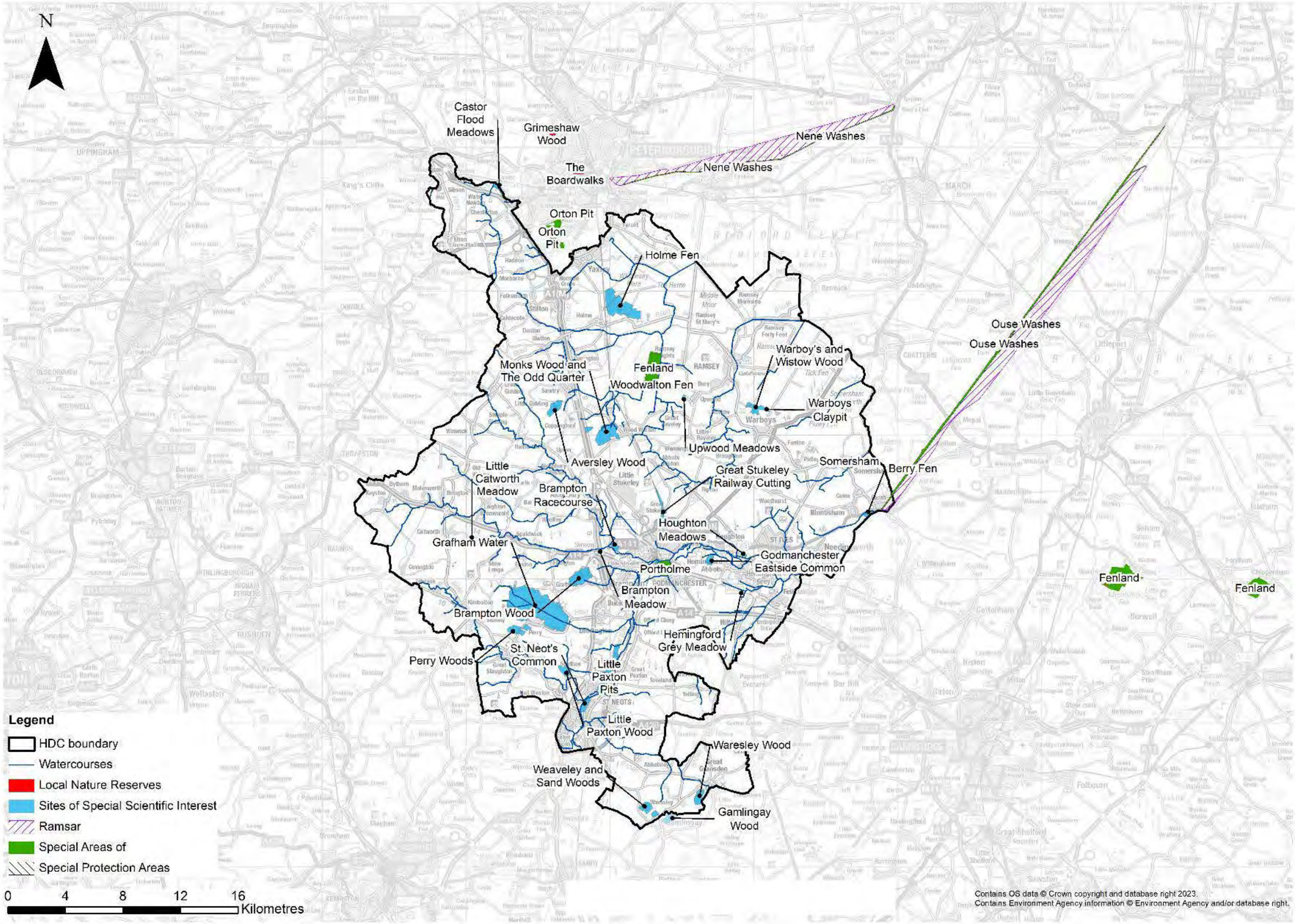

Figure 4.20 SSSIs and local nature reserves in and around the study area

4.8.5 Bathing waters

Good water quality for bathing and unpolluted water is required for ecosystems and to support economic and recreational activities such as tourism. There are no designated Bathing Waters in Huntingdonshire[81], although several undesignated sites used for bathing and water sports are present[82] as seen in Figure 4.21. These include:

- Coneygeare Bridge
- Overcote entryway, Great Ouse. The river at this point forms part of the district boundary with South Cambridgeshire. The site is located on the Pike and Eel side of the river.
- Houghton, Great Ouse

The foul and surface water drainage of new developments upstream of bathing waters should be carefully planned, in particular where there is a potential to increase the frequency or volume of discharges from network sewer overflows and storm tanks at WRCs. Furthermore, most inland WRCs are not designed to reduce pathogens in treated effluent down to safe levels. Many coastal WRCs which discharge into or close to bathing waters operate ultra-violet (UV) treatment to achieve this.

In Figure 4.21 storm overflows within the Huntingdonshire study area are shown in comparison to registered and unregistered bathing waters. St Neots Market Square is upstream of Coneygeare Bridge, Over Fen Road is upstream of Overcote entryway (Great Ouse), St Ives - The Waits Pumping Station is upstream of Houghton (Great Ouse). Increased growth could affect the water quality of these bathing areas.

81 Bathing Water Quality, Environment Agency, 2021
82 River Bathing Sites, CaBA, 2023

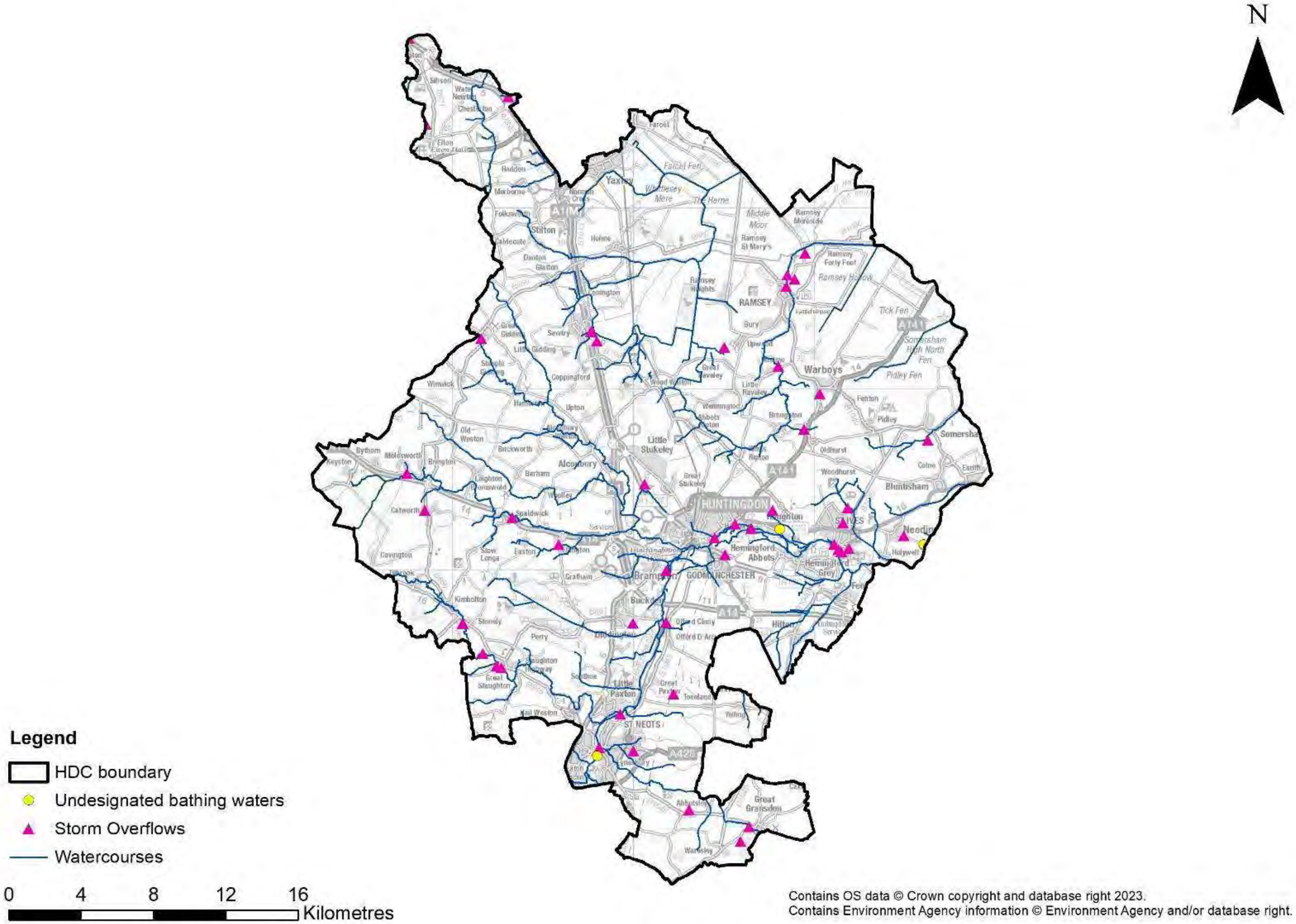

Figure 4.21 Undesignated sites used for bathing and water sports in Huntingdonshire in comparison to storm overflows

4.8.6 Water Framework Directive Overview

Water Framework Directive Overview

The Water Framework Directive (WFD) aims to ensure "no deterioration" in the environmental status of rivers and sets objectives to improve rivers to meet "good" status. LPAs must have regard to the WFD and associated statutory objectives as implemented in the EA's River Basin Management Plans (RBMPs).

Figure 4.22 shows the overall WFD classification (2019) for waterbodies in Huntingdonshire. This is assessed for each of the waterbodies that are predicted to receive additional effluent from growth during the plan period. Several of the WRCs discharge to small watercourses which are not within the WFD classifications.

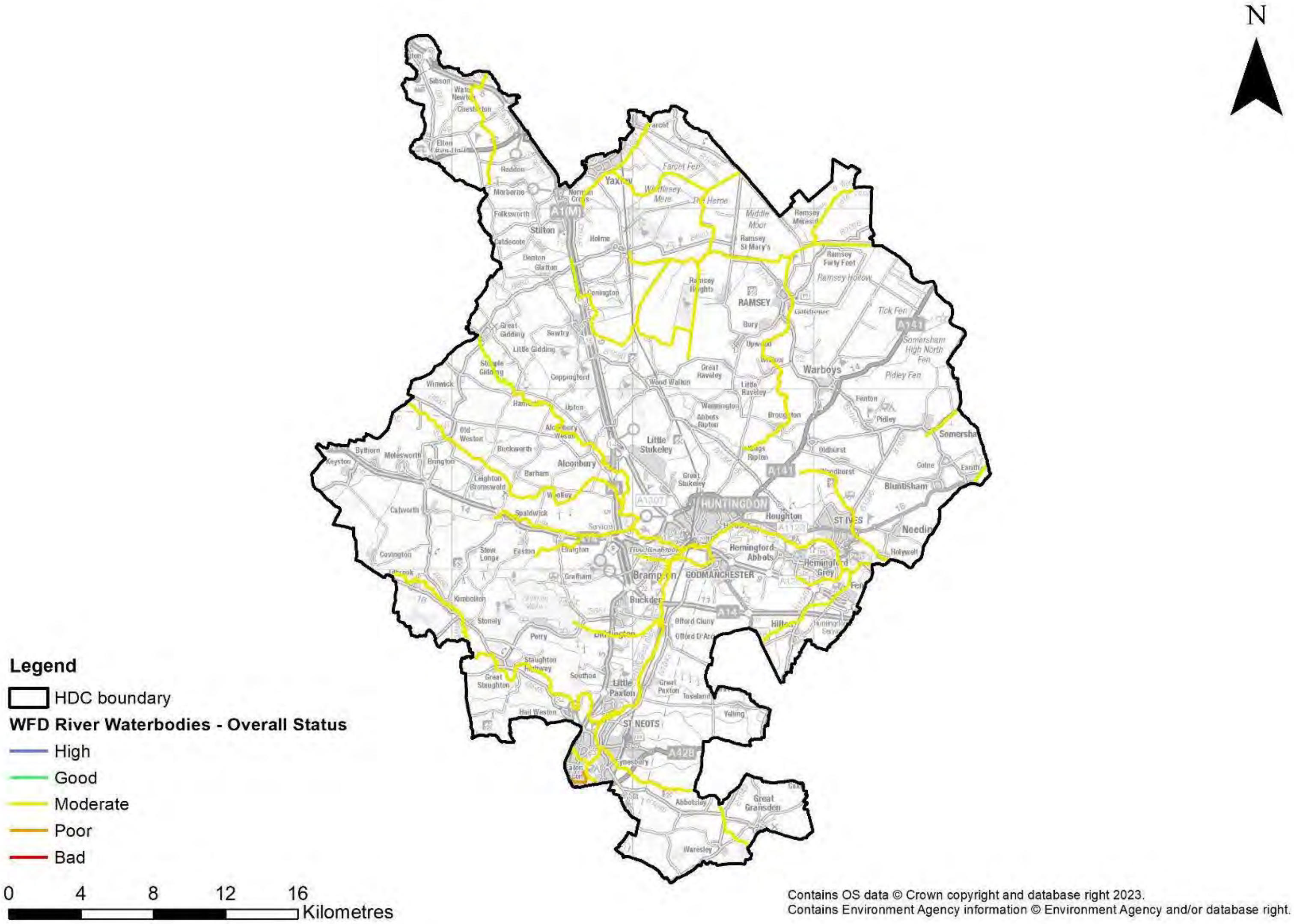

Figure 4.22 WFD waterbody overall health

The overall WFD status is made of Ecological and Chemical status, which are further broken down into sub-elements, the measurement of which is prioritised for each waterbody based on its characteristics and risk, hence not all elements are reported for each river (indicated by N/A). Invertebrate status can be used as an indicator of the overall health of the aquatic ecology (See Table 4.7).

Table 4.7 WFD overall status and invertebrate class

Name	Waterbody ID	Overall Status	Invertebrate Class
Abbotsley and Hen Brooks	GB105033043240	Moderate	Moderate
Alconbury and Brampton Brooks	GB105033042790	Moderate	Good
Alconbury Brook	GB105033042820	Moderate	Moderate
Billing Brook	GB105032050330	Moderate	N/A
Bury Brook	GB105033043140	Moderate	Moderate
Cock Brook	GB105033042810	Moderate	Good
Colmworth Brook	GB105033043220	Poor	Moderate
Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	GB205033000010	Moderate	High
Diddington Brook	GB105033043310	Moderate	N/A
Duloe Brook	GB105033043260	Moderate	Good
Ellington Brook	GB105033042870	Moderate	Moderate
Ellington Brook (Trib)	GB105033042830	Moderate	N/A
Kym	GB105033043270	Moderate	Good
Kym (and Til)	GB105033042980	Moderate	Good
Marley Gap Brook	GB105033042800	Moderate	Moderate
Middle Level	GB205033000050	Moderate	High
Nene - Islip to tidal	GB105032050381	Moderate	Good
Old Bedford River / River Delph (inc The Hundred Foot Washes)	GB205033000060	Moderate	Good
Ouse (Roxton to Earith)	GB105033047921	Moderate	Good
Pertenhall Brook	GB105033042960	Moderate	Good
West Brook	GB105033042730	Moderate	Moderate
Wittering Brook	GB105032050350	Moderate	High

The physio-chemical quality of watercourses in the study area are presented in Table 4.8.

Table 4.8 WFD physio-chemical quality elements

Name	Waterbody ID	Dissolved oxygen status	Phosphate status	Ammonia status
Abbotsley and Hen Brooks	GB105033043240	Poor	Poor	High
Alconbury and Brampton Brooks	GB105033042790	Poor	Poor	High
Alconbury Brook	GB105033042820	Bad	Moderate	High
Billing Brook	GB105032050330	Good	Moderate	High
Bury Brook	GB105033043140	Bad	High	High
Cock Brook	GB105033042810	Poor	Poor	High
Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	GB205033000010	Good	High	Moderate
Diddington Brook	GB105033043310	N/A	N/A	N/A
Duloe Brook	GB105033043260	High	Poor	High
Ellington Brook	GB105033042870	Bad	Poor	High
Ellington Brook (Trib)	GB105033042830	Bad	Poor	High
Kym	GB105033043270	Poor	Poor	High
Kym (and Til)	GB105033042980	Poor	Poor	High
Marley Gap Brook	GB105033042800	Good	Moderate	Good
Middle Level	GB205033000050	Bad	Good	Good
Nene - Islip to tidal	GB105032050381	N/A	N/A	N/A
Old Bedford River / River Delph (inc The Hundred Foot Washes)	GB205033000060	High	Moderate	High

Name	Waterbody ID	Dissolved oxygen status	Phosphate status	Ammonia status
Ouse (Roxton to Earith)	GB105033047921	High	Poor	Good
Pertenhall Brook	GB105033042960	Poor	Poor	High
West Brook	GB105033042730	High	Poor	High
Wittering Brook	GB105032050350	High	Poor	Good

4.8.7 Priority Substances

As well as the physico-chemical water quality elements (Dissolved Oxygen, Ammonia, Phosphate etc.), 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.

Consideration should be given to 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.

- Domestic wastewater sources - some priority substances are found in domestic wastewater because 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 (by changes to the products themselves), rather than through restricting housing growth through the planning system.

The Water Framework Directive and the EA recognise a group of ubiquitous chemicals which are persistent, bioaccumulative or toxic (uPBT), and without which over 90% of England's waterbodies would achieve Good Chemical Status. Mercury, PFOS and PBDE are the most ubiquitous cases of failures. Due to the persistent nature of these chemicals, the date for getting all waterbodies within the Environmental Quality standards for the uPBTs is set for 2063, whereas the target for all other WFD elements remains 2027.

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

4.8.8 Reasons for not achieving good status

The reasons for not achieving good status are provided by the Environment Agency in the 'Reason for Not Achieving Good Status' Database[83]. Appendix C provides a summary of the 'Reason for Not Achieving Good status' for waterbodies within Huntingdonshire. There are a total of 29 river waterbodies that cover Huntingdonshire, with 28 that are not achieving good status. The primary reasons for not achieving good status are agriculture and agricultural land management, sewage discharge, flood protection infrastructure and natural conditions, such as drought. There are a number of elements which are impacted and are causing failure, which include invertebrates, phosphates, dissolved oxygen, fish and ammonia.

Issues from agricultural land management include pollution from fertilisers, manures, pesticides, and soils washing into streams when it rains or percolating into the groundwater. Other pressures from agriculture include deepening, widening or re-routing of streams for land drainage, gravel removal and bankside erosion.

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

Potential schemes could include:

- Buffer strips
- Cross slope tree planting
- Runoff retention basins

83 WFD RBMP2 Reasons for Not Achieving Good Status, Environment Agency, 2023

- 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 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.

5 Water quality

5.1 Introduction

An increase in the discharge of effluent from Water Recycling Centres (WRCs) 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 WRC 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. The previous operational instructions[84] (now withdrawn but with no published replacement) 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 is to ensure 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"[85] 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.
- **Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) or Potential?** Is GES possible with

84 Water Quality Planning: no deterioration and the Water Framework Directive, The Environment Agency's approach to groundwater protection, Environment Agency, 2012
85 European Court of Justice - Press Release, CURIA, 2015

current technology or is GES technically possible after development with any potential WRC 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[86].

5.2 Methodology

5.2.1 General Approach

In the Phase 1 IWMS, a sensitivity analysis of the waterbodies in Huntingdonshire to changes in the volume of treated effluent was undertaken. A detailed modelling study will form part of Phase 2, when the preferred locations and types of development to be allocated will be modelled.

5.2.2 Water quality sensitivity assessment

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 catchment scale model which represents inputs from both point-source effluent discharges and diffuse sources, and the behaviour of solutes in the river[87].

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 Wash SIMCAT model.

Within SIMCAT, the determinands modelled were Biochemical Oxygen Demand (BOD), Ammonia (NH_4) 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.

86 Assessment of sanitary and other pollutants within surface water discharges (H1 Annex D2), The Environment Agency's approach to groundwater protection, Environment Agency, 2014

87 A review of currently available in-stream water-quality models and their applicability for simulating dissolved oxygen in lowland rivers, Cox, 2003

The following methodology was used:

- An updated baseline model was created by taking the baseline model as supplied by the EA and updating the WRCs within Huntingdonshire with the latest flow data.
- Effluent flows at every WRC in the model were increased by 20% to simulate future increases in population and the model was re-run as a future scenario.
- River quality data (for ammonia, biochemical oxygen demand (BOD) and phosphate) was extracted.
- Results from the two models were then compared and the percentage change calculated.

Where water quality downstream of a WRC in any given determinand deteriorates by 10% or more in response to a 20% increase in effluent flow, the sewer catchment can be said to be "more sensitive" to changes in effluent flow, and therefore growth. It should be noted that this assessment takes the existing SIMCAT model based on 2014-2020 data and increases flow by a consistent figure across the whole model. In some cases, a WRC may be able to accommodate a higher flow, in other cases, a 20% increase may not be likely or feasible. This assessment therefore just highlights the relative risk of deterioration.

5.3 WINEP

The actions from the Water Industry National Environment Programme that relate to water quality are presented in Table 5.1 and show that most WRCs in the study area have an action against them. In most cases these include monitoring of storm overflows and the volume of sewage being treated. In many, a permit condition to limit the concentration of phosphate in the treated effluent is being applied in order to improve downstream water quality. Where a new permit is defined for a WRC, this was applied in the SIMCAT model so that its baseline includes all committed schemes up to 2025.

Table 5.1 WINEP Actions relating to water quality.

Waterbody name	WINEP ID	Unique ID	Scheme name	Type of scheme/ notes
Alconbury Brook	EAN00586 EAN00767 EAN00768	7AW200164 7AW200343 7AW200344	Alconbury WRC	Proposed phosphorous permit limit of 0.3mg/l (AA)
Alconbury and Brampton Brooks	EAN00704 EAN00909 EAN00910	7AW200282 7AW200485 7AW200486	Brampton WRC	Proposed phosphorous permit limit of 0.25mg/l (AA)
Diddington Brook	EAN00949 EAN00950	7AW200525 7AW200526	Buckden WRC	Monitoring and increased FFT.

Waterbody name	WINEP ID	Unique ID	Scheme name	Type of scheme/ notes
	EAN00951	7AW200527		
Ellington Brook	EAN00998 EAN00999 EAN01001	7AW200574 7AW200575 7AW200577	Catworth-Hostel WRC	Monitoring and increase in storm storage.
Nene – Islip to tidal	EAN01169 EAN01170	7AW200745 7AW200746	Elton WRC	Monitoring (installing EDM to ensure that the current FFT setting is being complied with).
Alconbury Brook	EAN00595	7AW200173	Great Gidding WRC	Proposed phosphorous permit limit of 0.4mg/l (AA)
Ouse (Roxton to Earith)	EAN01466 EAN01467 EAN01469	7AW201042 7AW201043 7AW201045	Huntingdon (Godmanchester) WRC	Monitoring and increase in storm storage.
Kym	EAN01506 EAN01507 EAN01508	7AW201082 7AW201083 7AW201084	Kimbolton WRC	Monitoring and increased FFT
Ouzel US Caldecote Mill	EAN01544 EAN01545 EAN01547	7AW201120 7AW201121 7AW201123	Leighton Linslade WRC	Monitoring and increase in storm storage.
Kym	EAN01578 EAN01579	7AW201154 7AW201155	Little Staughton WRC	Monitoring (installing EDM to ensure that the current FFT setting is being complied with).
Ellington Brook	EAN01675 EAN01676	7AW201251 7AW201252	Molesworth WRC	Monitoring (installing EDM to ensure that the current FFT setting is being complied with).
Ouse (Roxton to Earith)	EAN01702 EAN01703 EAN01705	7AW201278 7AW201279 7AW201281	Needingworth WRC	Monitoring and increase in storm storage.
Cock Brook	EAN00601	7AW200179	Old Weston WRC	Proposed phosphorous permit limit of

Waterbody name	WINEP ID	Unique ID	Scheme name	Type of scheme/ notes
				1.0mg/l (AA)
Bury Brook	EAN00516 EAN01769 EAN01770 EAN01772	7AW200099 7AW201345 7AW201346 7AW201348	Oldhurst WRC	Monitoring and increase in storm storage. Proposed phosphorous permit limit of 0.5mg/l (AA)
Old West River	EAN01783 EAN01784 EAN01786 EAN02407	7AW201359 7AW201360 7AW201362 7AW300466	Over WRC	Monitoring and increase in storm storage. Proposed ammonia permit limit of 3mg/l (95th)
West Brook	EAN00520 EAN01791 EAN01792	7AW200103 7AW201367 7AW201368	Papworth Everard WRC	Monitoring Proposed phosphorous permit limit of 0.5mg/l (AA)
Ouse (Roxton to Earith)	EAN01795 EAN01796	7AW201371 7AW201372	Paxton WRC	Monitoring
Pertenhall Brook	EAN01801 EAN01802	7AW201377 7AW201378	Pertenhall WRC	Monitoring
North Level Pumped Areas 2 and 3	EAN01804 EAN01805 EAN01807	7AW201380 7AW201381 7AW201383	Peterborough (Flag Fen) WRC	Monitoring and increase in storm storage.
Middle Level	EAN01840 EAN01841 EAN01842 EAN01843	7AW201416 7AW201417 7AW201418 7AW201419	Ramsey WRC	Monitoring, increase in FFT and storm storage
Middle Level	EAN01894 EAN01895 EAN01897	7AW201470 7AW201471 7AW201473	Sawtry WRC	Monitoring and increase in storm storage.

Waterbody name	WINEP ID	Unique ID	Scheme name	Type of scheme/ notes
Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	EAN00529 EAN01949 EAN01950	7AW200112 7AW201525 7AW201526	Somersham WRC	Monitoring Proposed phosphorous permit limit of 0.5mg/l (AA)
Marley Gap Brook	EAN09174 EAN01975	7AW201550 7AW201551	St Ives WRC	Monitoring
Ouse (Roxton to Earith)	EAN01978 EAN01979 EAN01981	7AW201554 7AW201555 7AW201557	St Neots WRC	Monitoring and increase in storm storage.
Nene – Islip to tidal	EAN00667 EAN02004 EAN02005 EAN02006	7AW200245 7AW201580 7AW201581 7AW201582	Stibbington WRC	Schemes to improve discharges Monitoring and increased FFT
Middle Level	EAN02171 EAN02172	7AW201747 7AW201748	Upwood WRC	Monitoring
Abbotsley and Hen Brooks	EAN00543 EAN00710 EAN02192 EAN02193	7AW200125 7AW200288 7AW201768 7AW201769	Waresley WRC	Monitoring Schemes to meet requirements to prevent deterioration in phosphorous (5mg/l AA) Proposed phosphorous permit limit of 1.5mg/l (AA)
Ouse (Roxton to Earith)	EAN02318 EAN02319	7AW201894 7AW201895	Wyton WRC	Monitoring

5.4 Water quality sensitivity analysis

The sensitivity analysis was conducted using the EA's SIMCAT model and the full results are shown in Appendix B. The modelling results suggest changes in the volume of treated wastewater in Huntingdonshire do not cause a significant response in the concentrations of BOD or phosphate within Huntingdonshire, whereas for Ammonia a significant deterioration in concentration is observed.

For ammonia, most waterbodies are highly sensitive with a greater than 10% deterioration in response to a 20% increase in the discharged volume of treated effluent, with higher sensitivity concentrated more in the centre and south of Huntingdonshire. Generally, sensitivity of ammonia across the waterbodies in Huntingdonshire is 10%. A deterioration of greater than 3% is observed at Over and Waresley WRCs which are at 'Bad' WFD status. Of the 39 modelled WRCs in Huntingdonshire, a deterioration in class is observed downstream of Great Gidding (High to Good), Paxton (High to Good), and Ramsey (Good to Moderate) WRCs.

For BOD, most waterbodies are moderately sensitive with a less than 10% deterioration in response to a 20% increase in the discharged volume of treated effluent, with higher sensitivity concentrated in the north-west and south of Huntingdonshire. Generally, sensitivity of BOD across the waterbodies in Huntingdonshire is 1%. Several WRCs are shown to have negative deteriorations, and this is believed to be due to the upstream reach concentrations in the model being higher than the predicted discharged at the WRCs. These should not be considered as improvements in quality due to uncertainty in the upstream river quality represented in the model, see Appendix B.

For phosphate, most waterbodies are moderately sensitive with a less than 10% deterioration in response to a 20% increase in the discharged volume of treated effluent. Generally, sensitivity of phosphate across the waterbodies in Huntingdonshire is 4%. A deterioration of greater than 3% is observed at Holme, Little Staughton, and Molesworth WRCs which are at 'Bad' WFD status. Of the 39 modelled WRCs in Huntingdonshire, a deterioration in class is observed at Needingworth WRC (Moderate to Poor).

The water bodies downstream of the following WRCs are shown to deteriorate by greater than 10% as a result of a 20% increase in WRC flows:

WRC	Ammonia	BOD	Phosphate
Alconbury	15%	N/A	N/A
Brampton	13%	N/A	N/A
Covington	15%	N/A	N/A
Easton	17%	N/A	N/A
Elton	12%	N/A	N/A
Great Gidding	11%	N/A	N/A
Huntingdon	11%	N/A	N/A
Kimbolton	15%	N/A	N/A
Kings Ripton	19%	N/A	N/A
Little Staughton	12%	N/A	N/A
Lutton	18%	N/A	N/A
Needingworth	12%	N/A	N/A

WRC	Ammonia	BOD	Phosphate
Oldhurst	16%	N/A	N/A
Papworth Everard	12%	N/A	N/A
Paxton	13%	N/A	N/A
Pertenhall	11%	N/A	N/A
Flag Fen (Peterborough)	12%	N/A	10%
Ramsey	14%	N/A	N/A
St Neots	13%	N/A	N/A
Stibbington	10%	N/A	N/A
Tilbrook	14%	N/A	N/A
Upton Peterborough	11%	N/A	N/A
Waresley	12%	N/A	N/A
Woodwalton	16%	N/A	N/A
Wyton	13%	N/A	N/A

5.5 Conclusions

Growth during the local plan period will increase the discharge of treated wastewater from WRCs in Huntingdonshire. There is a potential for this to cause a deterioration in water quality in the receiving watercourses and this must be carefully considered. A significant deterioration in water quality is not acceptable under the Water Framework Directive. The sensitivity analysis suggests that ammonia concentrations in watercourses within Huntingdonshire may be most sensitive to increases in the discharge of treated wastewater. Further modelling should be conducted in a Stage 2 IWMS.

6 Water balance

6.1 Introduction

Water balance is the sum of water entering, stored within, and leaving a system. In a natural system it is usually expressed as:

Precipitation = Streamflow + evapotranspiration + change in storage in ground or surface stores.

In this study, we are interested in the urban water balance of Huntingdonshire. As previously discussed, Huntingdonshire is covered by three WRZs:

- Ruthamford North - RTN (Anglian Water)
- Ruthamford South - RTS (Anglian Water)
- Cambridge Company Wide Zone - CW (Cambridge Water)

In studying integrated water management, analysing the water balance can be a useful tool to illustrate where Huntingdonshire draws its water resources from, where these are discharged to and how these are forecast to change over time. At stage 2 this approach will be extended to explore how planning policies might impact the water balance.

6.2 Water balance baseline for 2024-25

6.2.1 Overview

The Dry Year Annual Average (DYAA) water balance of Ruthamford North, Ruthamford South and Cambridge Wide WRZs are shown in Table 6.1, using data from the draft WRMP24 for each water company. A base year of 2024-25 was used, the end of AMP 7. This can be seen graphically in the Sankey diagram in Figure 6.1. On the left are the inputs from the three WRZs zones that serve Huntingdonshire. This is the total volume of water put into the distribution system by the water companies in each zone. A proportion of these inputs is then lost in leakage. Some water is also transferred out of the WRZ. The remaining water meets the demand from Huntingdonshire and the other LPAs that make up the WRZs. Water is then returned to the environment via the sewer system, infiltration or evaporation. The diagram is a representation of the overall plans and does not represent the relationship between individual abstractions and discharges, which may be in different catchments.

The water balance presented in Stage 1 should be considered to be indicative of how the WRZs are set up, and the numbers are directionally correct. However, both Anglian Water and Cambridge Water are in the process of revising their WRMPs and do not have final figures for use in this assessment. These are expected to be finalised early in 2024 and should be reviewed in the Stage 2 study.

The individual components of the water balance are summarised in the following sections.

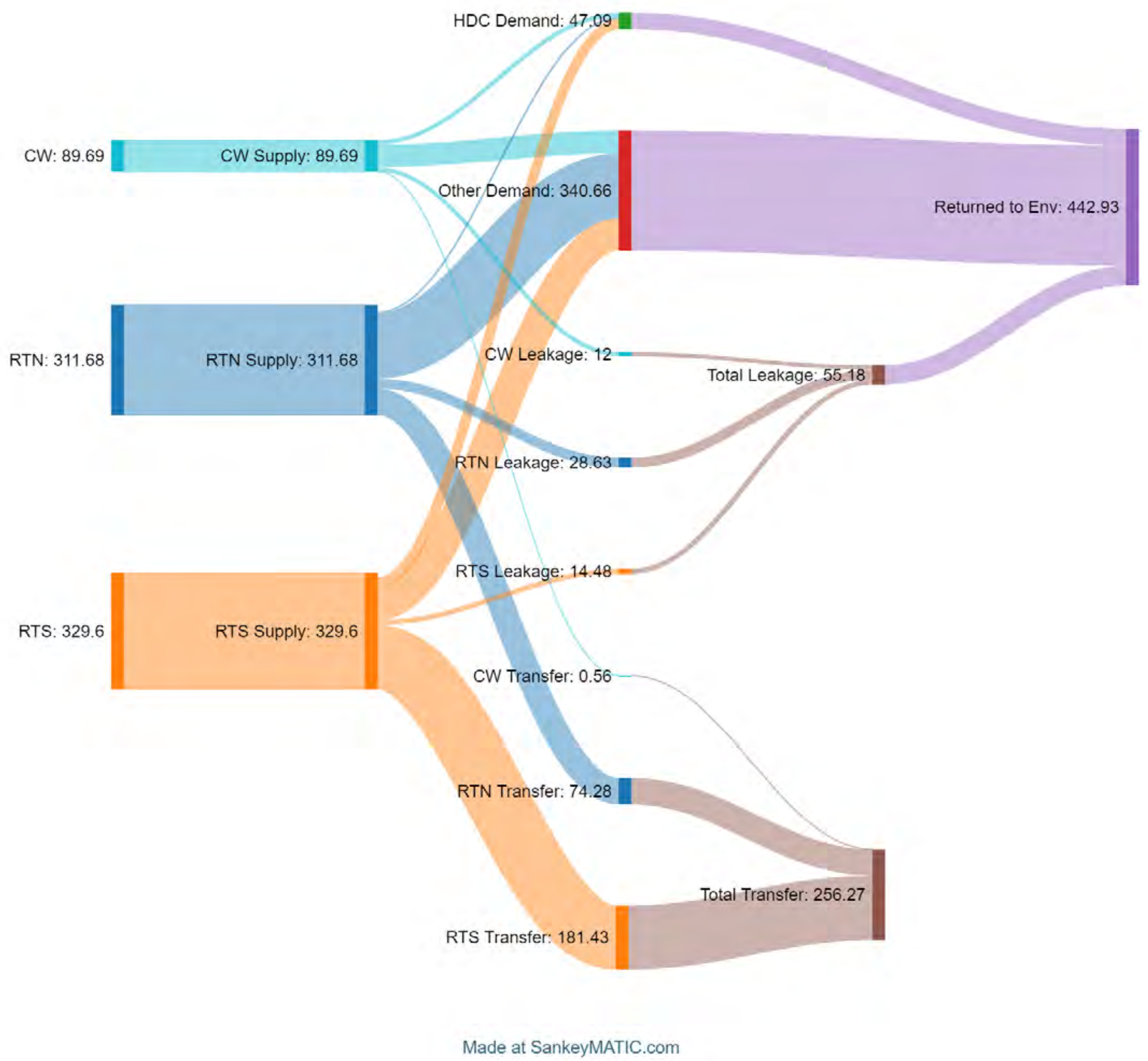

Figure 6.1 Supply-demand balance in WRZs serving HDC for base year 2024-25

Note - The units of this Sankey diagram are in Ml/d

Table 6.1 Supply-demand balance in Ruthamford North, Ruthamford South and Cambridge Wide WRZs for dWRMP24 base year 2024-25 (ML/d)

WRZ	Baseline Supply (including transfers)	Leakage (per day)	Estimated Huntingdonshire Demand	Estimated Rest of WRZ Demand	Transfer to adjacent WRZ
Ruthamford North	237.40	28.63	5.77	183.97	74.28
Ruthamford South	148.17	14.48	28.90	91.98	181.43
Cambridge Wide	89.10	12.00	12.42	64.71	0.56

6.2.2 Demand

Demand for Huntingdonshire alone is not specified in the dWRMP24. The split of households between the three WRZs has therefore been based on the projected number of households of 77,297 in 2024-25[88], and the Open Code Point data set which is used as an indication of the geographic distribution of households in HDC between the three WRZs.

6.2.3 Supply

Ruthamford North is supplied solely from surface water, with River abstractions from the River Nene and River Great Ouse to Pitsford Water, Rutland Water and Grafham Water reservoirs. Ruthamford South is supplied by both groundwater and surface water.

Ruthamford Central has no internal water supply and subsequently relies on imports from Ruthamford North and Ruthamford South. During AMP7 (2023-2025) there will be small increase (0.8Ml/d) in the volume transferred from Ruthamford North and Ruthamford South to Ruthamford Central.

Cambridge Water operate a single, company-wide water resource zone. The WRZ is supplied by groundwater sources linked to a series of storage reservoirs via a highly integrated pipe network. Water is transferred between supply zones (sub-zones of the WRZ) to meet demand as required. Supply zones in the north of the Cambridge Water area without direct supplies rely solely on this transfer to meet demand.

Water is transferred from the Cambridge supply zone, the largest of five supply zones within the company area to the north of the company area, where there are limited supply sources.

6.2.4 Returned to sewer and the environment.

All household and non-household water use is returned to sewer or, where used on garden-watering and other outdoor uses, to the environment. It is commonly assumed in the industry that 95% of all water used is discharged to foul and combined sewers and therefore is discharged to rivers following treatment. The remaining 5% are assumed to be used outside of the home for watering, car-washing etc, and either infiltrate to the ground, taken up by plants as transpiration or evaporated.

When considering water return to the environment disparity between the environment the water is abstracted from and the environment the water is returned to needs to be considered.

88 Household Projections for England, Office for National Statistics, 2020

The EA have commented that ' for Cambridge Water Company (CWC) in particular, the abstraction is taking place well outside of HDC's operating area and predominantly in the headwaters of chalk streams, whereas the return of effluent is much further downstream. As a result, the effects of abstraction are unlikely to be offset by the return of water'.

6.3 Water balance in 2045-46

6.3.1 Overview

Given the continued work on both the Anglian Water and Cambridge Water WRZs noted above, this section provides a brief overview of the anticipated changes to the water balance in Huntingdonshire by 2050. More detailed analysis will be included in the stage 2 IWMS, which will benefit from using the final WRMP24 data.

Both Anglian Water and Cambridge Water are committed to reducing their PCC to 110 l/h/d by 2050[61,64]. Within Cambridge Water's 2050 forecast the population of their served area is expected to increase by 75,500 people with approximately 41,250 new homes increasing their property connection by 28%. Within the Anglian Water zones, the population in Ruthamford North is expected to increase, between 2025 and 2050, by 20% in Ruthamford North and 31% in Ruthamford South.

6.4 Planning and the water balance

Within a water resource planning system which is highly centralised and focused on water industry actions, what is the role of integrated water management in the planning system? As introduced in section 1.2, water management is considered to be an essential element of spatial planning and placemaking. The CIRIA guidance identifies a range of positive outcomes from an IWM approach:

1. Reducing risk from flooding.
2. Increased water efficiency and reduced water stress.
3. Clean and good quality water environment.
4. Enabling new housing
5. Facilitating economic growth and regeneration.
6. Enhanced biodiversity.
7. Better blue-green infrastructure.
8. Improved accessible public spaces and places, and well-being.
9. Mitigating and adapting to climate change.
10. Utilising resources more sustainability and effectively.

Adopting an integrated water management approach in spatial planning is not seeking to replace regional plans and water company WRMPs, but to consider and quantify how IWM might deliver multiple benefits which include, but are not limited to, reducing or delaying the need for future development of new water resources by water companies, or potentially bring forward the date when the WRE and dWRMPs long-term environmental objectives (also known as the environmental destination) can be achieved.

We have developed a two-stage approach within this strategy:

Stage 1:

- Quantify the public water supply water balance both now and over the plan period to 2046.
- Identify a series of High-Level objectives to which IWM may be able to positively contribute in developing the new Local Plan.
- Using a multi-objective decision analysis (MODA) approach, quantify to what extent a long-list of IWM approaches could contribute to the Council's strategic objectives (see sections 7 and 8).

Stage 2:

- Select a short-list of IWM approaches to meet the objectives set out in 2.4.
- Quantify the potential contribution of these IWM approaches and build these into a new water balance model for 2046.

It is assumed in this analysis that the final WRMP24 which will be assessed and approved by the EA and Ofwat is sustainable. The stage 2 study will compare HDC's growth plan to that contained in the WRMP24.

7 Approach to quantifying integrated water management benefits in spatial planning

7.1 Introduction

Multi-Objective Decision Analysis (MODA) is a method that allows decisions to be made whilst considering multiple factors, objectives, and trade-offs. In the context of this strategy, the approach is used to quantify how different approaches to IWM might, if promoted through planning policies contribute to meeting the objectives of the emerging Local Plan for the period from 2021 to 2046.

The available literature on MODA illustrates a range of staged approaches[89, 90]. We have adopted the following six-staged approach:

- Objectives - agree the multiple objectives against which planning policy options for IWM can be evaluated.
- Weighting - determine the relative weighting or importance of each objective.
- Options - identify the IWM options to be evaluated.
- Scoring - score the relative merits of the options against each objective.
- Quantification - quantify the potential contribution of favourable measures to the water balance.
- Decision - evaluate the results and make recommendations for future policy.

7.2 Objectives

The following set of objectives were agreed with HDC:

- Achieve net zero by 2040
- Healthy water environment
- Increase biodiversity and natural capital
- Resilience to climate change
- Enabling healthy places
- Using natural resources wisely
- Promote sufficient water and wastewater capacity to serve new development
- Reduced risk of flooding
- Delivery of viable housing
- Opportunities for local skills and employment

These objectives are explained in more detail in section 2.4, and have been translated into a series of questions to consider to what extent does each option:

89 Plight Sound Energy, Energize, 2014

90 Multi-objective Decision Analysis for Workforce Planning: A Case Study, Scala and Kutzner, 2012

- Work towards achieving net zero by 2040?
- Help create a healthy water environment?
- Work towards increasing biodiversity and natural capital?
- Increase resilience to climate change?
- Enable healthy places to be created or regenerated?
- Ensure natural resources are used wisely?
- Increase water and wastewater capacity to serve new development?
- Reduce the risk of flooding?
- Help to deliver viable housing?
- Help to provide opportunities for local skills and employment?

7.3 Weighting

For this stage 1 analysis, each of the objectives has been given an equal weighting. This approach will be reviewed at stage 2.

7.4 Preliminary options

A preliminary list of options was identified as follows:

- Green infrastructure
- Blue infrastructure
- SuDS
- Diversifying water resources
- Leakage reduction
- Water efficient fixtures and fittings
- Education
- Rainwater harvesting
- Greywater recycling

7.5 Scoring

As part of the ranking of each option, a scoring system has been devised to rank each option and how it will benefit each objective, see Table 7.1. The higher the overall score, the better it is for the objective. For example, habitat creation is more beneficial for biodiversity net gain than affordable housing is.

Table 7.1 The scoring system for the MODA

Rank	Description
2	Significant potential to contribute to this objective.
1	Some potential to contribute to this objective.
0	Neutral
-1	Some potential to cause detriment to this objective.
-2	Significant potential to cause detriment to this objective.

8 Preliminary options scoring

8.1 Introduction

Radar diagrams have been used to present the ranking of each option in comparison with the objectives. An overall average is presented in the diagrams as well, to show how all options compare. Brief case studies are presented to provide an example of what each option could look like. However, no analysis has been performed at this stage on how that particular case study could apply in HDC.

8.2 Green Infrastructure (GI)

Green Infrastructure (GI) can include street trees, parks, gardens, SuDS (although these are dealt with separately in section 8.4), and nature reserves. GI are often accessible by the public and benefit the environment at the same time. This can include carbon sequestration from trees, buffer systems for road run off from planted roadside verges and prevention of urban heat islands. Incorporating GI into Healthy Places can help approach socio-economic and environmental issues.

Consideration should be given to planning GI that requires low or no water. Peak water demand for plant watering / irrigation is likely to coincide with peak customer demands, so anything that can be done to reduce this will contribute to meeting the objectives of "using water resources wisely" and "resilience to climate change".

Natural England's Green Infrastructure Framework aims to increase green spaces by 40% in residential urban spaces[91]. The framework is an integrated set of principles to increase accessible GI including features such as green walls and trees. By increasing GI in urban areas other benefits such as carbon sequestration, clean air and better health and wellbeing for individuals in the community.

GI can be delivered in numerous ways such as improving already present infrastructure or creating new spaces. Implementing both can help towards:

- Biodiversity Net Gain
- Local Nature Recovery Strategies
- The government's 25-year plan to improve the environment
- Enabling healthy spaces that have more than one purpose

91 Green Infrastructure Framework, Natural England, 2023

8.2.1 Results

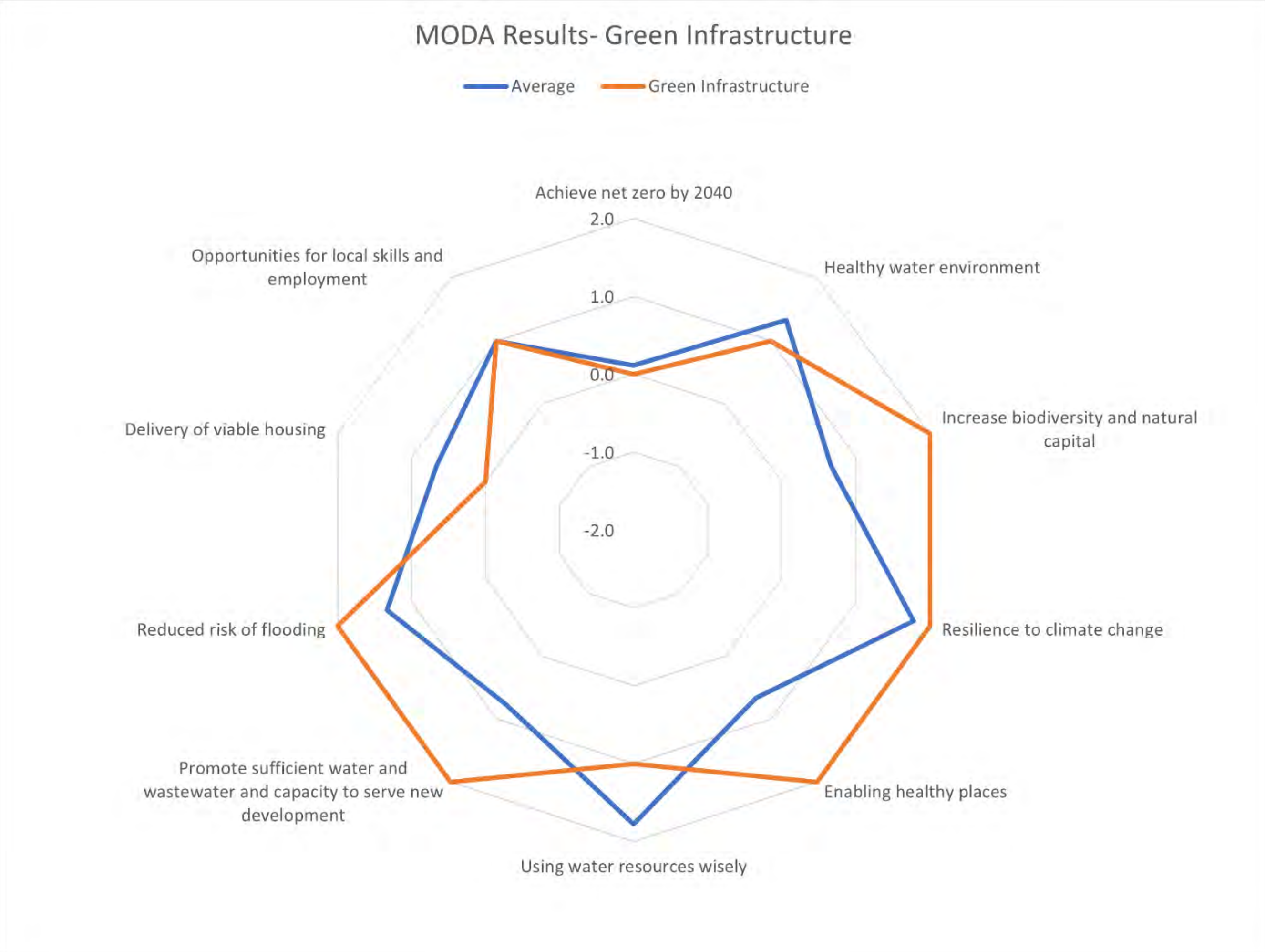

Figure 8.1 Radar diagram showing the MODA for Green Infrastructure

8.2.2 Case study: Urban greening, London, England

London has around one million m^2 of green roofs installed to increase green space across the city. Green Roofs and Walls (GRaWs) help to keep buildings cool in hotter months and warm in colder months. They are also known to soak up rainwater with 50% of annual rainwater being absorbed if the soil is 60-100mm deep, and 90% being absorbed if the soil is 500mm deep[92].

In the 2023 State of Nature report 11% of the UKs insects were found to be threatened by extinction[93]. The same report labelled urbanisation as one of the main

92 Guidelines for the Planning, Construction and Maintenance of Green Roofing, FLL, 2018

93 State of Nature, State of Nature Partnership, 2023

drivers of species decline. Implementing GRaWs can help to increase habitat and shelter for species such as bees, butterflies, and beetles.

8.3 Blue Infrastructure (BI)

Blue Infrastructure (BI) is more water focussed, with Natural Flood Management (NFM), de-culverting watercourses and stormwater management. BI also encompasses WRCs and how they are managed. Although, like GI, BI can be incorporated into healthy public places, the safety risks of water need to be considered and addressed through good design.

8.3.1 Results

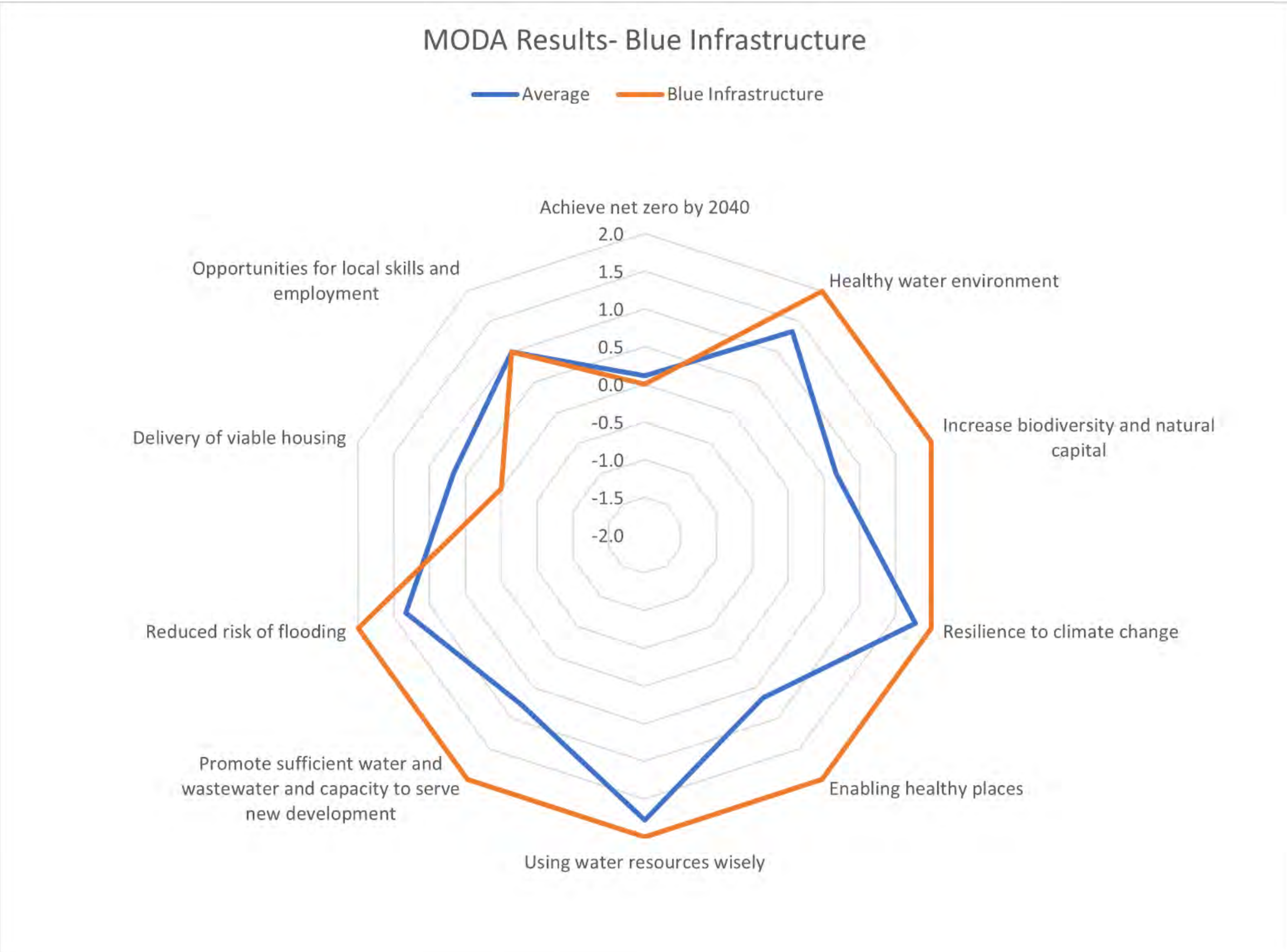

Figure 8.2 Radar diagram showing the MODA for Blue Infrastructure

8.3.2 Case study: Eddleston Water, Scotland

Natural Flood Management (NFM) and river restoration can help prevent surface water flooding as well as improving habitat for specific species. At Eddleston Water in Scotland tree planting and cross-slope hedgerows within the upper catchment have been used to restore the river. Cross slope hedgerows are hedgerows that are planted across embankments, this can help with NFM.

Dams have also been built across side-streams to re-meander the river as well as removing embankments to help reconnect flood plains which subsequently reduced the risk of flood risk downstream by 30%. Storage ponds were also created to help provide temporary storage of flood water thus delaying the flooding downstream[94].

As well as the benefits above, this type of NFM and river restoration can benefit amphibians such as frogs, toads, and newts, increasing overall biodiversity.

8.4 SuDS

8.4.1 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. The SUDS Management Train principle is discussed further in Section 5.7.3 of the SFRA. Considerations for SuDS design for water quality are summarised in Table 8.1.

Table 8.1 Considerations for SuDS deign for water quality

SuDS Type	Examples of Techniques
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 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 delt with more effectively without impacting on the whole site
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

94 Nature Based Solutions Report, British Ecological Society, 2021

SuDS Type	Examples of Techniques
	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	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.
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 insure 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 ladings and treatment processes.

Managing pollution close to its source can help keep pollutant levels and accumulation rates low, allowing natural processes to be more effective. Treatment can often be delivered within the same components that are delivering water quantity design criteria, requiring no additional cost or land-take.

SuDS designs should control the 'first flush' of pollutants (usually mobilised by the first 5mm of rainfall) at source, to ensure contaminants are not released from the site. Best practise is that no runoff should be discharged from the site to receiving watercourses or sewers for the majority of small (e.g., less than 5mm) rainfall events.

Infiltration techniques will need to consider Groundwater Source Protection Zones (GSPZs) and are likely to require consultation with the Environment Agency.

Early consideration of SuDS within master planning will typically allow a more effective scheme to be designed.

8.4.2 SuDS in 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.

8.4.3 Additional benefits

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 wastewater treatment works.

SuDS techniques aim to replicate the natural hydrology of a site, infiltrating rainfall into the ground where local hydrogeological conditions allow, or releasing it slowly into watercourses. This in turn helps maintain groundwater levels and river flows during dry periods, maintaining or enhancing the percentage of time during which abstraction can take place.

Climate Resilience

Climate projections for the UK suggest that winters may become milder, and wetter and summers may become warmer. 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.

8.4.4 Suitable SuDS Techniques

The hydraulic and geological characteristics of each property development site across Huntingdonshire should be assessed to identify the most appropriate forms of surface water management and any constraining factors to the utilisation of SuDS. These assessments are designed to inform the early-stage site planning process and should be followed up the site-specific detailed drainage assessments.

Appropriate SuDS techniques have been categorised into five main groups, as shown in Table 8.2. Further site-specific investigation should be conducted to determine what SuDS techniques could be used on a particular development, informed by detailed ground investigations.

Table 8.2 Summary of SuDS Categories

SuDS Type	Example Techniques*
Source Controls	Green Roof, Rainwater Harvesting, Pervious Pavements, Rain Gardens
Infiltration	Infiltration Trench, Infiltration Basin, Soakaway
Detention	Pond, Wetland, Subsurface Storage, Shallow Wetland, Extended Detention Wetland, Pocket Wetland, Submerged Gravel Wetland, Wetland Channel, Detention Basin
Filtration	Surface Sand filter, Sub-Surface Sand Filter, Perimeter Sand Filter, Bioretention, Filter Strip, Filter Trench
Conveyance	Dry Swale, Under-drained Swale, Wet Swale

*Some benefits and example techniques may overlap e.g. permeable paving could be considered under all SuDS types

8.4.5 Results

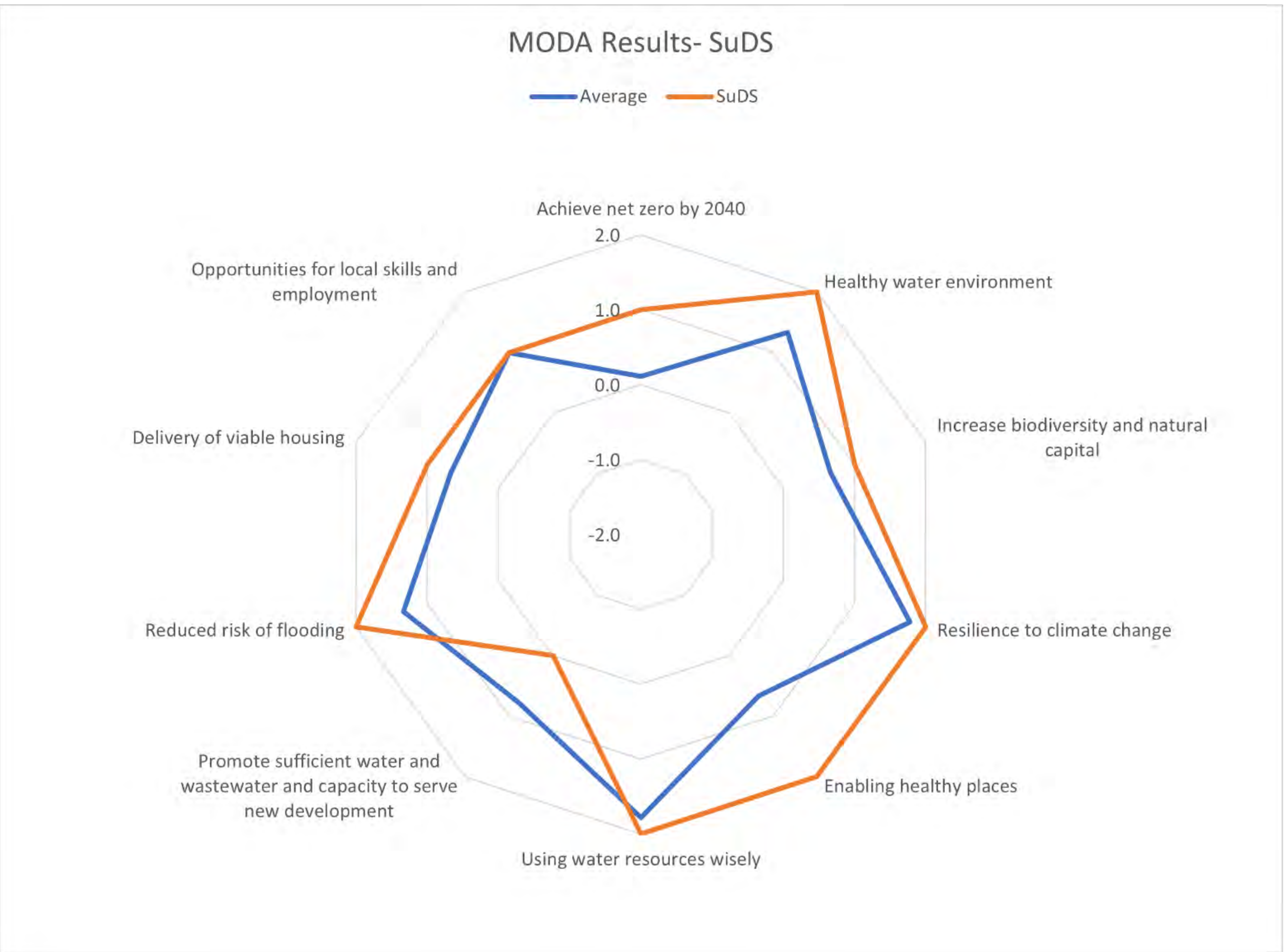

Figure 8.3 Radar diagram showing the MODA for SuDS

8.4.6 Case study: Sidmouth, Amphitheatre flood defence

The first phase of Sidmouth's flood alleviation scheme was completed in 2021 with funding of £1 million. This included installing a new drainage system to divert surface water away from properties and into a newly formed amphitheatre in the grounds of Knowle Park, see Figure 8.4[95]. Highway drainage from the road feed into the field and water is taken down into a soakaway in the centre of the amphitheatre. The underground water storage of the amphitheatre can hold up to a one in 30-year storm event, and the tiered sections can hold up to half a meter of water in a one in 100-year storm event.

Figure 8.4 Sidmouth flood alleviation amphitheatre[96]

This is an example of how SuDS can be incorporated into spaces for local communities and visitors. The amphitheatre, carried out by Jacobs, can hold 300 people at any one time where local events can be held (when the weather is dry).

8.5 Diversifying water resources

Modelling carried out within the National Framework for Water Resources[97], assumes that 700 million litres per day of water come from unsustainable abstractions. To replace this unsustainable abstraction, an extra 720 million litres per day would be

95 Sidmouth flood alleviation scheme, Devon County Council, 2021

96 Sidmouth Amphitheater: Flood defenses with a theatrical twist, Jacobs, 2021

97 Meeting our future water needs: a National Framework for Water Resources, The Environment Agency's approach to groundwater protection, Environment Agency, 2020

needed across England. The regional water resource plans and the Regulators' Alliance for Progressing Infrastructure Development (RAPID) process have given an impetus to the search for new water resources in the UK, including regional transfers, direct and indirect water recycling, desalination and new reservoirs which can abstract river water at times of high flow and store it for use during dryer periods.

Large-scale diversification of water resources is primarily the responsibility of the water companies; however opportunities may exist for smaller-scale local schemes to be developed such as developer sinking their own borehole.

8.5.1 Results

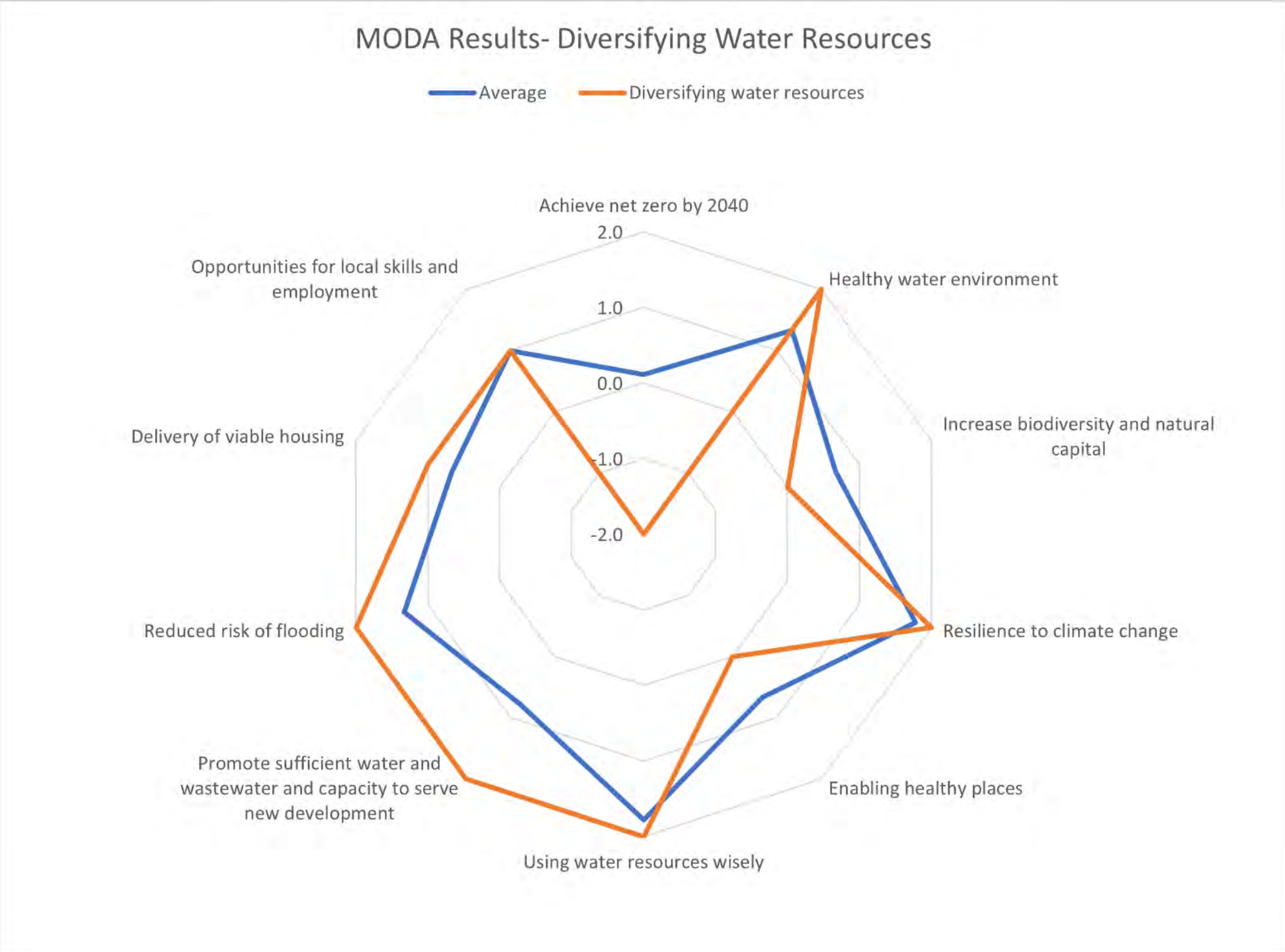

Figure 8.5 Radar diagram showing the MODA for Diversifying water resources

8.5.2 Case study: Anglian Water and the Strategic Pipeline Alliance

Anglian Waters most recent project to ensure water resources are plentiful is the Strategic Pipeline Alliance (SPA). This pipeline will help transport water more freely from the north to the south from some of the wetter areas of the country more water stressed areas. This will help to reduce the amount of water taken from the environment as well as increasing resilience of homes by presenting another water resource. Anglian Water acknowledge, however, that long-distance, inter-catchment transfers can increase the carbon costs of supplying water due to the need for extensive pumping.

8.6 Leakage reduction

Water leakage in this case refers to the loss of treated water from distribution systems managed by water companies. Leakage can be impacted by several factors such as:

- Operational strategies e.g., pressure management
- Network characteristics e.g., length of mains
- Asset condition e.g., age
- Customer base composition e.g., rural or urban areas[98]

Leak detection is the main way to manage leakage. Different technologies help monitor leakage from cracked pipes such as:

- CCTV Inspection- where cameras are sent down pipes to find cracks and deterioration.
- Acoustic leak detection- a speaker is used to send out a noise and using the echo leaks can be detected.
- The next generation of smart water meters will enable detection of customer-side leaks, and to communicate this to the water company and to householders and business customers.

98 Leakage, OFWAT, 2023

8.6.1 Results

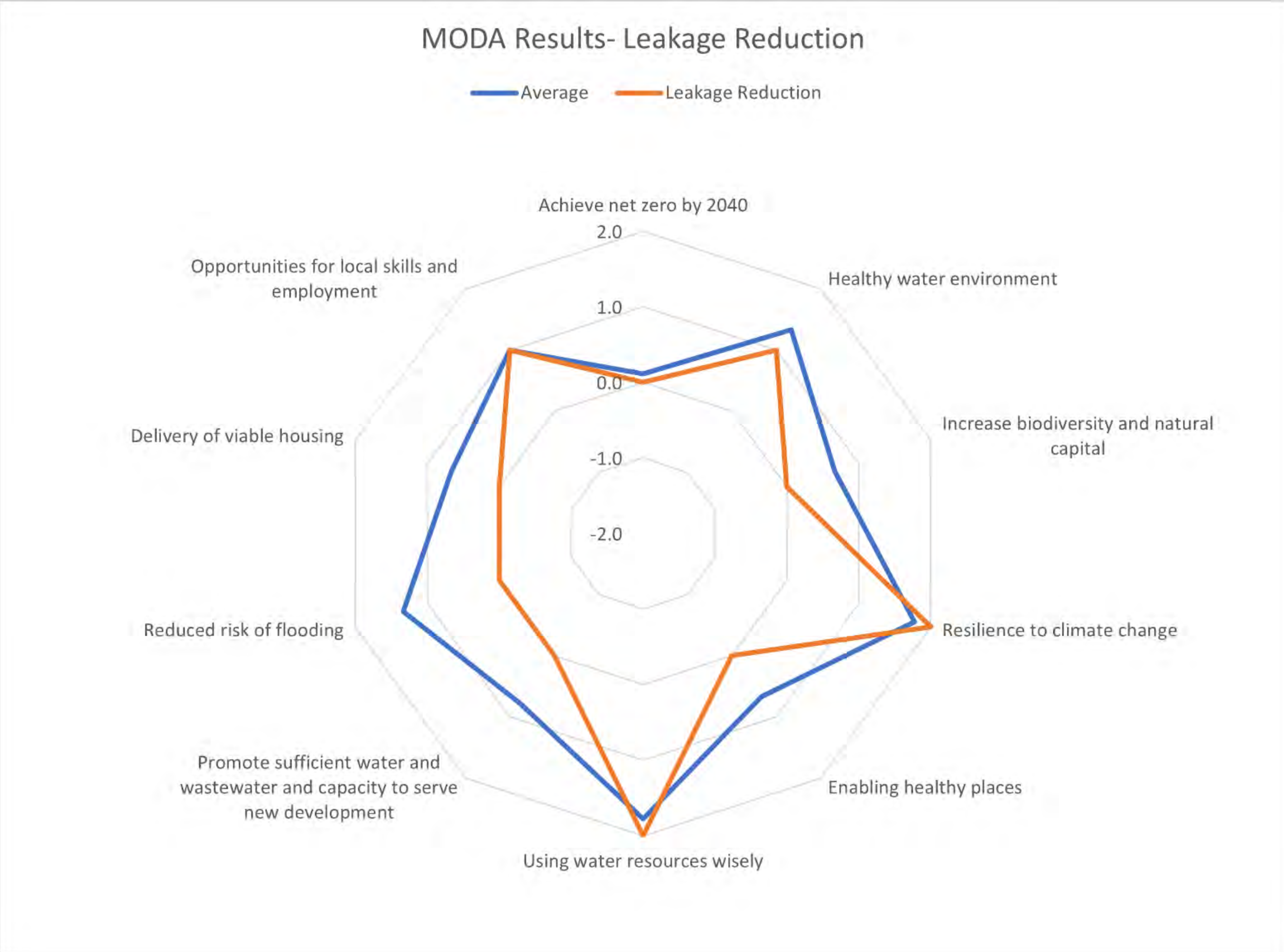

Figure 8.6 Radar diagram showing the MODA for leakage reduction

8.6.2 Case study: Uisce Éireann and Limerick City and County Council, reducing losses[99]

Uisce Éireann, the Irish water utility company and their delivery partner Shareridge have worked with Limerick City and County Council to fix leaks and replace pipes to provide a more reliable water supply.

Since 2018, close to 22km of water mains have been replaced with over 33 million litres of water having been saved. Other leakage reduction activities carried out by Uisce Eireann, and Limerick City and County Council are 'Find and Fix' of leaks and ' First Fix for Free' to help incentivise the public to report leaks.

Metering was also focussed on to aid the 'Find and Fix' project. Improvements in gathered demand data resulted in 565 major leaks being repaired so far and thus 16 million litres of clean water being saved.

99 Over 30 million litres of water saved following intensive campaign to reduced leakage in Limerick, Uisce Éireann, 2023

This case study is a good example of a local council and the water company working together to benefit residents in the area.

A significant proportion of leakage occurs on the "customer side", in pipes within the curtilage of homes and businesses. Some of this can be prevented through appropriate design. WaterSafe have developed some simple guidance for all developers[100]. For larger employment developments, the BREEAM certification system includes measure WAT 03 on water leak detection and prevention[101]. BREEAM points are available where appropriate technologies to control flow and actively detect leaks are designed into buildings.

8.7 Efficient fixtures and fittings

There are several ways to save water within households. Table 8.3 presents different consumer water efficiency measures and how they can be implemented.

Table 8.3 Consumer Water Efficiency Measures

Measure	Examples
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 inserts, 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 with water butt • Grey water recycling
Water-efficient measures addressing	• Hosepipe flow restrictors • Hosepipe siphons

100 https://www.watersafe.org.uk/downloads/developers_info/developing_homes_to_prevent_leaks.pdf

101 https://kb.breeam.com/wp-content/plugins/breeamkb-pdf/pdf/?c=176

Measure	Examples
outdoor use	• Hose guns (trigger hoses) • Drip irrigation systems • Mulches and composting

8.7.1

8.7.2 Results

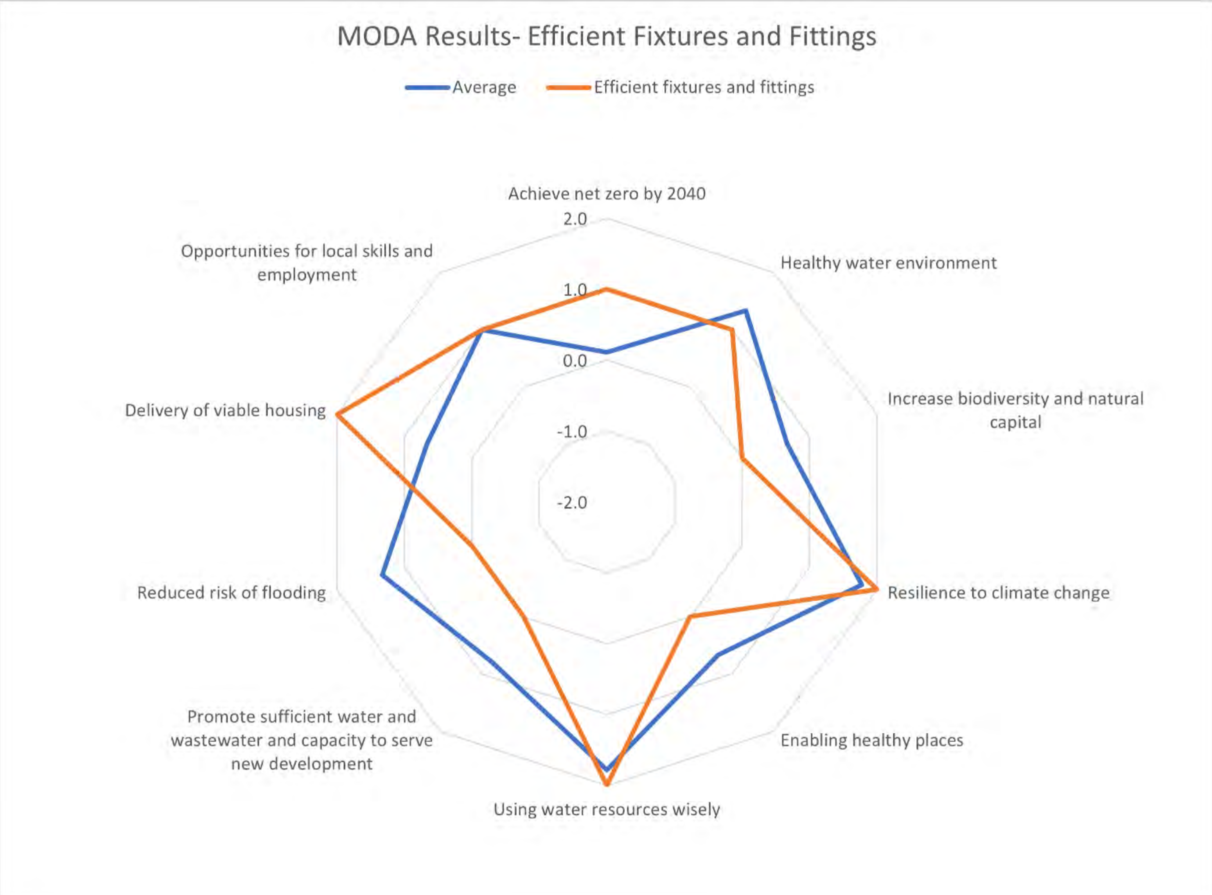

Figure 8.7 Radar diagram showing the MODA for efficient fixtures and fittings

8.7.3 Case study: BBC Northern Ireland Blackstaff House and Broadcasting House, Belfast[102]

BBC Northern Ireland started monitoring water consumption at its two main sites in 2008. They managed to reduce their water consumption by 27% from 2008 to 2013. Some of the actions BBC Northern Ireland put in place were:

- Fitted low flush toilets
- Sensor taps
- Waterless urinals
- Installed various water saving devices, including flow restrictors to taps and hippo bags in toilet cisterns
- Installed building management systems alarms to warn if a leak occurs

These actions resulted in:

- A reduction of 3,000 litres/day at Blackstaff House
- A reduction of 7,000 litres/day at Broadcasting House
- Staff awareness of the importance of saving water
- Early detection of leaks
- Regular meter readings to monitor consumption

8.8 Education

Education and promotional campaigns can contribute to behaviour changes when considering water use. Water efficiency measures that can help promote behaviour change include:

- encouraging community establishments (e.g., schools and hospitals) to carry out self-audits on their water use;
- delivering water conservation messages in schools and providing visual material for schools;
- delivering water conservation messages to households; and
- discouraging misuse of sewerage systems to dispose of fats, wipes, nappies etc, which lead to blockages, sewer flooding and river pollution from sewer overflow incidents.

Organisations such as Waterwise give information on how to save water in the home as well as information to schools.

102 Water Champions Case Studies, Consumer Council, 2023

8.8.1 Results

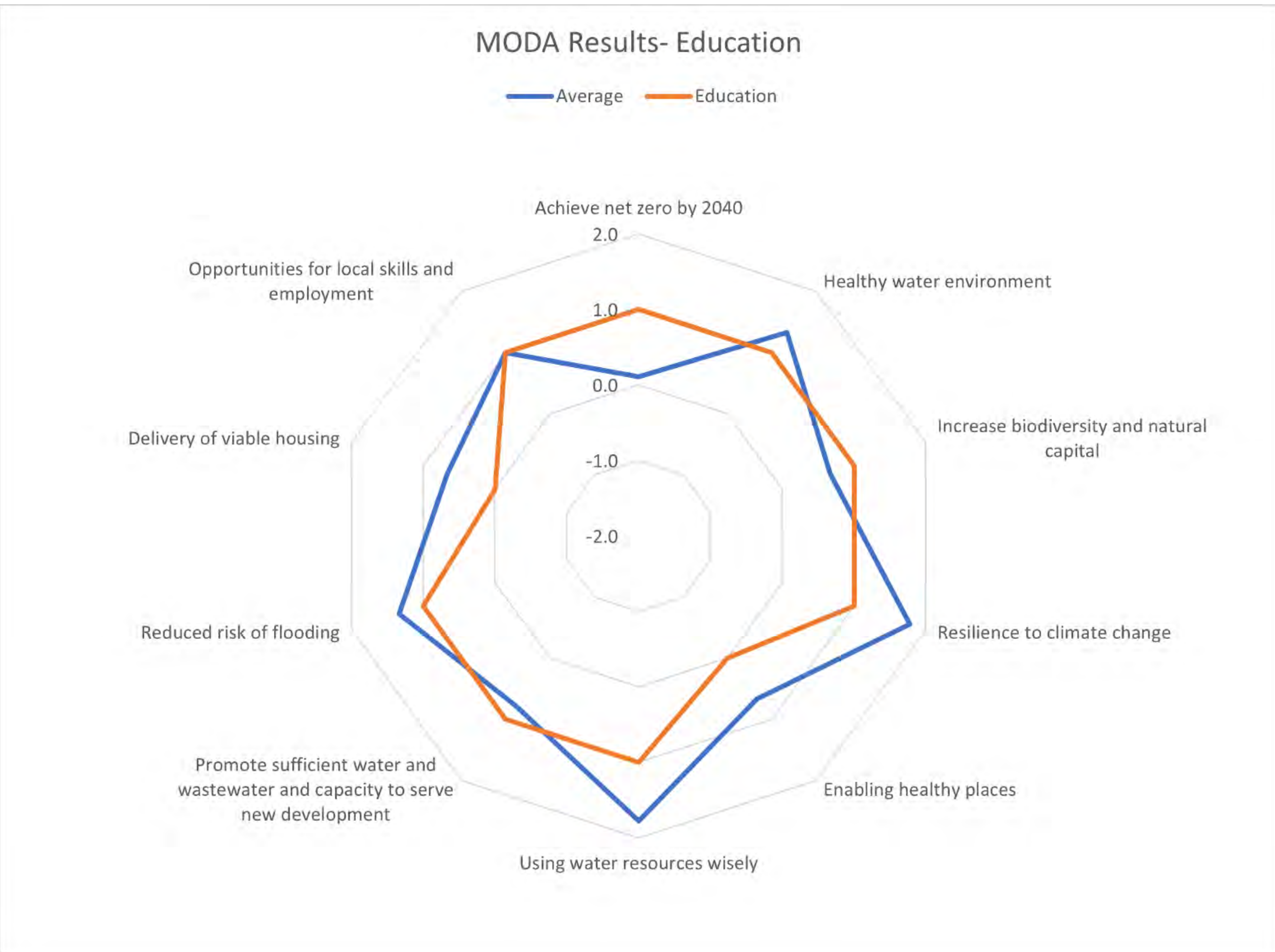

Figure 8.8 Radar diagram showing the MODA for education

8.8.2 Case study: Australia, Water labelling

Since 2005 Australia put in place a mandatory water labelling scheme linked to minimum fittings standards. By 2017 300 Ml/d of water a day was estimated to be saved[103].

The water labelling system is used on dishwashers and flow controllers such as taps, toilets and washing machines. The label contains a star rating to help you understand the amount of water the product uses compared to other products. It also gives the rate of water consumption and the products registration and details, see Figure 8.9.

103 UK Water Efficiency Strategy 2030, Waterwise, 2022

Figure 8.9 Example of water labelling in Australia[104]

This case study gives an example of how education can result in behaviour change and thus an increase in water efficiency choices in households.

8.9 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, principally for toilet flushing, garden watering and for clothes washing machines.

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 Rainwater Harvesting

- 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

104 Water Rating Label, Australian Government, 2023

* 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. Further information available here.
* Carbon costs can be higher than mains water.

8.9.1 Results

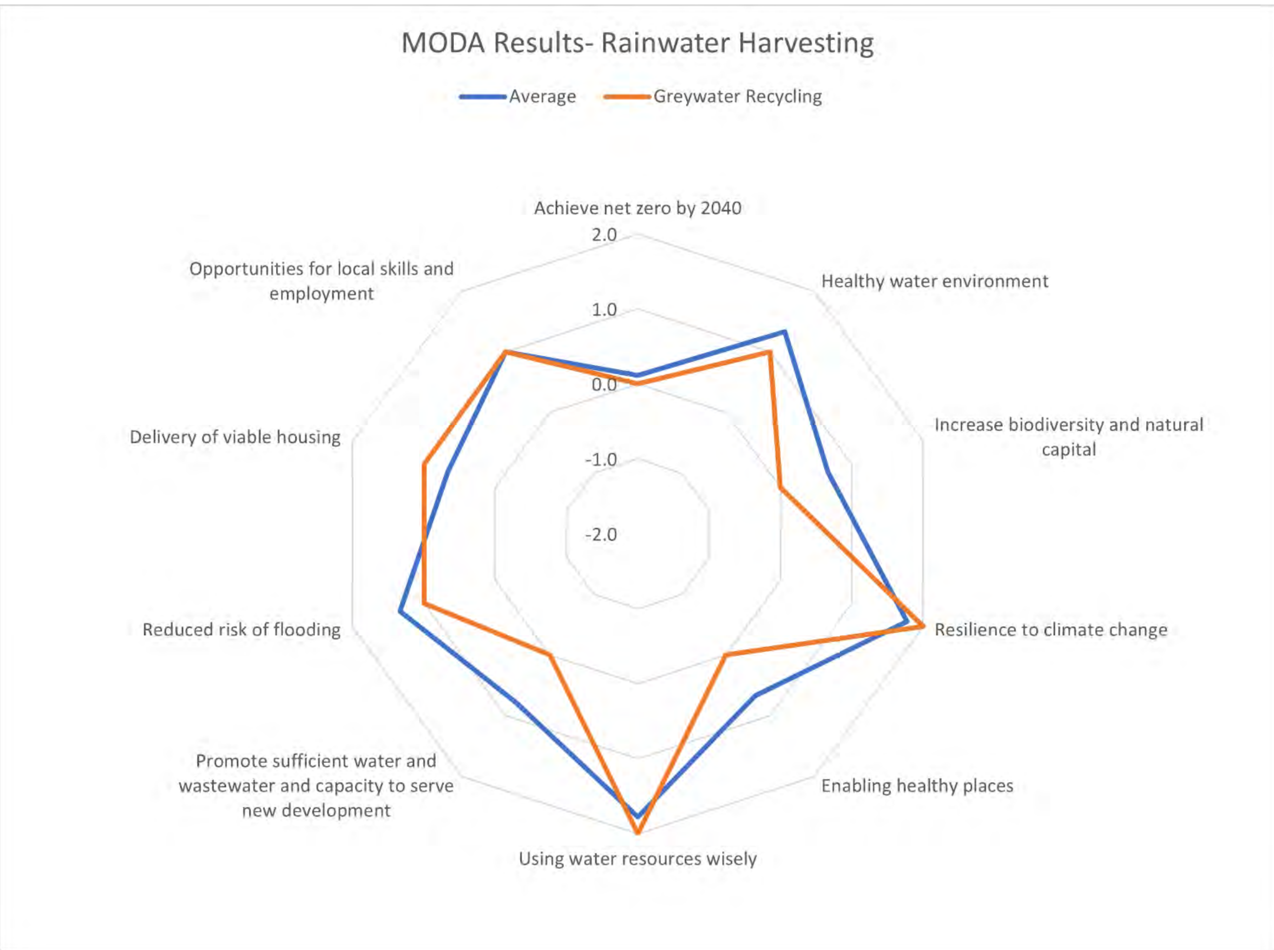

Figure 8.10 Radar diagram showing the MODA for Rainwater Harvesting

8.10 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 when the building is occupied (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 mains 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.

8.10.1 Results

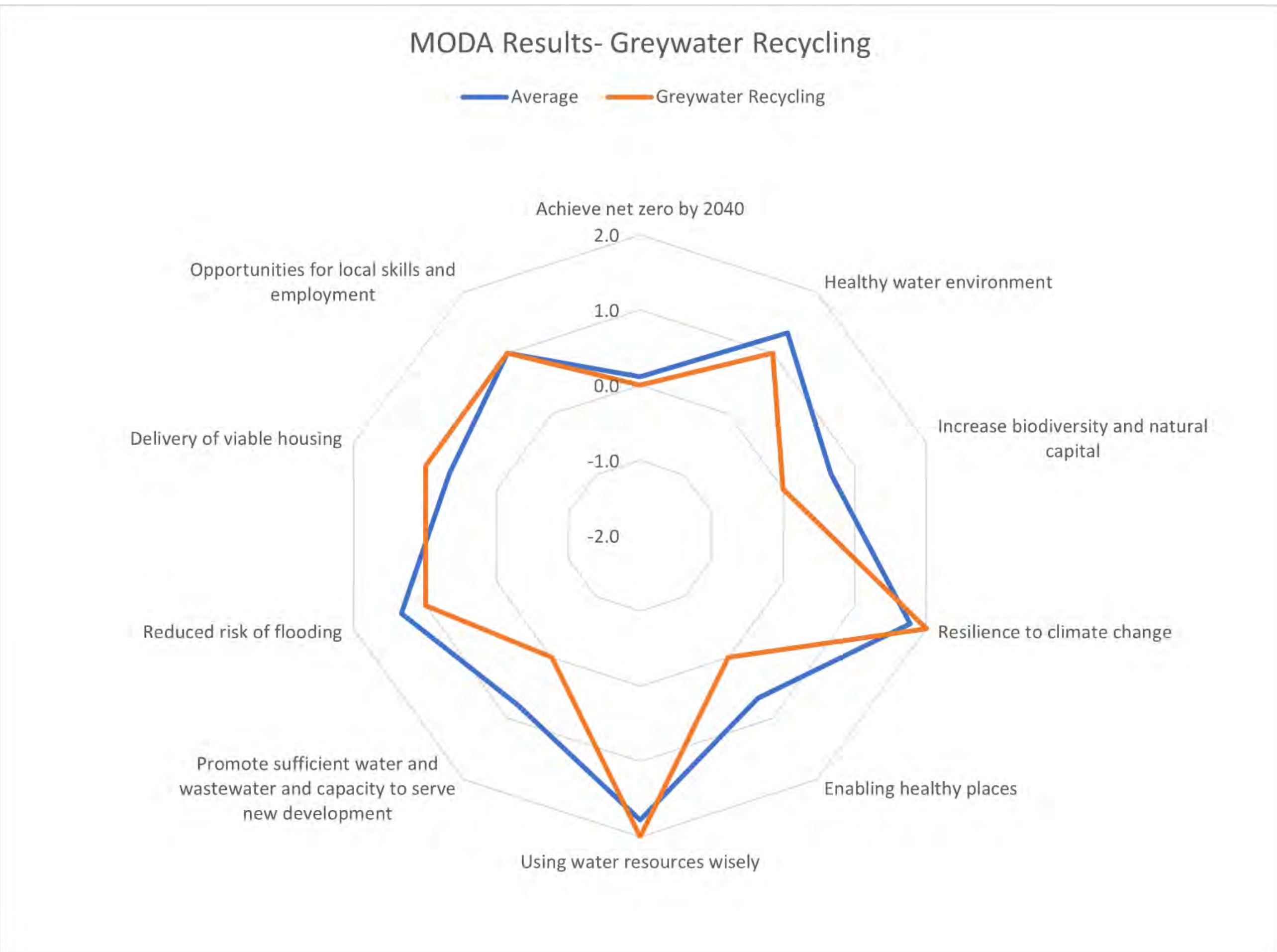

Figure 8.11 Radar diagram showing the MODA for Greywater Recycling

8.11 Conclusion

The MODA provided a baseline understanding of how the objectives relate to and benefit the options presented. The initial conclusions from the MODA are:

- The scoring at this stage is unweighted, i.e., each objective is given equal weighting. This should be revisited at stage 2.
- The most beneficial options are green infrastructure, blue infrastructure and SuDs.

The option with the lowest overall score is leakage reduction. This should not be considered an indication that this is not a valuable option, simply that it is an option with narrowly focussed benefits.

Table 8.4 Summary of MODA scoring for all options

Objectives	Diversify water resources	Efficient fixtures and fittings	Green Infrastructure	Blue Infrastructure	Rainwater harvesting	Greywater recycling	SuDS	Education	Leakage reduction	Average
Achieve net zero by 2040	-2	**1**	0	0	0	0	**1**	**1**	-1	0.1
Healthy water environment	**2**	1	1	**2**	1	1	**2**	1	1	1.3
Increase biodiversity and natural capital	0	0	**2**	**2**	0	0	**1**	**1**	0	0.7
Resilience to climate change	**2**	**2**	**2**	**2**	1	**2**	**2**	1	**2**	1.8
Enabling healthy places	0	0	**2**	**2**	0	0	**2**	0	0	0.7
Using natural resources wisely	**2**	**2**	1	**2**	**2**	**2**	**2**	1	**2**	1.8
Promote sufficient water and wastewater capacity to serve new development	**2**	0	**2**	**2**	0	0	0	**1**	0	0.8
Reduced risk of flooding	**2**	0	**2**	**2**	**2**	1	**2**	1	0	1.3
Delivery of viable housing	**1**	**2**	0	0	**1**	**1**	**1**	0	0	0.7
Opportunities for local skills and employment	1	1	1	1	1	1	1	1	1	1.0
Total	10	9	**13**	**15**	8	8	**14**	8	6	10.1

* Values above the average for each objective or for the total score are highlighted.

9 Conclusions and recommendations for stage 2

9.1 Conclusions

9.1.1 Stage 1 overview

This report is the first stage in the Integrated Water Management Strategy for Huntingdonshire. It sets out how the study area is expected to grow up to 2046 and agrees a set of objectives that can be used in assessing future water management options. Following the IWMS guidance developed by CIRIA, a baseline is presented showing Huntingdonshire in the context of the wider catchment and presenting information on the current status of water resources, wastewater infrastructure and water quality. An approach to quantifying integrated water management benefits was presented and a preliminary scoring of identified options undertaken.

9.1.2 Water resources

Huntingdonshire is within the Anglian Water and Cambridge Water supply areas. Huntingdonshire is covered by three WRZs including Anglian Water's Ruthamford North and Ruthamford South WRZs and Cambridge Water's Company Wide Zone. Ruthamford North and South have been identified as being at risk of climate change impacts in the future. Consequently, finding alternative water resources and increase water efficiency maybe important in the future to mitigate these risks.

Within AW's WRMP there is a focus on climate change resilience, the implementation of smart meters and working towards better pipe connections to increase water availability. CW's WRMP includes a focus on leakage reduction and the introduction of smart meters and increased water efficiency including the incorporation of rainwater harvesting and grey water recycling within new sites. CW's WRMP also highlights the importance of working collaboratively with key stakeholders including Anglian Water, Affinity Water and the EA to ensure the long-term resilience of water supplies and in meeting WFD and RBMP objectives.

CW submitted their draft WRMP to the Environment Agency in October 2022. The EA then completed a review of the plan and provided their representation in May 2023. The representations showed that the EA are concerned Cambridge Water will not be able to meet the demand for water in its area without increasing the risk of deterioration in the status of waterbodies. The EA recently objected to planning applications for large developments in South Cambridgeshire and Cambridge based on the impact of CW's abstractions. In principle this objection would also apply to large developments within the CW WRZ in Huntingdonshire (the east of the HDC area).

CW have since provided their response to the EA and other stakeholder's comments as part of their consultation process and issued a revised draft WRMP (rdWRMP).

The EA and Defra completed a review of CW's Statement of Response and rdWRMP in December 2023. The updated Statement of Response and rdWRMP were published in February 2024 in response to the recommendations received[105].

The EA is not able to comment on the Statement of Response or revised draft WRMP directly until after the Advice report has been considered by Defra.

A review of CW's rdWRMP alongside the EA's advice report should therefore be carried out in a Stage 2 IWMS.

The objective of increasing water availability and water efficiency are also mirrored in the WRE summary, with the goals for desalination, reservoir design and planning and water re-use. Affordable bills and housing are also discussed in the WRE report.

9.1.3 Wastewater

Anglian Water are the sewerage undertaker for the whole of Huntingdonshire. Increased wastewater flows into the wastewater network due to growth in population can increase the pressure on existing infrastructure, increasing the risk of sewer flooding and where present increasing the risk of storm overflow operation. Headroom at Water Recycling Centres (WRCs) can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity.

The Environment Act requires water companies to report and monitor storm overflows as well as reduce the harm caused to the rivers they discharge to. Within Huntingdonshire there are thirty storm overflows and eighteen storm tanks overflows located on the sewer network and at WRCs (based on 2022 EDM dataset). In all of these, the frequency of operations in 2020, 2021 and 2022 are below the threshold for further investigation by the EA. The overflows at Kimbolton STW and Upwood STW operated over 50 times in 2022. Whilst below the trigger for an investigation, in the longer term this may require improvement in order to meet the 2050 target of 10 or fewer operations per year.

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. Redevelopment of brownfield sites with previously combined

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sewerage systems offer the potential to separate surface water from foul and reduce discharges from sewer overflows.

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. A headroom assessment was carried out comparing the current discharge from each WRC in Huntingdonshire to its permit value, taking into account growth already planned.

There are 33 WRCs within or serving communities in Huntingdonshire. Of these, twenty nine are expected to serve committed growth within the period of the adopted Local Plan.

Ten WRCs (Alconbury, Brampton (Cambs), Easton (Cambs), Elton, Huntingdon (Godmanchester), Molesworth, Old Weston Main Street, Oldhurst, Somersham and St Neots) are close to, or likely to exceed their permit due to committed growth (based on the 80th exceedance percentile). Further development in these catchments would require an increase in their flow permit and / or upgrades to treatment processes. A further two WRCs (Needingworth and St Ives) have less than 10% headroom remaining and may have limited capacity for further growth without an increase in their flow permit.

Five WRCs either do have a descriptive permit (no flow permit has been set) or there is no flow monitoring (smaller WRCs often do not have flow monitoring). An amber rating has also been given to these WRCs as they are unlikely to be able to serve significant growth.

9.1.4 Environmental

The latest Water Framework Directive assessment data shows that all of the watercourses in the study area have moderate or poor overall status. The EA reasons for not achieving good (RNAG) dataset indicates that the water industry (sewage discharges) and agriculture and rural land management (livestock, arable and land drainage) are the main reasons for watercourses not achieving good status in this area. Another principal source of pollution is from urban and highway runoff. This can be managed through design of new development and transport infrastructure including nature-based solutions.

9.1.5 Water Quality

An increase in the discharge of effluent from Water Recycling Centres (WRCs) 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).

A sensitivity analysis was carried out using the EA's SIMCAT water quality model. Growth in population was simulated by increasing the discharge from each WRC by 10%. Where water quality downstream of a WRC in any given determinand deteriorates by 10% or more in response to a 10% increase in effluent flow, the sewer catchment can be said to be “more sensitive” to changes in effluent flow, and therefore growth. Where the response is less than 10% the watercourse can be said to be "less sensitive".

The sensitivity analysis suggests that ammonia concentrations in watercourses within Huntingdonshire may be sensitive to increases in the discharge of treated wastewater.

9.2 Outline options assessment

The potential for integrated water management options to deliver against a range of objectives set out in the Strategy for 2050 was assessed using a Multi-Objective Decision Analysis (MODA) approach. The main conclusions from this assessment are:

- The scoring at this stage is unweighted, i.e., each objective is given equal weighting. This should be revisited at stage 2.
- The most beneficial options are green infrastructure, blue infrastructure and SuDs.
- The option with the lowest overall score is leakage reduction. This should not be considered an indication that this is not a valuable option, simply that it is an option with narrowly focussed benefits.

9.3 Recommendations for the stage 2 IWMS

9.3.1 Growth scenario

The growth information provided by HDC will be updated in order to allow a revised estimate of water demand in Huntingdonshire. This will be used within an updated water balance, and within all the assessments conducted in Stage 2.

9.3.2 Water resources

Evidence presented in the Stage 1 study shows that Huntingdonshire is in an area of serious water stress and there is sufficient justification for the tighter water efficiency target currently allowed for under building regulations of 110l/p/d. The direction of travel for water resources in the UK is to go further than this and achieve tighter standards. The Government's Environmental Improvement Plan (EIP) shows a target of 100l/p/d is being considered in water stressed areas, and in some areas, LPAs are now considering water neutrality.

In the Stage 2 IWMS, the options for achieving higher water efficiency standards in new build housing and non-household development will be outlined, including options to achieve or go further than water neutrality. This impact this would have on the baseline water balance presented in the Stage 1 study will be explored.

Growth forecasts provided for the Stage 2 study by HDC (including the distribution of growth) will be compared to the growth forecast allowed for HDC in the final WRMP24s to investigate whether the full amount of growth has been taken into account. If it has not, then the impact of exceeding the water company forecast will be discussed with the water company.

9.3.3 Water quality

An updated growth scenario developed with HDC will be tested within the water quality model. The following tests will be applied:

- Does growth cause a 10% or greater deterioration in BOD, Ammonia or Phosphate concentration OR a change in WFD class?
- If a significant deterioration is predicted, can this be prevented by improvements in treatment processes?
- Could growth alone prevent good ecological status being achieved in the future assuming improvements elsewhere in the catchment?

Where upgrades are required to treatment processes in order to accommodate growth within WFD constraints, these will be identified. Whilst water quality modelling may show no significant deterioration in water quality from the local plan, future changes to river flows from climate change could result in a deterioration in water quality as periods of lower flow in rivers increase concentration of pollutants. This will be assessed using a further climate change sensitivity run of the model where river flow is modified according to recent EA guidance.

9.3.4 Options appraisal and the water balance

The preliminary options discussed in Stage 1 will be reviewed and updated in collaboration with stakeholders. The MODA scoring will be updated and where appropriate weightings added to quantify the relative importance of the objectives.

A short-list of IWM approaches will be selected to meet the aims of the IWMS outlined in 2.4.and the potential contribution of these IWM approaches will be quantified and built into a new water balance model for 2046, which demonstrates the role of planning policies and interventions to reduce demand and exploit sustainable use of local water resources and water recycling.

A Appendix A Protected sites

Table 9.1 SSSIs in and within 5km downstream of the study area

SSSI Name	GRID REF	Potential hydrological link to waterbody?	WRC upstream?
Brampton Wood	TL179701	N	N
Castor Flood Meadows	TL123972	Y	Y
St. Neot's Common	TL182612	Y	N
Monks Wood and The Odd Quarter	TL196801	Y	N
Hemingford Grey Meadow	TL291692	N	N
Great Stukeley Railway Cutting	TL233759	N	N
Grafham Water	TL148680	Y	N
Little Catworth Meadow	TL103727	N	N
Gamlingay Wood	TL241534	N	N
Holme Fen	TL206889	Y	Y
Upwood Meadows	TL251826	N	N
Warboys and Wistow Wood	TL300818	N	N
Little Paxton Wood	TL168636	N	N
Warboys Claypit	TL307818	N	N
Berry Fen	TL378745	Y	Y
Portholme	TL236708	Y	Y
Perry Woods	TL136664	N	N
Weaveley and Sand Woods	TL226540	N	N
Woodwalton Marsh	TL211812	N	N
Houghton Meadows	TL293716	Y	Y
Waresley Wood	TL262548	N	N
Brampton Meadow	TL192720	Y	Y
Ouse Washes	TL490879	Y	Y
Little Paxton Pits	TL199637	Y	Y
Brampton	TL203722	Y	Y

SSSI Name	GRID REF	Potential hydrological link to waterbody?	WRC upstream?
Racecourse			
Aversley Wood	TL161819	N	N
Woodwalton Fen	TL229844	Y	Y
Godmanchester Eastside Common	TL269713	Y	Y
Orton Pit	TL162941	Y	Y
Nene Washes	TL307999	Y	Y
Dogsthorpe Star Pit	TF212026	Y	Y
Aldwincle Marsh	TL004807	Y	N
Ashton Wold	TL091875	N	N
Barnack Hills & Holes	TF075046	N	N
Bedford Purlieus	TL041995	N	N
Bonemills Hollow	TF035012	Y	N
Buff Wood	TL282503	N	N
Caldecote Meadows	TL348578	N	N
Castor Hanglands	TF117016	N	N
Collyweston Great Wood and Easton Hornstocks	TF019002	N	N
Elsworth Wood	TL312618	N	N
Eversden and Wimpole Woods	TL341524	N	N
Hayley Wood	TL291529	N	N
Kingston Wood and Outliers	TL328542	Y	N
Old Sulehay Forest	TL062985	N	N
Overhall Grove	TL338630	Y	N
Papworth Wood	TL291629	N	N
Potton Wood	TL252501	N	N
Southorpe Meadow	TF083031	N	N
Southorpe Paddock	TF084021	N	N
Southorpe Roughs	TF073031	N	N

SSSI Name	GRID REF	Potential hydrological link to waterbody?	WRC upstream?
Sutton Heath and Bog	TF089000	Y	N
Swineshead Wood	TL061668	N	N
Thrapston Station Quarry	SP999776	N	N
Titchmarsh Meadow	TL030796	Y	N
Upper Nene Valley Gravel Pits	SP971720	Y	N
Wansford Pasture	TL069994	Y	N
West Abbot's and Lound Woods	TF059010	Y	N
Yelden Meadows	TL009673	N	N

Table 9.2 Ramsar sites within and downstream of the study area

Ramsar Name	GRID REF	Potential hydrological link to waterbody downstream of Huntingdonshire?	WRC upstream?
Ouse Washes	TL490879	Y	Y
Woodwalton Fen	TL229844	Y	Y
Nene Washes	TL307999	Y	Y

Table 9.3 Special Protection Areas downstream of the study area

SPA Name	GRID REF	Potential hydrological link to waterbody downstream of Huntingdonshire? WRC upstream?	WRC upstream?
Ouse Washes	TL490879	Y	Y
Nene Washes	TL307999	Y	Y

Table 9.4 Special Areas of Conservation downstream of the study area

SAC Name	GRID REF	Potential hydrological link to waterbody downstream of Huntingdonshire?	WRC upstream?
Portholme	TL237707	Y	Y
Fenland	TL554701	Y	Y
Orton Pit	TL162941	Y	Y
Nene Washes	TL303990	Y	Y
Ouse Washes	TL480872	Y	Y

B Appendix B - WRC Deterioration

Modelled WRC	Ammonia	BOD	Phosphate
ALCONBURY STW	14.96%	-0.64%	-0.94%
BRAMPTON STW	12.76%	0.19%	6.85%
BUCKDEN STW	7.25%	-6.68%	1.44%
CATWORTH	0.00%	0.00%	0.00%
CATWORTH (HOSTEL) ST	6.98%	-0.19%	3.04%
COVINGTON STW	15.19%	0.57%	0.36%
EASTON(CAMBS) STW	16.98%	-0.36%	6.30%
ELTON STW	11.76%	0.04%	9.21%
GREAT GIDDING STW	11.11%	0.18%	0.43%
HAIL WESTON STW	8.75%	-0.18%	2.66%
HOLME STW	9.58%	-1.71%	7.17%
HUNTINGDON STW	10.70%	0.11%	6.66%
KIMBOLTON STW	14.92%	-0.04%	0.88%
KINGS RIPTON STW	19.47%	0.00%	0.95%
LEIGHTON	0.85%	-0.40%	2.21%
LITTLE STAUGHTON(N)	11.88%	-1.12%	9.18%
Lutton	18.30%	0.37%	3.34%
MOLESWORT	0.00%	0.00%	0.00%
MOLESWORTH STW	3.47%	2.98%	4.94%
Needingworth STW	12.05%	-0.11%	6.52%
OLD WESTON MAIN STREET STW	-0.99%	-0.57%	4.53%
OLDHURST STW	16.40%	-0.78%	2.65%
Over STW	4.24%	1.57%	-0.43%

Modelled WRC	Ammonia	BOD	Phosphate
PAPWORTH EVERARD STW	12.33%	-0.89%	3.27%
PAXTON STW	12.51%	0.26%	6.96%
Pertenhall STW	11.24%	-0.31%	7.47%
Flag Fen STW FE	12.00%	1.49%	10.27%
RAMSEY STW	14.17%	-1.06%	3.76%
SAWTRY STW	3.12%	-0.71%	0.22%
SOMERSHAM STW	0.16%	0.08%	0.09%
ST IVES STW	3.42%	-0.67%	-0.96%
ST NEOTS STW	13.05%	0.93%	7.22%
STIBBINGTON STW	10.23%	0.34%	9.53%
TILBROOK STW	13.92%	0.21%	0.67%
Upton Peterborough	11.01%	0.14%	9.65%
UPWOOD STW	4.75%	0.04%	2.80%
WARESLEY STW	12.21%	3.12%	3.54%
WOODWALTON WATER RECYCLING CENTRE	15.61%	1.69%	8.87%
WYTON STW (EXRAF)	12.70%	0.00%	6.66%

C Appendix C - Reasons for not achieving good status

Waterbody	Reason	Element
Willow Brook (Nene)	Agriculture and rural land management. Sewage discharge	Macrophytes and Phytobenthos Combined. Phosphate
Billing Brook	Agriculture and rural land management	Invertebrates Macrophytes and Phytobenthos Combined
Stanground Lode	Flood protection Urbanisation	Mitigation Measures Assessment Mitigation Measures Assessment
Nene - Islip to tidal	Navigation Agriculture and rural land management Water Industry	Mitigation Measures Assessment Phosphate Phosphate
Hog Dyke	Sewage discharge Agriculture and rural land management Transport Drainage	Phosphate Invertebrates Macrophytes and Phytobenthos Combined Phosphate Phosphate Invertebrates
Thorpe Waterville Brook	Agriculture and rural land management. Sewage discharge	Macrophytes and Phytobenthos Combined Phosphate Invertebrates Dissolved oxygen Phosphate Dissolved oxygen
Millbridge and Potton Brooks	Sewage discharge Agriculture and rural land management Land drainage	Invertebrates Macrophytes and Phytobenthos Combined Phosphate Macrophytes and

Waterbody	Reason	Element
		Phytobenthos Combined Invertebrates
Ouse (Roxton to Earith)	Recreation Flood protection Sewage discharge Agriculture and rural land management	Mitigation Measures Assessment Mitigation Measures Assessment Phosphate Phosphate
Colmworth Brook	Agriculture and rural land management Flood protection	Invertebrates Macrophytes and Phytobenthos Combined Invertebrates
Abbotsley and Hen Brooks	Agriculture and rural land management Urbanisation Flood protection Sewage discharge Drought	Mitigation Measures Assessment Dissolved oxygen Invertebrates Mitigation Measures Assessment Invertebrates Mitigation Measures Assessment Dissolved oxygen Invertebrates Invertebrates Dissolved oxygen Phosphate Dissolved oxygen
Duloe Brook	Sewage discharge	Phosphate

Waterbody	Reason	Element
Kym	Agriculture and rural land management Flood protection Barriers to ecology Flood protection Drought	Mitigation Measures Assessment Mitigation Measures Assessment Fish Fish Dissolved oxygen
Diddington Brook	Agriculture and rural land management Water supply/regulation	Mitigation Measures Assessment Mitigation Measures Assessment
Stone Brook	Sewage discharge Drought Agriculture and rural land management	Ammonia (Phys-Chem) Invertebrates Phosphate Dissolved oxygen Dissolved oxygen Invertebrates
Pertenhall Brook	Sewage discharge Agriculture and rural land management Flood protection Natural conditions	Dissolved oxygen Phosphate Ammonia (Phys-Chem) Phosphate Mitigation Measures Assessment Mitigation Measures Assessment Dissolved oxygen
Kym (and Til)	Flood protection Agriculture and rural land management Sewage discharge Natural conditions	Invertebrates Mitigation Measures Assessment Mitigation Measures Assessment Invertebrates Phosphate Ammonia (Phys-Chem) Dissolved oxygen
Bury Brook	Flood protection Agriculture and rural land management Sewage discharge Recreation	Mitigation Measures Assessment Invertebrates Mitigation Measures Assessment

Waterbody	Reason	Element
		Dissolved oxygen Invertebrates Phosphate Invertebrates Dissolved oxygen Phosphate
Bourn Brook	Flood protection Agriculture and rural land management Sewage discharge	Mitigation Measures Assessment Fish Mitigation Measures Assessment Fish Phosphate
West Brook	Sewage discharge Agriculture and rural land management Private sewage treatment Flood protection	Phosphate Phosphate Invertebrates Phosphate Invertebrates
Marley Gap Brook	Agriculture and rural land management Flood protection Urbanisation Sewage discharge	Mitigation Measures Assessment Mitigation Measures Assessment Invertebrates Mitigation Measures Assessment Phosphate Invertebrates
Alconbury and Brampton Brooks	Sewage discharge Flood protection Agriculture and rural land management Drought	Dissolved oxygen Phosphate Invertebrates Invertebrates Mitigation Measures Assessment Phosphate Mitigation Measures Assessment Dissolved oxygen

Waterbody	Reason	Element
Cock Brook	Sewage discharge Drought Agriculture and rural land management Barriers to ecology	Dissolved oxygen Phosphate Phosphate Dissolved oxygen Fish Mitigation Measures Assessment Fish Phosphate Fish
Alconbury Brook	Sewage discharge Barriers to ecology Drought Agriculture and rural land management	Dissolved oxygen Invertebrates Fish Fish Dissolved oxygen Fish Invertebrates Fish Invertebrates
Ellington Brook (Trib)	Agriculture and rural land management Drought	Phosphate Dissolved oxygen
Ellington Brook	Agriculture and rural land management Flood protection Urbanisation Private sewage treatment Sewage discharge	Invertebrates Mitigation Measures Assessment Phosphate Dissolved oxygen Mitigation Measures Assessment Dissolved oxygen Invertebrates Mitigation Measures Assessment Dissolved oxygen Dissolved oxygen Phosphate Invertebrates Phosphate Invertebrates

Waterbody	Reason	Element
		Dissolved oxygen
Middle Level	Abstraction	Hydrological regime
Old Bedford River / River Delph (inc The Hundred Foot Washes)	Flood protection	Fish
Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	Abstraction Sewage discharge	Hydrological regime Ammonia (Phys-Chem)

D Appendix D - Groundwater Dependent Terrestrial Ecosystems

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1003973	Alder Carr (SSSI)	Cam and Ely Ouse Chalk	Yes
1004488	Alder Wood & Meadow (SSSI)	Nene Northampton Sands	No
1004488	Alder Wood & Meadow (SSSI)	Nene Mid Lower Jurassic Unit	No
1002551	Aldwincle Marsh (SSSI)	Nene Northampton Sands	No
1002551	Aldwincle Marsh (SSSI)	Nene Mid Lower Jurassic Unit	No
1002262	Arger Fen (SSSI)	North Essex Chalk	Yes
1001965	Ashdon Meadows (SSSI)	Cam and Ely Ouse Chalk	Yes
1000593	Ashwell Springs (SSSI)	Cam and Ely Ouse Chalk	Yes
1002620	Badby Wood (SSSI)	Nene Mid Lower Jurassic Unit	No
1002620	Badby Wood (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1002331	Barnham Heath (SSSI)	Cam and Ely Ouse Chalk	Yes
1000547	Barnhamcross Common (SSSI)	Cam and Ely Ouse Chalk	Yes
1006626	Baynhall Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1001413	Bestmoor (SSSI)	Banbury Jurassic	No
1002664	Birch Spinney & Mawsley Marsh (SSSI)	Nene Mid Lower Jurassic Unit	No
1000942	Bittell Reservoirs (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1000847	Blagrove Common (SSSI)	Upper Bedford Ouse Chalk	Yes
1000633	Blo' Norton & Thelnetham Fens (SSSI)	Cam and Ely Ouse Chalk	Yes
1005495	Blow's Down (SSSI)	Upper Bedford Ouse Chalk	Yes
1000112	Bonemills Hollow (SSSI)	Welland Limestone Unit A	Yes
1002171	Bosworth Mill Meadow	Warwickshire Avon -	No

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
	(SSSI)	Secondary Mudrocks	
1000663	Boughton Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1001277	Bozeat Meadow (SSSI)	Nene Mid Lower Jurassic Unit	No
1000167	Brackland Rough (SSSI)	Cam and Ely Ouse Chalk	Yes
1001151	Brandon Marsh (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003078	Bridgham & Brettenham Heaths (SSSI)	Cam and Ely Ouse Chalk	Yes
1005617	Bugbrooke Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003517	Bugg's Hole, Thelnetham (SSSI)	Cam and Ely Ouse Chalk	Yes
1004276	Bulwick Meadows (SSSI)	Welland Limestone Unit A	Yes
1004276	Bulwick Meadows (SSSI)	Nene Mid Lower Jurassic Unit	No
1006390	Burley & Rushpit Woods (SSSI)	Welland Lower Jurassic Unit	No
1000932	Calcutt Locks Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1004020	Cam Washes (SSSI)	Cam and Ely Ouse Woburn Sands	No
1000293	Castor Flood Meadows (SSSI)	Northampton Sands	No
1000293	Castor Flood Meadows (SSSI)	Nene Mid Lower Jurassic Unit	No
1001593	Castor Hanglands (SSSI)	Northampton Sands	No
1001593	Castor Hanglands (SSSI)	Nene Mid Lower Jurassic Unit	No
1000992	Cavenham-Icklingham Heaths (SSSI)	Cam and Ely Ouse Chalk	Yes
1003549	Cave's Inn Pits (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003619	Chater Valley (SSSI)	Welland Lower Jurassic Unit	No
1003217	Cherry Hill & The Gallops, Barton Mills (SSSI)	Cam and Ely Ouse Chalk	Yes

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1001619	Chippenham Fen & Snailwell Poor's Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1005946	Cooksholme Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003307	Cornard Mere, Little Cornard (SSSI)	North Essex Chalk	Yes
1001552	Cranberry Rough, Hockham (SSSI)	Cam and Ely Ouse Chalk	Yes
1003656	Dagnell End Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1007251	Dean Brook Valley Pastures (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1002925	Debden Water (SSSI)	Cam and Ely Ouse Chalk	Yes
1005499	Delph Bridge Drain (SSSI)	Cam and Ely Ouse Woburn Sands	No
1000388	Dernford Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1001678	Didlington Park Lakes (SSSI)	Cam and Ely Ouse Chalk	Yes
1007253	Dormston Church Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1001298	Draycote Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
2000079	Drybank Meadow, Cherington (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1004206	Dungee Corner Meadow (SSSI)	Northampton Sands	No
1003780	East Harling Common (SSSI)	Cam and Ely Ouse Chalk	Yes
1001738	East Wretham Heath (SSSI)	Cam and Ely Ouse Chalk	Yes
2000085	Elm Road Field, Thetford (SSSI)	Cam and Ely Ouse Chalk	Yes
1004415	Empingham Marshy Meadows (SSSI)	Welland Limestone Unit A	Yes
1004415	Empingham Marshy Meadows (SSSI)	Welland Lower Jurassic Unit	No
1000520	Fancott Woods & Meadows (SSSI)	Upper Bedford Ouse Chalk	Yes

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1000541	Felmersham Gravel Pits (SSSI)	Upper Bedford Ouse Principal Oolite 2	No
1000558	Flitwick Moor (SSSI)	Upper Bedford Ouse Woburn Sands	Yes
1004455	Foster's Green Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1002450	Foulden Common (SSSI)	Cam and Ely Ouse Chalk	Yes
1001079	Fowlmere Watercress Beds (SSSI)	Cam and Ely Ouse Chalk	Yes
1001093	Fulbourn Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1000571	Galley & Warden Hills (SSSI)	Upper Bedford Ouse Chalk	Yes
1004480	Grafton Wood (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1007249	Great Blaythorn Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1000080	Great Bowden Borrowpit (SSSI)	Welland Lower Jurassic Unit	No
1000561	Great Cressingham Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1002271	Great Wilbraham Common (SSSI)	Cam and Ely Ouse Chalk	Yes
1001247	Greetham Meadows (SSSI)	Welland Limestone Unit A	Yes
1003048	Grimsthorpe Park (SSSI)	Welland Mid Jurassic Unit	Yes
1002746	Hardwick Lodge Meadow (SSSI)	Nene Mid Lower Jurassic Unit	No
1005052	Herald Way Marsh (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1000092	Hewell Park Lake (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1001149	Hooks Well Meadows, Great Cressingham (SSSI)	Cam and Ely Ouse Chalk	Yes
1004395	Hopton Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1002960	Houghton Regis Marl Lakes (SSSI)	Upper Bedford Ouse Chalk	Yes
1000148	Ipsley Alders Marsh (SSSI)	Warwickshire Avon - Secondary Mudrocks	No

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1000583	Kenninghall & Banham Fens with Quidenham Mere (SSSI)	Cam and Ely Ouse Chalk	Yes
1000638	King's Wood & Glebe Meadows, Houghton Conquest (SSSI)	Upper Bedford Ouse Woburn Sands	Yes
1002559	Knettishall Heath (SSSI)	Cam and Ely Ouse Chalk	Yes
2000068	Lackford Lakes (SSSI)	Cam and Ely Ouse Chalk	Yes
1004452	Lakenheath Poors Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1004467	Lakenheath Warren (SSSI)	Cam and Ely Ouse Chalk	Yes
1004495	Lineage Wood & Railway Track, Long Melford (SSSI)	North Essex Chalk	Yes
1001329	L-moor, Shepreth (SSSI)	Cam and Ely Ouse Chalk	Yes
2000248	Lobbington Hall Farm Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1000925	Long Meadow, Thorn (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
2000258	Lower Saleway Farm Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1002460	Loxley Church Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1004407	Maulden Church Meadow (SSSI)	Upper Bedford Ouse Woburn Sands	Yes
1000725	Maulden Wood & Pennyfather's Hills (SSSI)	Upper Bedford Ouse Woburn Sands	Yes
1001617	Merriman's Hill Farm Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1000696	Middle Harling Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1002454	Midsummer Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1005498	Mill Crook (SSSI)	Upper Bedford Ouse Oolite Secondary	No
1004320	Misterton Marshes (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1007252	Naunton Court Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1004142	New Buckenham Common (SSSI)	Cam and Ely Ouse Chalk	Yes
1006650	Newmarket Heath (SSSI)	Cam and Ely Ouse Chalk	Yes
2000251	Oak Tree Farm Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003600	Old Buckenham Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1001341	Out & Plunder Woods (SSSI)	Cam and Ely Ouse Chalk	Yes
1001112	Owston Woods (SSSI)	Welland Lower Jurassic Unit	No
1005849	Pakenham Meadows (SSSI)	Cam and Ely Ouse Chalk	Yes
1000899	Pashford Poors Fen, Lakenheath (SSSI)	Cam and Ely Ouse Chalk	Yes
1001296	Plumpton Pasture (SSSI)	Upper Bedford Ouse Oolite Secondary	No
1000412	Porter's Lodge Meadows (SSSI)	Welland Mid Jurassic Unit	Yes
1000412	Porter's Lodge Meadows (SSSI)	Welland Limestone Unit A	Yes
1006624	Portway Farm Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003677	Potter's Carr, Cranworth (SSSI)	Cam and Ely Ouse Chalk	Yes
2000249	Racecourse Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
2000348	Railway Meadow, Langley (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1007250	Rectory Farm Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003726	Redgrave & Lopham Fens (SSSI)	Cam and Ely Ouse Chalk	Yes
1004261	River Ise & Meadows (SSSI)	Nene Mid Lower Jurassic Unit	No
1005547	River Itchen (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1007254	Rookery Cottage Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1001220	Rutland Water (SSSI)	Welland Limestone Unit A	Yes
1001220	Rutland Water (SSSI)	Welland Lower Jurassic Unit	No
2000360	Saddington Reservoir (SSSI)	Welland Lower Jurassic Unit	No
1002202	Salt Meadow, Earl's Common (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1002256	Sawston Hall Meadows (SSSI)	Cam and Ely Ouse Chalk	Yes
1003828	Scoulton Mere (SSSI)	Cam and Ely Ouse Chalk	Yes
1006052	Seaton Meadows (SSSI)	Welland Lower Jurassic Unit	No
1001268	Shacklewell Hollow (SSSI)	Welland Limestone Unit A	Yes
1001268	Shacklewell Hollow (SSSI)	Welland Lower Jurassic Unit	No
1006459	Sherbourne Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1001483	Smithcombe, Sharpenhoe & Sundon Hills (SSSI)	Upper Bedford Ouse Chalk	Yes
1002236	Snailwell Meadows (SSSI)	Cam and Ely Ouse Chalk	Yes
1002294	Soham Wet Horse Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1004156	Southfield Farm Marsh (SSSI)	Nene Mid Lower Jurassic Unit	No
1002139	Southorpe Meadow (SSSI)	Welland Limestone Unit A	Yes
1003893	Southorpe Paddock (SSSI)	Welland Limestone Unit A	Yes
1003893	Southorpe Paddock (SSSI)	Nene Mid Lower Jurassic Unit	No
1000993	Stallode Wash, Lakenheath (SSSI)	Cam and Ely Ouse Chalk	Yes
1000005	Stanford Training Area (SSSI)	Cam and Ely Ouse Chalk	Yes
1001505	Stevington Marsh (SSSI)	Upper Bedford Ouse Principal Oolite 2	No
1007255	Stock Wood Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1002332	Stow cum Quy Fen (SSSI)	Cam and Ely Ouse Chalk	Yes

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1004107	Sudborough Green Lodge Meadow (SSSI)	Nene Northampton Sands	No
1005586	Sundon Chalk Quarry (SSSI)	Upper Bedford Ouse Chalk	Yes
1002363	Sutton Heath & Bog (SSSI)	Northampton Sands	No
1002363	Sutton Heath & Bog (SSSI)	Welland Limestone Unit A	Yes
1002363	Sutton Heath & Bog (SSSI)	Nene Mid Lower Jurassic Unit	No
1000134	Swangey Fen, Attleborough (SSSI)	Cam and Ely Ouse Chalk	Yes
2000025	The Brinks, Northwold (SSSI)	Cam and Ely Ouse Chalk	Yes
1005772	The Gardens, Great Ashfield (SSSI)	Cam and Ely Ouse Chalk	Yes
1000192	Thetford Golf Course & Marsh (SSSI)	Cam and Ely Ouse Chalk	Yes
1000249	Thompson Water, Carr & Common (SSSI)	Cam and Ely Ouse Chalk	Yes
1002410	Thriplow Meadows (SSSI)	Cam and Ely Ouse Chalk	Yes
1002433	Thriplow Peat Holes (SSSI)	Cam and Ely Ouse Chalk	Yes
1004378	Tickencote Marsh (SSSI)	Welland Limestone Unit A	Yes
1004378	Tickencote Marsh (SSSI)	Welland Lower Jurassic Unit	No
1003066	Tiddesley Wood (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1002674	Titchmarsh Meadow (SSSI)	Northampton Sands	No
1007256	Trickses Hole (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003442	Ullenhall Meadows (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
2000494	Upper Nene Valley Gravel Pits (SSSI)	Nene Northampton Sands	No
2000494	Upper Nene Valley Gravel Pits (SSSI)	Northampton Sands	No
2000494	Upper Nene Valley Gravel	Nene Mid Lower Jurassic	No

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
	Pits (SSSI)	Unit	
1001648	Wadenhoe Marsh & Achurch Meadow (SSSI)	Nene Northampton Sands	No
1001648	Wadenhoe Marsh & Achurch Meadow (SSSI)	Northampton Sands	No
1001648	Wadenhoe Marsh & Achurch Meadow (SSSI)	Nene Mid Lower Jurassic Unit	No
1001871	Wangford Warren & Carr (SSSI)	Cam and Ely Ouse Chalk	Yes
1003825	Wansford Pasture (SSSI)	Welland Limestone Unit A	Yes
1003825	Wansford Pasture (SSSI)	Nene Mid Lower Jurassic Unit	No
1001584	Wavendon Heath Ponds (SSSI)	Upper Bedford Ouse Woburn Sands	Yes
1000350	Wayland Wood (SSSI)	Cam and Ely Ouse Chalk	Yes
2000358	Welford Field (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1001970	West Stow Heath (SSSI)	Cam and Ely Ouse Chalk	Yes
1003851	West, Abbot's & Lound Woods (SSSI)	Welland Limestone Unit A	Yes
1005773	Westhall Wood & Meadow (SSSI)	Cam and Ely Ouse Chalk	Yes
1001985	Weston Fen (SSSI)	Cam and Ely Ouse Chalk	Yes
1002348	Whichford Wood (SSSI)	Warwickshire Avon - Secondary Mudrocks	No
1003241	Whitewater Valley (SSSI)	Welland Limestone Unit A	Yes
1000877	Whittlesford-Thriplow Hummocky Fields (SSSI)	Cam and Ely Ouse Chalk	Yes
1003251	Wicken Fen (SSSI)	Cam and Ely Ouse Woburn Sands	No
1003284	Wilbraham Fens (SSSI)	Cam and Ely Ouse Chalk	Yes
1003809	Wilde Street Meadow, Mildenhall (SSSI)	Cam and Ely Ouse Chalk	Yes
1002184	Wollaston Meadows (SSSI)	Nene Mid Lower Jurassic Unit	No
1002144	Wretham Park Meres (SSSI)	Cam and Ely Ouse Chalk	Yes
1000459	Wylde Moor, Feckenham (SSSI)	Warwickshire Avon - Secondary Mudrocks	No

SSSI CODE	GWDTE NAME	WB NAME	SWMI for flow
1004179	Yardley Chase (SSSI)	Northampton Sands	No
1004179	Yardley Chase (SSSI)	Upper Bedford Ouse Principal Oolite 2	No
1006625	Yellow House Meadow (SSSI)	Warwickshire Avon - Secondary Mudrocks	No

E Appendix E - Protected sites adjacent to rivers within WRZs serving HDC

E.1 SSSIs

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Adventurers' Land	TF361019	GB205032050385	North Level Pumped Areas 2 and 3	No
Alder Carr	TL542489	GB105033037810	Granta	Yes
Aldwincle Marsh	TL004807	GB105032045230	Harpers Brook	Yes
Bassenhally Pit	TL286985	GB105032050382	Mortons Leam	No
Baston and Thurlby Fens	TF131169	GB105031050720	Glen	No
Baston and Thurlby Fens	TF131169	GB205031050705	Vernatt's Drain	No
Berry Fen	TL378745	GB105033047921	Ouse (Roxton to Earith)	No
Bonemills Hollow	TF035012	GB105032050350	Wittering Brook	No
Bosworth Mill Meadow	SP628822	GB109054043930	Avon (Warks) - source to Claycoton-Yelvertoft Bk	No
Bozeat Meadow	SP901590	GB105032045040	Grendon Brook	No
Brampton Meadow	TL192720	GB105033042870	Ellington Brook	No
Brampton Racecourse	TL203722	GB105033042790	Alconbury and Brampton Brooks	No
Breckland Farmland	TL760783	GB205033000040	Cut-off Channel	No
Breckland Forest	TL819835	GB205033000040	Cut-off Channel	No
Breckland Forest	TL819835	GB205033000070	Ely Ouse (South Level)	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Bugbrooke Meadows	SP671587	GB105032045320	Nene - conf Whilton Branch to conf Brampton Branch	No
Bulwick Meadows	SP961943	GB105032050290	Willow Brook (Nene)	No
Calender Meadows	SP685749	GB105032045530	Cottesbrooke Brook	No
Cam Washes	TL538728	GB105033042720	Burwell Lode	No
Cam Washes	TL538728	GB105033042750	Cam	No
Cam Washes	TL538728	GB205033000070	Ely Ouse (South Level)	No
Cam Washes	TL538728	GB205033043375	Old West River	No
Castor Flood Meadows	TL123972	GB105032050330	Billing Brook	No
Castor Flood Meadows	TL123972	GB105032050381	Nene - Islip to tidal	No
Cowbit Wash	TF240191	GB205031050685	Welland - conf Greatford Cut to tidal	No
Cross Drain	TF160136	GB205031050705	Vernatt's Drain	No
Deeping Gravel Pits	TF178081	GB205031050705	Vernatt's Drain	No
Deeping Gravel Pits	TF178081	GB205031050685	Welland - conf Greatford Cut to tidal	No
Delph Bridge Drain	TL567768	GB205033000070	Ely Ouse (South Level)	No
Ely Pits and Meadows	TL558807	GB205033000070	Ely Ouse (South Level)	No
Fancott Woods and Meadows	TL025275	GB105033037640	Flit	No
Felmersham Gravel Pits	SP990584	GB105033047923	Ouse (Newport Pagnell to Roxton)	No
Fleam Dyke	TL542548	GB105033042700	Bottisham Lode - Quy Water	No
Flitwick Moor	TL046350	GB105033037790	Flit and Ivel Navigation d/s of Shefford	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Fowlmere Watercress Beds	TL406454	GB105033038080	Shep	No
Fulbourn Fen	TL530561	GB105033042700	Bottisham Lode - Quy Water	No
Godmanchester Eastside Common	TL269713	GB105033047921	Ouse (Roxton to Earith)	No
Grafham Water	TL148680	GB105033043310	Diddington Brook	No
Great Wilbraham Common	TL533576	GB105033042700	Bottisham Lode - Quy Water	No
Hilgay Heronry	TL635992	GB205033000070	Ely Ouse (South Level)	No
Holme Fen	TL206889	GB205033000050	Middle Level	No
Houghton Meadows	TL293716	GB105033047921	Ouse (Roxton to Earith)	No
Kingston Wood and Outliers	TL328542	GB105033042690	Bourn Brook	No
Lakenheath Poors Fen	TL701827	GB205033000070	Ely Ouse (South Level)	No
Little Paxton Pits	TL199637	GB105033043310	Diddington Brook	No
Little Paxton Pits	TL199637	GB105033047921	Ouse (Roxton to Earith)	No
L-moor, Shepreth	TL386475	GB105033038080	Shep	No
Luffenham Heath Golf Course	SK958023	GB105031050440	Chater - Lower	No
Luffenham Heath Golf Course	SK958023	GB105031050580	Welland - conf Langton Bk to conf Gwash	No
Math and Elsea Wood	TF097183	GB105031050720	Glen	No
Monks Wood and The Odd Quarter	TL196801	GB105033043140	Bury Brook	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Monks Wood and The Odd Quarter	TL196801	GB205033000050	Middle Level	No
Nares Gladley Marsh	SP907277	GB105033037971	Ouzel US Caldecote Mill	No
Nene Washes	TL307999	GB205033000050	Middle Level	No
Nene Washes	TL307999	GB105032050382	Mortons Leam	No
Nene Washes	TL307999	GB105032050381	Nene - Islip to tidal	No
Nene Washes	TL307999	GB205032050385	North Level Pumped Areas 2 and 3	No
Orton Pit	TL162941	GB105032050340	Stanground Lode	No
Ouse Washes	TL490879	GB205033000020	Counter Drain (Manea and Welney IDB)	No
Ouse Washes	TL490879	GB205033000010	Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	No
Ouse Washes	TL490879	GB205033000030	Counter Drain (Upwell and Outwell IDB)	No
Ouse Washes	TL490879	GB205033000070	Ely Ouse (South Level)	No
Ouse Washes	TL490879	GB205033000060	Old Bedford River / River Delph (inc The Hundred Foot Washes)	No
Ouse Washes	TL490879	GB105033047921	Ouse (Roxton to Earith)	No
Overhall Grove	TL338630	GB105033042740	Fen Drayton Drain	No
Pitsford Reservoir	SP770695	GB105032045470	Pitsford Arm of the Brampton Branch	No
Portholme	TL236708	GB105033042790	Alconbury and Brampton Brooks	No
Portholme	TL236708	GB105033047921	Ouse (Roxton to Earith)	No
River Ise and Meadows	SP882830	GB105032045200	Ise - Upper	No
River Nar	TF834169	GB105033047662	Polver Drain	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Sawston Hall Meadows	TL491490	GB105033037590	Cam (Audley End to Stapleford)	Yes
Seaton Meadows	SP915979	GB105031050530	Uppingham Brook	No
Setchey	TF632131	GB105033047662	Polver Drain	No
Shacklewell Hollow	SK976077	GB105031050610	Gwash	No
Shippea Hill	TL637850	GB205033000070	Ely Ouse (South Level)	No
Soham Wet Horse Fen	TL612725	GB205033000070	Ely Ouse (South Level)	No
Southfield Farm Marsh	SP884758	GB105032045140	Ise - Lower	No
Southill Lake and Woods	TL142428	GB105033037800	Ickwell Brook	No
St. Neot's Common	TL182612	GB105033047921	Ouse (Roxton to Earith)	No
Stallode Wash, Lakenheath	TL675853	GB205033000070	Ely Ouse (South Level)	No
Stanford Park	SP586792	GB109054043930	Avon (Warks) - source to Claycoton-Yelvertoft Bk	No
Stevington Marsh	SP985551	GB105033047923	Ouse (Newport Pagnell to Roxton)	No
Stow-cum-Quy Fen	TL514627	GB105033042700	Bottisham Lode - Quy Water	No
Surfleet Lows	TF251286	GB105031050720	Glen	No
Sutton Heath and Bog	TF089000	GB105032050350	Wittering Brook	No
Tebworth Marsh	SP982289	GB105033037830	Clipstone Brook	No
The Brinks, Northwold	TL757955	GB205033000040	Cut-off Channel	No
Thriplow Meadows	TL437469	GB105033038120	Hoffer Brook	No
Thriplow Peat Holes	TL450475	GB105033038120	Hoffer Brook	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Tickencote Marsh	SK982091	GB105031050610	Gwash	No
Titchmarsh Meadow	TL030796	GB105032045190	Thorpe Waterville Brook	No
Upper Nene Valley Gravel Pits	SP971720	GB105032045130	Addington Brook	No
Upper Nene Valley Gravel Pits	SP971720	GB105032045090	Chelveston Brook	No
Upper Nene Valley Gravel Pits	SP971720	GB105032045330	Grendon Brook	No
Upper Nene Valley Gravel Pits	SP971720	GB105032045230	Harpers Brook	Yes
Upper Nene Valley Gravel Pits	SP971720	GB105032045120	Hog Dyke	No
Upper Nene Valley Gravel Pits	SP971720	GB105032045140	Ise - Lower	No
Upper Nene Valley Gravel Pits	SP971720	GB105032045060	Knuston Brook	No
Upper Nene Valley Gravel Pits	SP971720	GB105032045050	Nene - conf Brampton Branch to conf Ise	No
Upper Nene Valley Gravel Pits	SP971720	GB105032050383	Nene - conf Ise to Islip	No
Upper Nene Valley Gravel Pits	SP971720	GB105032050381	Nene - Islip to tidal	No
Upware North Pit	TL544727	GB205033000070	Ely Ouse (South Level)	No
Upware South Pit	TL539709	GB105033042750	Cam	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Wadenhoe Marsh and Achurch Meadow	TL009826	GB105032050381	Nene - Islip to tidal	No
Wangford Warren and Carr	TL755839	GB205033000040	Cut-off Channel	No
Wansford Pasture	TL069994	GB105032050381	Nene - Islip to tidal	No
West Abbot's and Lound Woods	TF059010	GB105032050350	Wittering Brook	No
Whitewater Valley	TF043036	GB105032050350	Wittering Brook	No
Whittlesford - Thriplow Hummocky Fields	TL447484	GB105033037600	Cam (Stapleford to Hauxton Junction)	No
Whittlesford - Thriplow Hummocky Fields	TL447484	GB105033038120	Hoffer Brook	No
Wicken Fen	TL554701	GB105033042720	Burwell Lode	No
Wiggenhall St. Germans	TF588138	GB205033000050	Middle Level	No
Wilbraham Fens	TL519591	GB105033042700	Bottisham Lode - Quy Water	No
Wollaston Meadows	SP897648	GB105032045050	Nene - conf Brampton Branch to conf Ise	No
Woodwalton Fen	TL229844	GB205033000050	Middle Level	No
Wretton	TL684992	GB205033000040	Cut-off Channel	No
Wretton	TL684992	GB205033000070	Ely Ouse (South Level)	No

E.2 SACs

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Baston Fen	UK0030085	GB205031050705	Vernatt's Drain	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Portholme	UK0030054	GB105033047921	Ouse (Roxton to Earith)	No
Portholme	UK0030054	GB105033042790	Alconbury and Brampton Brooks	No
Fenland	UK0014782	GB105033042720	Burwell Lode	No
Fenland	UK0014782	GB205033000050	Middle Level	No
Orton Pit	UK0030053	GB105032050340	Stanground Lode	No
Nene Washes	UK0030222	GB105032050382	Mortons Leam	No
Nene Washes	UK0030222	GB205033000050	Middle Level	No
Breckland	UK0019865	GB205033000040	Cut-off Channel	No
Ouse Washes	UK0013011	GB105033047921	Ouse (Roxton to Earith)	No
Ouse Washes	UK0013011	GB205033000060	Old Bedford River / River Delph (inc The Hundred Foot Washes)	No
Ouse Washes	UK0013011	GB205033000070	Ely Ouse (South Level)	No
Ouse Washes	UK0013011	GB205033000010	Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	No
Ouse Washes	UK0013011	GB205033000020	Counter Drain (Manea and Welney IDB)	No
Ouse Washes	UK0013011	GB205033000030	Counter Drain (Upwell and Outwell IDB)	No

E.3 SPAs

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Breckland	UK9009201	GB205033000040	Cut-off Channel	No
Breckland	UK9009201	GB205033000070	Ely Ouse (South Level)	No
Nene Washes	UK9008031	GB205033000050	Middle Level	No
Nene Washes	UK9008031	GB105032050382	Mortons Leam	No
Nene Washes	UK9008031	GB105032050381	Nene - Islip to tidal	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Nene Washes	UK9008031	GB205032050385	North Level Pumped Areas 2 and 3	No
Ouse Washes	UK9008041	GB205033000020	Counter Drain (Manea and Welney IDB)	No
Ouse Washes	UK9008041	GB205033000010	Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	No
Ouse Washes	UK9008041	GB205033000030	Counter Drain (Upwell and Outwell IDB)	No
Ouse Washes	UK9008041	GB205033000070	Ely Ouse (South Level)	No
Ouse Washes	UK9008041	GB205033000060	Old Bedford River / River Delph (inc The Hundred Foot Washes)	No
Ouse Washes	UK9008041	GB105033047921	Ouse (Roxton to Earith)	No
Upper Nene Valley Gravel Pits	UK9020296	GB105032045130	Addington Brook	No
Upper Nene Valley Gravel Pits	UK9020296	GB105032045090	Chelveston Brook	No
Upper Nene Valley Gravel Pits	UK9020296	GB105032045330	Grendon Brook	No
Upper Nene Valley Gravel Pits	UK9020296	GB105032045230	Harpers Brook	Yes
Upper Nene Valley Gravel Pits	UK9020296	GB105032045120	Hog Dyke	No
Upper Nene Valley Gravel Pits	UK9020296	GB105032045140	Ise - Lower	No
Upper Nene Valley Gravel	UK9020296	GB105032045060	Knuston Brook	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Pits				
Upper Nene Valley Gravel Pits	UK9020296	GB105032045050	Nene - conf Brampton Branch to conf Ise	No
Upper Nene Valley Gravel Pits	UK9020296	GB105032050383	Nene - conf Ise to Islip	No
Upper Nene Valley Gravel Pits	UK9020296	GB105032050381	Nene - Islip to tidal	No

E.4 Ramsar sites

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Nene Washes	UK11046	GB205033000050	Middle Level	No
Nene Washes	UK11046	GB105032050382	Mortons Leam	No
Nene Washes	UK11046	GB105032050381	Nene - Islip to tidal	No
Nene Washes	UK11046	GB205032050385	North Level Pumped Areas 2 and 3	No
Ouse Washes	UK11051	GB205033000020	Counter Drain (Manea and Welney IDB)	No
Ouse Washes	UK11051	GB205033000010	Counter Drain (Sutton and Mepal IDB incl. Cranbrook Drain)	No
Ouse Washes	UK11051	GB205033000030	Counter Drain (Upwell and Outwell IDB)	No
Ouse Washes	UK11051	GB205033000070	Ely Ouse (South Level)	No
Ouse Washes	UK11051	GB205033000060	Old Bedford River / River Delph (inc The Hundred Foot Washes)	No
Ouse Washes	UK11051	GB105033047921	Ouse (Roxton to Earith)	No
Upper Nene Valley Gravel	UK11083	GB105032045130	Addington Brook	No

NAME	CODE	Waterbody ID	Waterbody Name	SWMI Flow
Pits				
Upper Nene Valley Gravel Pits	UK11083	GB105032045090	Chelveston Brook	No
Upper Nene Valley Gravel Pits	UK11083	GB105032045330	Grendon Brook	No
Upper Nene Valley Gravel Pits	UK11083	GB105032045230	Harpers Brook	Yes
Upper Nene Valley Gravel Pits	UK11083	GB105032045120	Hog Dyke	No
Upper Nene Valley Gravel Pits	UK11083	GB105032045140	Ise - Lower	No
Upper Nene Valley Gravel Pits	UK11083	GB105032045060	Knuston Brook	No
Upper Nene Valley Gravel Pits	UK11083	GB105032045050	Nene - conf Brampton Branch to conf Ise	No
Upper Nene Valley Gravel Pits	UK11083	GB105032050383	Nene - conf Ise to Islip	No
Upper Nene Valley Gravel Pits	UK11083	GB105032050381	Nene - Islip to tidal	No
Wicken Fen	UK11077	GB105033042720	Burwell Lode	No
Woodwalton Fen	UK11078	GB205033000050	Middle Level	No

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