East Cambridgeshire District Water Cycle Study

Final Draft Report

November 2017

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Contract

This report describes work commissioned by East Cambridgeshire District Council. The Council's representative for the contract was Edward Dade. Rebecca Price, Richard Pardoe and Alistair Clark of JBA Consulting carried out this work.

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Purpose

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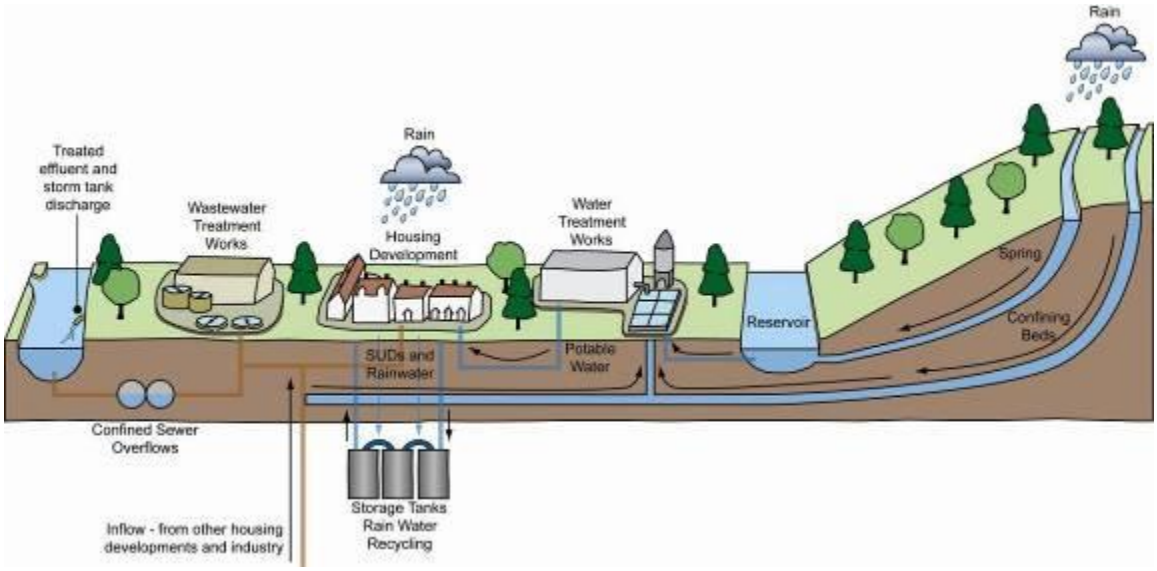
Executive Summary

Introduction

JBA Consulting was commissioned to undertake a Water Cycle Study (WCS) for East Cambridgeshire District Council (ECDC).

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. It is possible that allocating large numbers of new homes at some locations may result in the capacity of existing available infrastructure being exceeded. This situation could potentially lead to service failures to water and wastewater customers, adverse impacts to the environment or high costs for the upgrade of water and wastewater assets being passes on to bill payers. Climate change presents additional future challenges such as increased intensive rainfall and a higher frequency of drought events that can be expected to put greater pressure on the existing infrastructure. Sustainable planning for water must take this into account. The water cycle can be seen in below, and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

Figure 1-1: The Water Cycle



This study will assist the council to select and develop sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure and flood risk. This has been achieved by identifying areas where there may be conflict between any proposed development and the requirements of the environment and by recommending potential solutions.

The Water Cycle Study should be treated as a "dynamic document" that is periodically reviewed as further information becomes available. This will provide a better understanding of the impact of the developments on the water supply and wastewater infrastructure and water quality.

Development Scenarios and Policy Issues

East Cambridgeshire District Council (ECDC) are in the process of reviewing their Local Plan. An updated Objectively Assessed Needs assessment has been prepared to inform the overall scale of growth required in the district. In addition, the emerging Local Plan explores the application of government's proposed Local Housing Need (LHN) methodology for calculating housing requirement. The emerging Local Plan continues to support the Memorandum of Cooperation 2011-31 (MoC) which provides a growth strategy for Cambridgeshire and Peterborough, including the redistribution of a portion of East Cambridgeshire's housing growth.

Between 2014 and 2036, ECDC are potentially required to accommodate up to 12,900 additional new dwellings, supported by jobs growth and other appropriate forms of development. However, when the MoC and LHN are taken into account, the actual housing growth made provision for by the emerging Local Plan is likely to be lower. For the purposes of this Water Cycle Study, the greatest potential growth scenario is investigated to ensure the full implications of growth are addressed. Within this WCS, 104 housing and employment sites have been assessed in the district in total.

There are a number of national, regional and local polices that must be considered by the LPAs, water companies and developers during the planning stage and development stages. The Water Industry Act sets out arrangements for connections to public sewers and water supply networks, and developers should ensure that site specific capacity checks can be undertaken and where necessary additional infrastructure constructed to accommodate the development. Where permitted, Anglian Water may seek developer contributions towards infrastructure upgrades. Upgrades to water resources and wastewater treatment works are funded through the company business plans.

When considering investment requirements to accommodate growing demand, water companies are required to ensure a high degree of uncertainty 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 reports on their 25-year Strategic Direction Statements and WRMPs.

Water Resources and Water Supply Infrastructure

Anglian Water (AW) manages the water resources in East Cambridgeshire. The Environment Agency has undertaken an assessment of water stress across the UK, the assessment has classified Anglian Water supply regions as areas of “serious” water stress.

The Water Resource Management Plans (WRMPs) demonstrate the pressures on water resources throughout the AW supply area. East Cambridgeshire is supplied from three Anglian Water Resource Zones; Ely, Newmarket and Cheveley. There is some variation between the growth predicted by AW within the WRMPs and the growth estimates provided by East Cambridgeshire District Council. It is recommended that these differences are investigated to ensure that water supply in the relevant WRZs will keep up with future demand in the East Cambridgeshire district adequately.

Wastewater Collection

Anglian Water was asked to undertake a sewerage system capacity assessment to identify the available capacity within the existing systems, and the potential to upgrade to accommodate growth.

In the 2016 study AW assessed foul sewerage network capacity and surface water network capacity at each of the development sites. The foul sewerage network has been given an "amber" status for the majority of the sites assessed (with the remainder green). This reflects the assumption that for developments containing 10 or more houses, some enhancement of the network would be required. However no specific constraints to these enhancements have been identified.

AW's policy regarding surface water management is that connection to the sewer system is a last resort. On this basis the surface water network capacity has been given a "red" status across all the sites. This highlights the requirement for developers to incorporate SuDS into development proposals.

Wastewater Treatment Works Quality Consent Assessments

An assessment of the available headroom and flow consents at each of the key WRCs within East Cambridgeshire District Council was carried out. All the WRCs are currently within their DWF permits, however 4 WRCs would require an upgrade in order to serve all the proposed growth.

Wastewater Treatment Works Odour Assessment

JBA Consulting carried out an odour screening assessment to identify sites where there may be encroachment upon an existing WRC and where odour from the WRC may become a cause of nuisance and complaints. The assessment found that none of the proposed sites are likely to be impacted by odour from WRCs.

Water Quality Impact Assessment

Water quality assessments were completed for some of the WRCs within the East Cambridgeshire district in order to assess if the increased effluent discharges from WRCs as a result of the proposed levels of development could lead to an adverse impact on the quality of the receiving watercourse. It was found that:

- All WRCs are currently working within their permits with the exception of Ely (New) that exceeds its permit for Phosphate.

- The proposed growth is predicted to lead to a deterioration greater than 10% and/or class deterioration in WFD determinands at Burwell, Ely (New) and Soham WRCs. In the case of Soham this can be accommodated through an upgrade to the WRC (Application of BAT) and a tightening of permits, however for Burwell the deterioration in phosphate cannot be reduced to less than 10% using BAT. In this case environmental capacity is considered to be a constraint to growth.
- The load standstill assessment suggests that application of BAT at the remaining WRCs can allow future loads to return to present day levels for each WRC with the exception of Littleport.

Flood Risk

A detailed flood risk assessment can be found within the East Cambridgeshire District Council Strategic Flood Risk Assessment.

An additional assessment was carried out to determine whether the increased discharges of treated effluent from each WRC as a result of proposed development could lead to an increase in fluvial flood risk in the receiving watercourse. It was found that the impact of increased effluent is unlikely to have a significant impact upon flood risk in the receiving watercourses at any of the proposed sites.

Environmental Constraints and Opportunities

Maps have been created showing the location of significant environmental designations in the study area, these should be used in conjunction with Sustainability Appraisals (SA) and/or Strategic Environmental Assessments (SEAs) when these are available.

The environmental assessment provides an overview of the wider environment within the district and the potential risks and opportunities associated with the development of the proposed sites. Detailed environmental assessments should be conducted as part of the planning process.

Climate Change

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made within this Water Cycle Study. This assessment uses a matrix which considered both the potential impact of climate change on the assessment in question, and also the degree to which climate change has been considered in the information used to make the assessments contained within the WCS.

The capacity of the sewerage system and the water quality of receiving water bodies stand out as two elements of the assessment where the consequences of climate change are expected to be high but no account has been made of climate impacts in the assessments. This is a matter to be addressed at a detailed assessment stage.

Contents

Executive Summary iii

1 Introduction 1

1.1 Terms of reference 1
1.2 The Water Cycle 1
1.3 Impact of Development on the Water Cycle 2
1.4 Objectives of the Water Cycle Study 2
1.5 Phase 1 Water Cycle Study Scope 3
1.6 Structure of this report 4
1.7 Stakeholders and Consultation 4
1.8 Study area 6

2 Development Scenarios and Key Developments 8

2.1 Introduction 8
2.2 Key Developments and Commitments 8

3 Legislative and Policy Framework 10

3.1 National policy 10
3.2 Regional policy 15
3.3 Local policy 16
3.4 Environmental Policy 17
3.5 Water Industry Policy 22

4 Water Resources and Water Supply 24

4.1 Availability of Water Resources 25
4.2 Water Resource Assessment: Water Resource Management Plans 30
4.3 Water Resource Assessment: Water Resources and Water Supply Infrastructure Assessment 36

5 Wastewater Collection and Treatment 37

5.1 Drainage Strategies 39
5.2 Sewerage System Capacity Assessment 39
5.3 Water Recycling Centre Flow Permit Assessment 42
5.4 Water Recycling Centre Odour Assessment 45

6 Water Quality 47

6.1 Introduction 47
6.2 Methodology 48
6.3 Results - RQP Assessment 49
6.4 Load standstill assessment results 52
6.5 Conclusion 54
6.6 Recommendations 54

7 Flood Risk Management 55

7.1 Assessment of Additional Flood Risk from Increased WRC Discharges 55
7.2 Methodology 55
7.3 Data Collection 55
7.4 Results 55
7.5 Conclusion 56
7.6 Recommendations 56

8 Environmental Constraints and Opportunities 57

8.1 Introduction and Methodology 57
8.2 Data Collection 57
8.3 Environmental Features of East Cambridgeshire District 58
8.4 Key Water Cycle Features of East Cambridgeshire District 59
8.5 Water Cycle Risks and Opportunities 59
8.6 Management Options and Policies 60
8.7 Opportunities 61
8.8 Recommendations 62
8.9 Conclusion 62

Contents

9 Climate Change Impact Assessment 63

9.1 Introduction and Methodology 63
9.2 Results 63
9.3 Recommendations 64

10 Summary and Recommendations 65

Appendices 67

A Potential Housing and Economic Development Sites (Site Summary Spreadsheet) 67

B Water Quality Assessment 68

C Environmental Opportunities Maps 69

List of Figures

Figure 1-1: The Water Cycle iii
Figure 1-1: The Water Cycle 2
Figure 1-2: East Cambridgeshire District Study Area 6
Figure 1-3: Geology of East Cambridgeshire District 7
Figure 2-1: Potential Housing and Economic Development Sites 9
Figure 3-1: Flood Risk and the Preparation of Local Plans 11
Figure 4-1: Water Supply Company Boundaries 24
Figure 4-2: Abstraction Licences Strategy Boundaries for East Cambridgeshire District Council 26
Figure 4-3: Anglian Water's Ely, Newmarket and Cheveley Water Resource Zones Supplying the East Cambridgeshire District 32
Figure 5-1: East Cambridgeshire WRCs and Catchments 38
Figure 6-1 Water quality assessment flow chart 49

List of Tables

Table 1-1: Report structure 4
Table 3-1: PPG: Water supply, wastewater and water quality considerations for plan making and planning applications 12
Table 4-1: Implications of Surface Water Resource Availability Colours. 27
Table 4-2: Resource Availability for the Assessment Points within the Cam and Ely Ouse CAMS within the East Cambridgeshire district 28
Table 4-4: Anglian Water WRMP and Local Authority Growth Estimates for the Ely WRZ 33
Table 4-5: Anglian Water WRMP and Local Authority Growth Estimates for Newmarket WRZ 34
Table 4-6: Cheveley WRMP Growth Estimates 34
Table 4-7: Summary of forecast housing growth within East Cambridgeshire and Forest Heath District 35
Table 4-8: Recommendations of WRMPs. 36
Table 5-1: Anglian Water Wastewater Treatment Works Flow and Quality Consent Assessment 44
Table 5-2: Wastewater treatment odour actions 46
Table 6-1: RQP results summaries for passing or failing targets of 'Good Status', 'No >10% Deterioration' and 'No Class Deterioration' 50
Table 6-2: Summary of results assuming BAT is applied 50
Table 6-3 Load standstill assessment results 53
Table 6-5: Water Quality Assessment recommendations 54
Table 7-1: Summary of the impact of additional effluent discharges on flood risk 56
Table 8-1: Environmental Designations and Features 57
Table 8-2: Approximate distance at which an environmental feature becomes significant to the development of a proposed site 58
Table 8-3: Environmental opportunities and benefits 61
Table 8-4: Environmental Constraints and Opportunities Recommendations 62
Table 9-1: Climate change matrix 63
Table 9-2: Scoring of Climate Change Consequences for the Water Cycle Study 63
Table 9-3: Climate Change Actions 64
Table 10-1: Summary of Conclusions and Recommendations 65

Abbreviations

ALC ..... Agricultural Land Classification

ALS ..... Abstraction Licensing Strategy

AMP ..... Asset Management Plan

AONB ..... Area of Outstanding Natural Beauty

ASNW ..... Ancient Semi-Natural Woodland

AW ..... Anglian Water

BAT ..... Best Available Technology

BOD ..... Biological Oxygen Demand

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

CAMS ..... Catchment Abstraction Management Strategies

CCC ..... Cambridgeshire County Council

CFMP ..... Catchment Flood Management Plan

CfSH ..... Code for Sustainable Homes

CIL ..... Community Infrastructure Levy

CSO ..... Combined Sewer Overflow

DAP ..... Drainage Area Plans

DWF ..... Dry Weather Flow

EA ..... Environment Agency

ECDC ..... East Cambridgeshire District Council

EP ..... Environmental Permit

FRA ..... Flood Risk Assessment

GES ..... Good Ecological Status

GI ..... Green Infrastructure

Ha ..... Hectares

HoF ..... Hands-Off Flow

IDBs ..... Internal Drainage Boards

IIF ..... Infrastructure Investment Framework

IIP ..... Infrastructure Investment Plan

JBA ..... Jeremy Benn Associates

LDE ..... Level Dependent Environments

LDMU ..... Level Dependant Management Units

LNR ..... Local Nature Reserve

LPA ..... Local Planning Authority

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

Ml/d ..... Million litres per day

NH4 ..... Ammonia

NPPF ..... National Planning Policy Framework

NNR ..... National Nature Reserve

OfWAT	Water Service Regulation Authority
OPEX	Operational Expenditure
P	Phosphate
p/h	per house
R/A/G	Red / Amber / Green assessment
RBD	River Basin District
RMA	Risk Management Authorities
RMP	River Basin Management Plan
RQP	River Quality Planning tool
SAC	Special Area of Conservation
SBP	Strategic Business Plans
SDS	Strategic Direction Statements
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing and Land Availability Assessment
SMP	Sewerage Management Plans
SPA	Special Protection Area
SPZ	Source Protection Zone
SS	Suspended Solids
SSSI	Site of Special Scientific Interest
SU	Sewerage Undertaker
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
uFMfSW	Updated Flood Map for Surface Water
UWWTD	Urban Waste Water Treatment Directive
WaSC	Water and Sewerage Company
WCS	Water Cycle Study
WFD	Water Framework Directive
WQA	Water Quality Assessment
WRC	Water Recycle Centre
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone
WSZ	Water Supply Zone

1 Introduction

1.1 Terms of reference

JBA Consulting was commissioned to undertake a Water Cycle Study (WCS) for East Cambridgeshire District Council (ECDC) to inform the updated Local Plan. The purpose of the Water Cycle Study (WCS) along with the Strategic Flood Risk Assessment (SFRA) is to form part of a comprehensive and robust evidence base for the Local Plan which will set out a vision and framework for development in the area up to 2036 and will be used to inform decisions on the location of future development.

1.2 The Water Cycle

1.2.1 What is a Water Cycle Study (WCS)?

National Planning Policy Framework Practice Guidance on Water Supply, Wastewater and Water Quality[1] 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 the 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[2] recommends a phased approach:

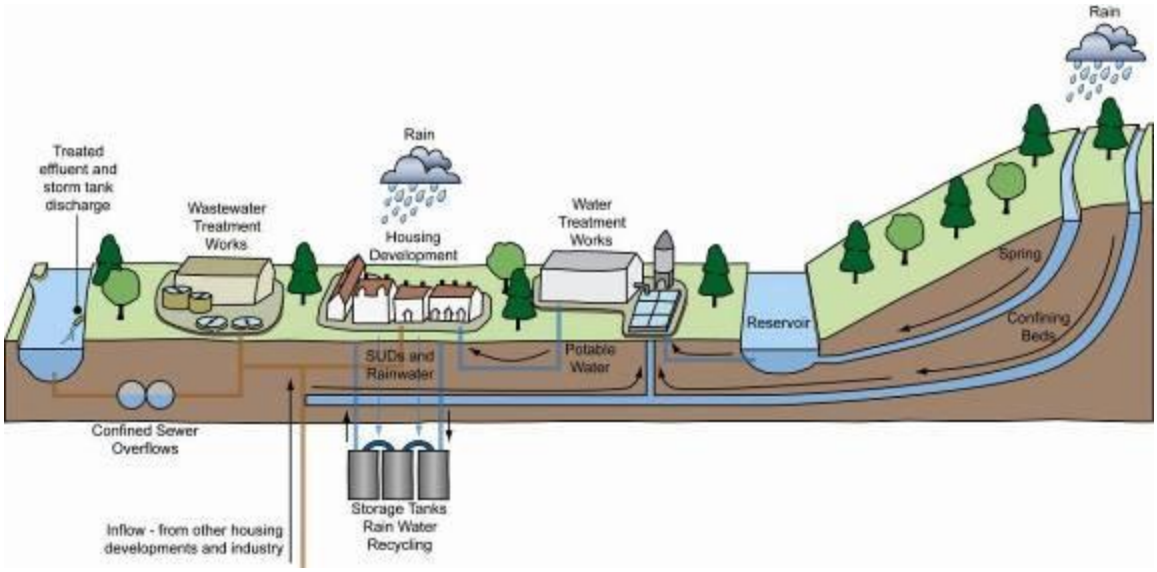
- Phase 1: Scoping study, focussing on formation of a steering group, identifying issues for consideration and the need for an outline study.
- Phase 2: Outline study, to identify environmental constraints, infrastructure constraints, a sustainability assessment and consideration of whether a detailed study is required.
- Phase 3: Detailed study, to identify infrastructure requirements, when they are required, how they will be funded and implemented and an overall assessment of the sustainability of proposed infrastructure.

Figure 1-1: The Water Cycle below shows the main elements that compromise the Water Cycle and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

1 Department for Communities and Local Government (2015) Planning Practice Guidance: Water supply, wastewater and water quality. Accessed online at https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality on 05/10/2017

2 Environment Agency (2009) Water Cycle Study Guidance. Accessed online at: http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geho0109bpff-e-e.pdf on: 05/10/2017

Figure 1-1: The Water Cycle



1.3 Impact of Development on the Water Cycle

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. It is possible that allocating large numbers of new homes at some locations may result in the capacity of existing available infrastructure being exceeded. This situation could potentially lead to service failures to water and wastewater customers, adverse impacts to the environment or high costs for the upgrade of water and wastewater assets being passes on to bill payers. Climate change presents additional future challenges such as increased intensive rainfall and a higher frequency of drought events that can be expected to put greater pressure on the existing infrastructure. Sustainable planning for water must take this into account.

This study will assist the council to select and develop sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure and flood risk. This has been achieved by identifying areas where there may be conflict between any proposed development and the requirements of the environment and by recommending potential solutions.

The Water Cycle Study should be treated as a "dynamic document" that is periodically reviewed as further information becomes available. This will provide a better understanding of the impact of the developments on the water supply and wastewater infrastructure and water quality.

1.4 Objectives of the Water Cycle Study

ECDC are in the process of identifying draft site allocations to meet their targets for housing and employment provision to 2036.

The WCS is required in order to assess the constraints and requirements that will arise from the potential growth on the water infrastructure.

The overall objective of the WCS is to understand the environmental and physical demands of the development and identify opportunities for more sustainable planning and improvements that may be required so that proposals don't exceed the existing water cycle capacity. This is assessed by considering the following issues:

- Water Resources;
- Water supply;
- Wastewater Collection and Treatment;
- Water Quality and the Environment;
- Flood Risk, and
- Climate Change.

This report focuses upon the proposed site allocations provided by the council. The report outlines the current status of the environment and infrastructure, identified the possible

constraints to the development, the impacts and demands of the development, and gives recommendations as to any improvements or mitigation required including approximate costings.

1.5 Phase 1 Water Cycle Study Scope

The scope of the Phase 1 WCS has been defined by the Environment Agency within the Water Cycle Study Guidance[3]:

We recommend the following issues are scoped into the Phase 1 WCS:

Water Resources and Water Supply

Environmental Capacity

- Is there capacity in existing licenses for development?
- Will existing licences remain valid?
- Can we reduce abstraction by better management practices?

Infrastructure capacity

- If new major infrastructure (reservoirs, water treatment works, boreholes) are needed, can they be provided in time, can they be funded, and are they sustainable?

Wastewater Collection and Treatment

Environmental Capacity

- Is there volumetric capacity in existing effluent discharge permit for growth?
- Will discharge permit be valid to meet future standards (e.g. WFD)?
- Will additional discharge be allowed if there is no additional environmental capacity to assimilate it?

Infrastructure capacity

- If new major infrastructure (wastewater treatment works, major pumping mains or sewer mains) are needed, can they be provided in time, and can they be funded?

Environmental Opportunities

- Are we making the most out of our new development?
- Are there multi-use options that will provide water resources, flood risk management and water quality benefits?
- Examples:
    - Green roofs and permeable road surfaces for new developments
    - SuDS designed to provide green infrastructure and biodiversity benefits as well as surface water flood risk and water quality management.

3 Environment Agency (2009) Water Cycle Study Guidance. Accessed online at: http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geho0109bpff-e-e.pdf on: 05/10/2017

1.6 Structure of this report

Table 1-1: Report structure

Chapter	Description
1. Introduction	This chapter provides the background, the objective and the scope of the project.
2. Development Scenarios and Key Developments	This chapter illustrates the scale and locations of the planned developments that were assessed in this study.
3. Legislation and Policy Framework	This chapter introduces the policy and legislative framework which drives the management of development and the water environment in England at local, national and European level.
4. Water Resources and Water Supply	This chapter looks at the availability of water resources to cover the future demand. It also covers the impact of the planned development on the existing capacity of the water supply infrastructure and highlights where upgrades or new infrastructure might be needed.
5. Wastewater Collection and Treatment	This chapter covers the impact of the planned development on the existing capacity of the sewerage system infrastructure and water recycling centres and highlights where upgrades or new infrastructure might be needed. It also looks at the potential impact of odour from the water recycling centres on new developments. Finally, it covers the water quality impact assessment of discharges from future water recycling centres into the receiving watercourses.
6. Flood Risk Management	This chapter considers the flood risk to the potential site allocations as well as the potential risk of increased flood flows in watercourses due to additional flows of sewage effluent.
7. Environmental Constraints and Opportunities	This chapter looks at the environmental risks and opportunities associated with the allocation sites.
8. Climate Change Impact Assessment	This chapter illustrates the qualitative assessment undertaken to assess the potential impacts of Climate Change on the assessments made in this water cycle study.
9. Summary and Recommendations	This chapter outlines whether the required upgrades and solutions for all the assessments covered by this study can be delivered where a Red status is scored. This chapter also summarises all the recommendations provided in each chapter.

1.7 Stakeholders and Consultation

It is important that a WCS brings together all partners and stakeholders knowledge, understanding and skills to help to understand the environmental and physical constraints to development. The following stakeholders were consulted during this WCS and have provided data for use within the study:

- East Cambridgeshire District Council;
- Environment Agency;
- Anglian Water.

Future large-scale developments within and outside East Cambridgeshire can have the potential to affect water supply and demand, existing sewer networks and infrastructure. The following stakeholders, have been involved in the consultation process for this WCS:

- *South Cambridgeshire District Council*
- *Huntingdonshire District Council*
- *Fenland District Council*
- *King's Lynn and West Norfolk District Council*

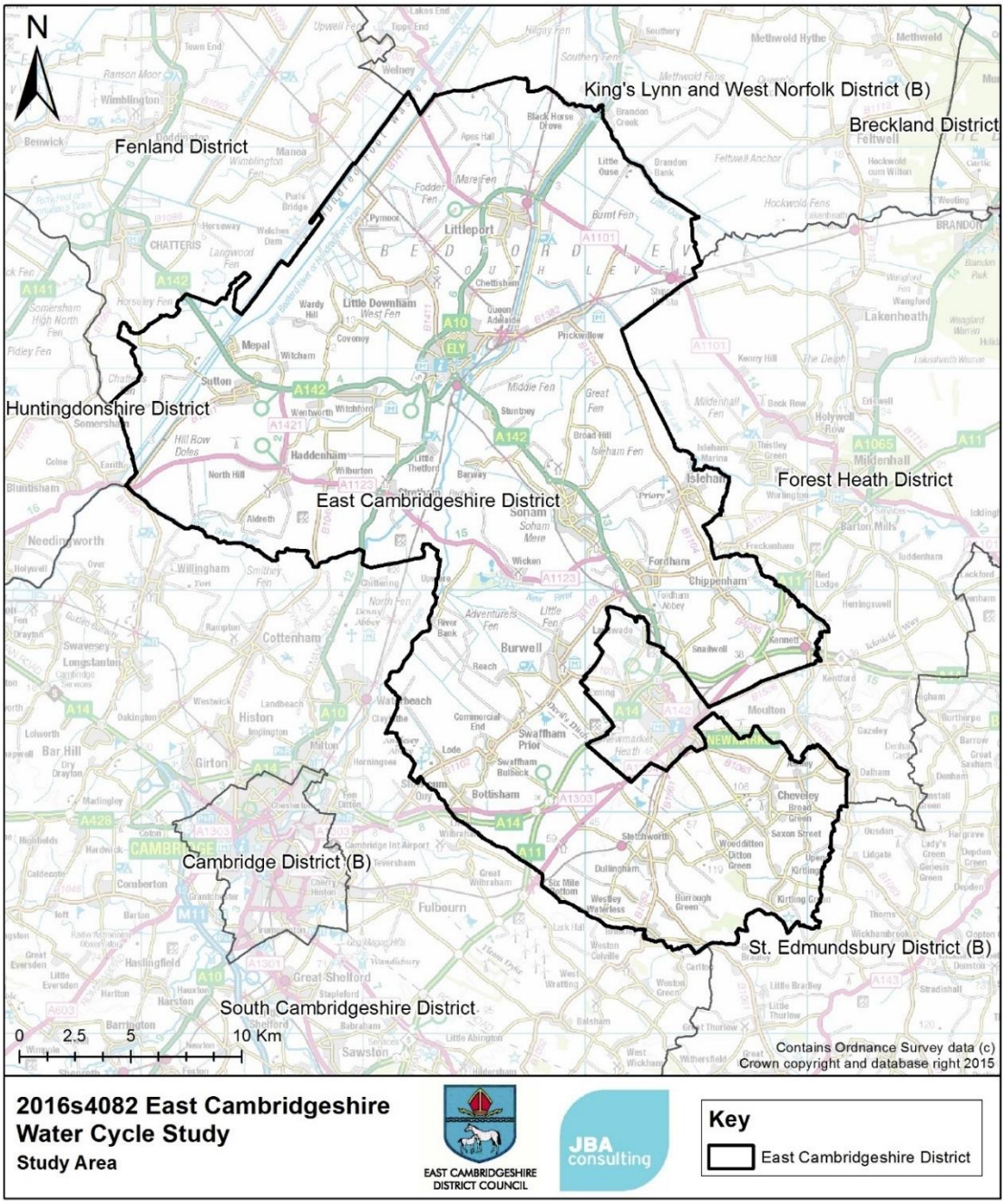
- *Forest Heath County Council*
- *St Edmundsbury District Council*
- *Environment Agency*
- *Anglian Water*
- *Ely Group of Internal Drainage Boards (IDBs)*
- *Haddenham Internal Drainage Boards (IDBs)*

1.8 Study area

The study area is the predominantly rural district of East Cambridgeshire; this district is located to the north-east of Cambridge in the county of Cambridgeshire. East Cambridgeshire covers an area of around 655 km^2 and the mid-2012 population was around 85,000. The district contains 3 main market towns Ely, Soham and Littleport, it also contains the fringe areas of Newmarket (see Figure 1-2).

Significant watercourses within the district include the Great Ouse, the Old and New Bedford Rivers in the north of the study area. Anglian Water manage the entirety of the water supply and wastewater collection and treatment for the district.

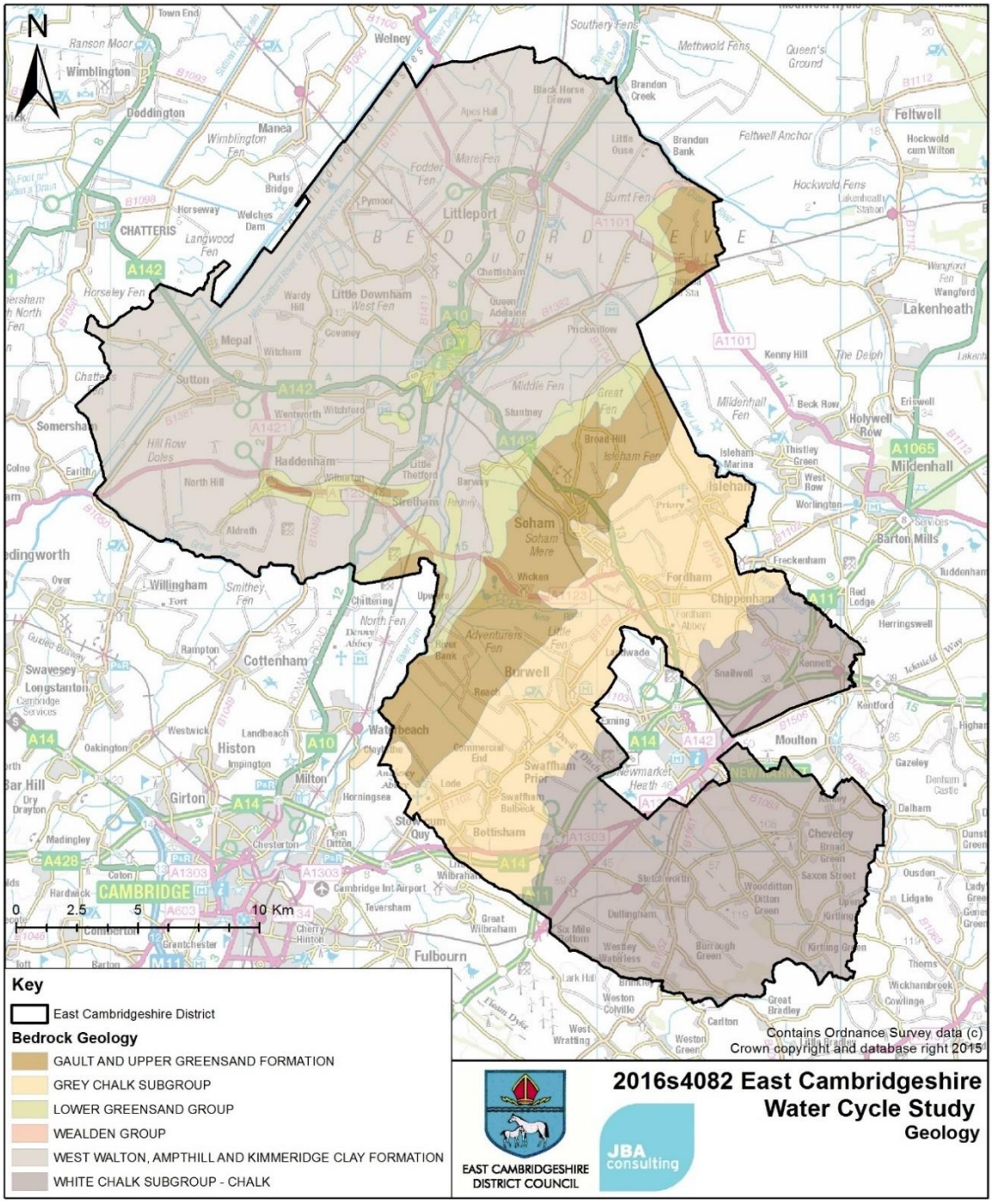
Figure 1-2: East Cambridgeshire District Study Area



1.8.1 Geology

The geology varies considerably across East Cambridgeshire District. The north-eastern portion of the study area is underlain by the West Walton, Ampthill and Kimmeridge Clay formations. There are central bands Lower Greensand, Gault and Upper Greensand Formations. In the south, Grey and White Chalk Subgroups are located, leading to an increased permeability in this area of the catchment. Figure 1-3 shows the geology across East Cambridgeshire.

Figure 1-3: Geology of East Cambridgeshire District



2 Development Scenarios and Key Developments

2.1 Introduction

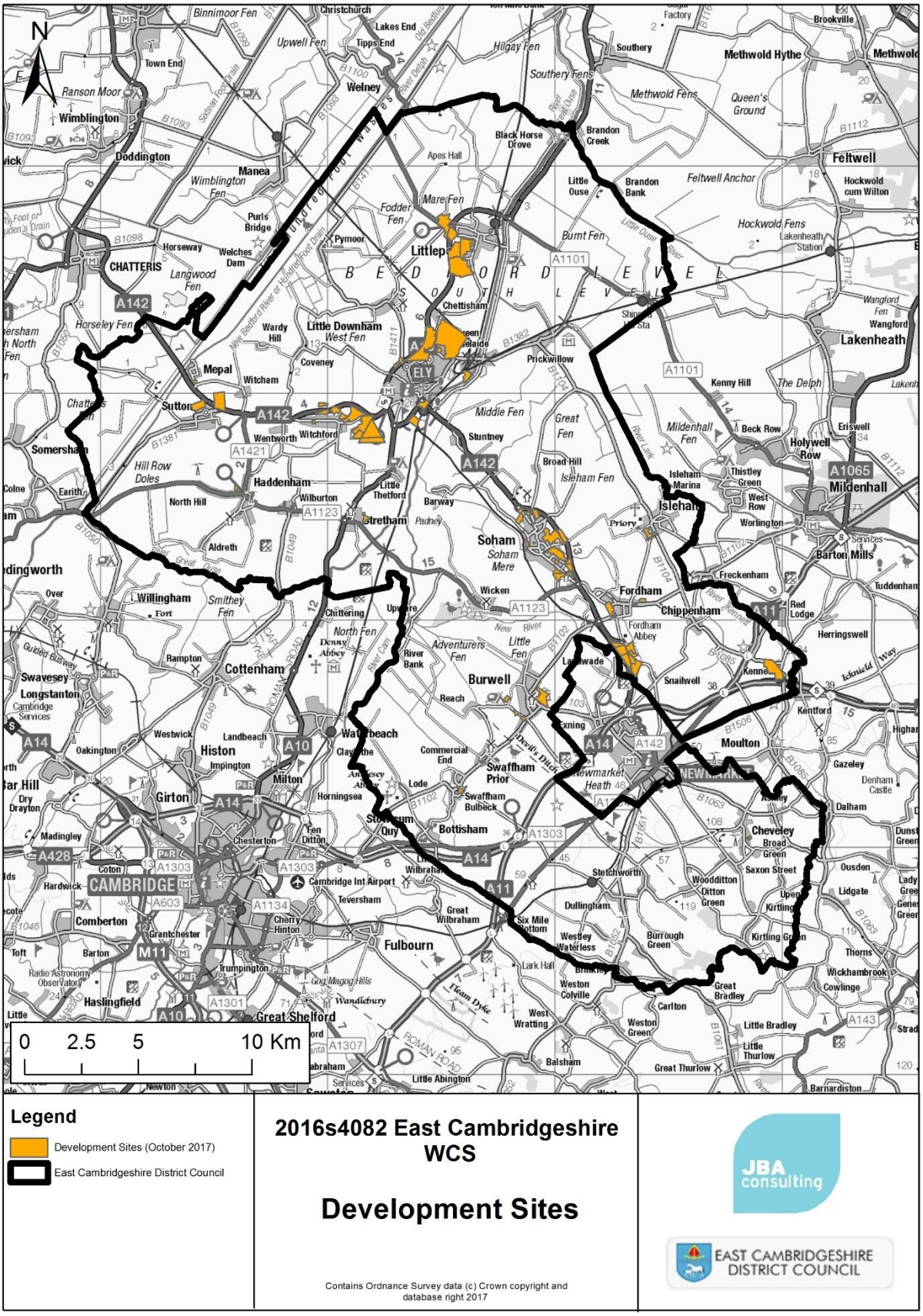
East Cambridgeshire District Council are in the process of updating the adopted Local Plan (2015). To assist ECDC to understand the capacity for growth within the district, this WCS assess the housing growth scenarios against the likely impact upon water resources, wastewater services and the water environment.

2.2 Key Developments and Commitments

ECDC provided a list of 104 potential sites within the district which this study is based upon. Some or all of these sites will make up ECDC's future housing and economic land allocations. Existing commitments, or sites granted planning permission are not included in this assessment.

Appendix A lists the sites assessed within this study and Figure 2-1 shows the locations of all the sites in this study.

Figure 2-1: Potential Housing and Economic Development Sites



3 Legislative and Policy Framework

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

3.1 National policy

3.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[4] was published on 27th March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans.

Paragraph 94:

> "Local planning authorities should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk, coastal change and water supply and demand considerations"

Paragraph 99:

> "Local Plans should take account of climate change over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. New development should be planned to avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure."

Paragraph 100 states:

> "Local Plans should be supported by a strategic flood risk assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change".

Paragraph 156 states

> "Local planning authorities should set out the strategic priorities for the area in the Local Plan. This should include strategic policies to deliver...the provision of infrastructure for transport, telecommunications, waste management, water supply, wastewater, flood risk and coastal changes management, and the provision of minerals and energy".

In March 2014, the Planning Practice Guidance was issued by Department for Communities and Local Government, with the intention of providing guidance on the application of the National Planning Policy Framework (NPPF) in England. Of relevance to this study;

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

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

5 Department for Communities and Local Government (2014) Planning Practice Guidance: Flood Risk and Coastal Change. Accessed online at http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/ on 05/10/2017.

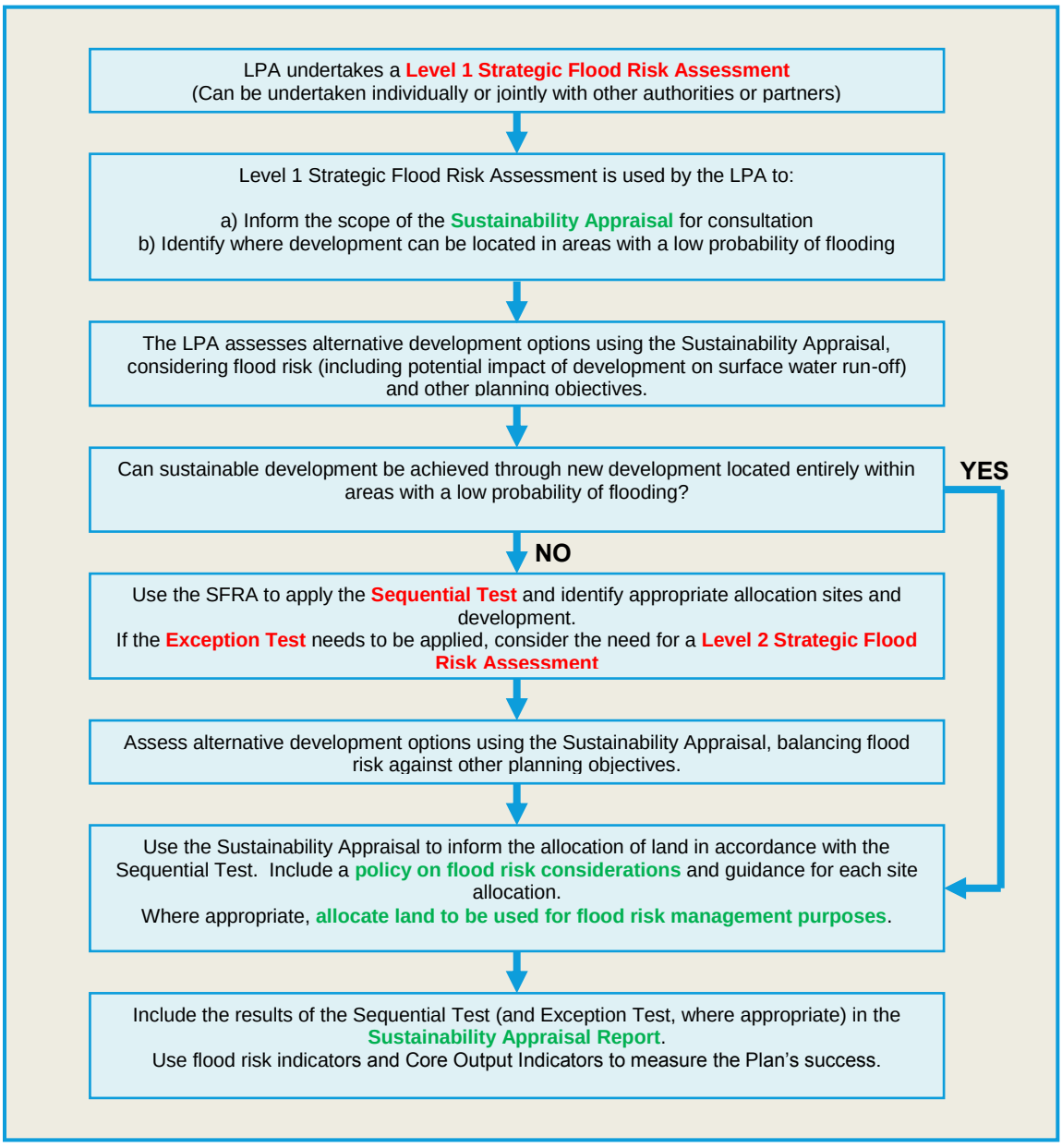
6 Department for Communities and Local Government (2015) Planning Practice Guidance: Water supply, wastewater and water quality. Accessed online at http://planningguidance.planningportal.gov.uk/blog/guidance/ on 05/10/2017

7 Department for Communities and Local Government (2015) Planning Practice Guidance: Housing - Optional Technical Standards. Accessed online at: http://planningguidance.planningportal.gov.uk/blog/guidance/ on 05/10/2017

3.1.2 Planning Practice Guidance: Flood Risk and Coastal Change

Diagram 1 in the Planning Practice Guidance sets out how flood risk should be taken into account in the preparation of Local Plans (see Figure 3-1). These requirements are addressed principally in the Council's new 2016 Strategic Flood Risk Assessment (SFRA).

Figure 3-1: Flood Risk and the Preparation of Local Plans



Based on Diagram 1 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 004, Reference ID: 7-021-20140306) March 2014

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

A summary of the specific guidance on how infrastructure, water supply, wastewater and water quality considerations should be accounted for in both plan-making and planning applications is summarised below in Table 3-1.

Table 3-1: PPG: Water supply, wastewater and water quality considerations for plan making and planning applications

Plan-making			Planning applications
Infrastructure	Identification of suitable sites for new or enhanced infrastructure. Consider whether new development is appropriate near to water and wastewater infrastructure. Phasing new development so that water and wastewater infrastructure will be in place when needed.		Wastewater considerations include: • First presumption is to provide a system of foul drainage discharging into a public sewer. • Phasing of development and infrastructure. • Circumstances where package sewage treatment plants or septic tanks are applicable.
Water supply	Not Specified		Planning for the necessary water supply would normally be addressed through the Local Plan, exceptions might include: • Large developments not identified in Local Plans; • Where a Local Plan requires enhanced water efficiency in new developments.
Water quality	How to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage. The type or location of new development where an assessment of the potential impacts on water bodies may be required. Expectations relating to sustainable drainage systems.		Water quality is only likely to be a significant planning concern when a proposal would: • Involve physical modifications to a water body; • Indirectly affect water bodies, for example as a result of new development such as the redevelopment of land that may be affected by contamination etc. or through a lack of adequate infrastructure to deal with wastewater.
Wastewater	The sufficiency and capacity of wastewater infrastructure. The circumstances where wastewater from new development would not be expected to drain to a public sewer.		If there are concerns arising from a planning application about the capacity of wastewater infrastructure, applicants will be asked to provide information about how the proposed development will be drained and wastewater dealt with.
Cross-boundary concerns	Water supply and water quality concerns often cross local authority boundaries and can be best considered on a catchment basis. Recommends liaison from the outset.		No specific guidance (relevant to some developments).
SEA and Sustainability Appraisal	Water supply and quality are considerations in strategic environmental assessment and sustainability appraisal ... sustainability appraisal objectives could include preventing deterioration of current water body status, taking climate change into account and seeking opportunities to improve water bodies.		No specific guidance (should be considered in applications).

3.1.4 Planning Practice Guidance: Housing - Optional Technical Standards

This guidance, advises planning authorities on how to gather evidence to set optional requirements, including for water efficiency. It states that "all new homes already have to meet the mandatory national standard set out in the Building Regulations (of 125 litres/person/day). Where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day." Planning authorities are advised to consult with the EA and water companies to determine where there is a clear local need, and also to consider the impact of setting this optional standard on housing viability. A 2014 study[8] into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £9 for a four-bedroom house.

3.1.5 Building Regulations and Code for Sustainable Homes

The Building Regulations (2010) Part G[9] was amended in early 2015 to require that all new dwellings must ensure that the potential water consumption must not exceed 125l/person/day, or 110 l/person/day where required under planning conditions. The regulations include advice on how to calculate this.

The Code for Sustainable Homes (CfSH) was, from 2007 to March 2015, the Government's optional national standard for new housing. It became effective in England in April 2007 and a Code rating for new homes became mandatory in May 2008. The Code included six levels of water efficiency for new homes seeking to simplify the various building codes that house builders have to adhere to, the Government withdrew CfSH in March 2015, with the exception of legacy cases: *"where residential developments are legally contracted to apply a code policy (e.g. affordable housing funded through the national Affordable Housing Programme 2015 to 2018, or earlier programme), or where planning permission has been granted subject to a condition stipulating discharge of a code level, and developers are not appealing the condition or seeking to have it removed or varied".*

3.1.6 Sustainable Drainage Systems (SuDS)

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

- The National Planning Policy Framework which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.
- The House of Commons written statement[10] 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." 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[11]. 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. Neither does it address adoption and maintenance.

8 Department for Communities and Local Government (2014) Housing Standards Review: Cost Impacts. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on: 05/10/2017.

9 HM Government (2015) The Building Regulations (2010) Part G - Sanitation, hot water safety and water efficiency. 2015 edition. Accessed online at: http://www.planningportal.gov.uk/uploads/br/BR_PDF_AD_G_2015.pdf on 05/10/2017.

10 Department for Communities and Local Government (2014) Sustainable drainage systems: Written statement - HCWS161. Accessed online at:

http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/ on: 05/10/2017.

11 Defra (2015) Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems

- As the Lead Local Flood Authority (LLFA) Cambridgeshire County Council (CCC) are responsible for advising Local Planning Authorities, including East Cambridgeshire District Council and play a lead role in ensuring that the proposed drainage schemes for all new developments comply with technical standards and policies in relation to SuDS.
- CCC has published a Sustainable Drainage Cambridge Design and Adoption Guide in order to promote the use of SuDS within Cambridge and the surrounding areas[12].
- An updated version of the CIRIA SuDS Manual[13] 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.
- Anglian Water have produced a SuDS adoption manual[14] on the design, construction and adoption of SuDS. SuDS located within private property boundaries are the responsibility of the property owner. Anglian Water will consider the adoption and maintenance of SuDS features in public open space that can be shown to receive treated surface water runoff from a development. Anglian Water will not adopt any SuDS within the intermediate area unless they are satisfied that all this part of the management train is maintained effectively.

SuDS features not adopted by CCC or Anglian Water need to be maintained by householders (in the case of SuDS on private land) and by management companies for other SuDS on public open spaces and highways.

3.1.7 BREEAM

BREEAM (Building Research Establishment Environmental Assessment Methodology) is an internationally recognised method of assessing, rating and certifying the sustainability of buildings. It can be used to assess the environmental performance of any type of building: new and existing. Standard BREEAM schemes exist for assessment of common domestic and non-domestic building types and less common building types can be assessed by developing bespoke criteria.

Using independent, licensed assessors, BREEAM 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. This promotes both climate change mitigation (energy efficiency) and adaptation (water efficiency). Buildings are rated and certified on a scale of 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'.

BREEAM has expanded from its original focus on individual new buildings at the construction stage to encompass the whole life cycle of buildings from planning to in-use and refurbishment. The standard is regularly revised to improve sustainability, respond to industry feedback and support sustainability strategies and commitments. BREEAM standard can be applied to virtually any building and location, with versions for new buildings, existing buildings, refurbishment projects and large developments.

ECDC has the opportunity to seek BREEAM status for all new, residential and non-residential buildings. Whilst BREEAM contains the flexibility to achieve this in a number of ways, a "Very Good" rating for water resources would typically relate to a 40% improvement over baseline building water consumption[15]. As a minimum, a 12.5% improvement must be demonstrated to obtain BREEAM status. Guidance is provided on how to calculate this. Table 3-2 shows the BREEAM credits available for percentage improvement over baseline building water consumption in precipitation zone 1, which covers the whole of the UK.

12 Cambridge City Council (No date) Cambridge Sustainable Drainage Design and Adoption Guide. Accessed online at: https://www.cambridge.gov.uk/sites/default/files/docs/SUDS-Design-and-Adoption-Guide.pdf on: 05/10/2017

13 CIRIA (2015) The SuDS Manual (C753)

14 Anglian Water (2011) Towards Sustainable Water Stewardship. Sustainable drainage systems (SUDS) adoption manual. Accessed online at: http://www.anglianwater.co.uk/_assets/media/AW_SUDS_manual_AW_FP_WEB.pdf on: 05/10/2017.

15 BREEAM (2017) BREEAM International New Construction Version 2: Technical Manual SD233 2.0. Accessed online at: http://www.breeam.com/new-construction on: 05/10/2017.

Table 3-2: BREEAM credits for percentage improvement over baseline water consumption

BREEAM Credits	Percentage improvement over baseline water consumption
1	12.5%
2	25%
3	40%
4	50%
5	55%
Exemplary	65%

3.2 Regional policy

3.2.1 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMP) are high level policy documents covering large river basin catchments. They aim to set policies for sustainable flood risk management for the whole catchment covering the next 50 to 100 years. East Cambridgeshire is covered by the Great Ouse CFMP[16] and lies over several sub areas which have different policies and actions. These set out ways of reducing the flood risk across the catchment, for example, flood warning services or flood water storage.

As Cambridgeshire is a densely populated area the existing flood risk is high as towns are situated in the natural floodplain. This region has been given a policy option 5 defined as areas of moderate to high flood risk. Options into reducing the probability of flooding need to be investigated as well as actions to manage the consequences of flooding. It would be beneficial to work with partners to develop emergency response plans for critical infrastructure, community facilities and transport links at risk from flooding.

3.2.2 Surface Water Management Plans (SWMPs)

SWMPs outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. A county-wide update to the Cambridgeshire SWMP was published in 2011. This study identified Ely as being one of the highest priority wet spots for Cambridgeshire County Council. A detailed SWMP for Ely was published in April 2012.

3.2.3 Water Resource Management Plans

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

- Future demand (due to population and economic growth)
- Demand management measures (e.g. water efficiency and leakage reduction)
- How the company will address changes to abstraction licenses
- How the impacts of climate change will be mitigated

Where necessary, set out the requirements for developing additional water resources to meet growing demand

The Anglian Water WRMP describes how the company will manage the balance between water supply and demand over the time period from 2015-2040. This includes:

- 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.

16. Environment Agency (2009) Great Ouse Catchment Flood Management Plan Summary Report. Accessed online at: https://www.gov.uk/government/publications/great-ouse-catchment-flood-management-plan on: 05-10-2017

- 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 WRMP is reviewed in more detail in section 4.2.

3.3 Local policy

3.3.1 Localism Act

The Localism Act outlined plans to shift and re-distribute the balance of decision making from central government back to councils, communities and individuals. The Localism Act was given Royal Assent on 15 November 2011.

In relation to the planning of sustainable development, provision 110 of the Act places a duty to cooperate on local authorities. This duty requires Local Authorities to *"engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter"*[17].

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

3.3.2 Local Plan and Local Strategy

The East Cambridgeshire District Council Local Plan 2015 sets out the Council's vision on how the area will develop in the future, ensuring growth happens in a structured way and outlines the principles that will guide future development. The Local Plan is in the process of being revised and this updated WCS will inform its development.

The 2015 adopted plan sets out the vision, objectives, spatial strategy and overarching policies to guide development in East Cambridgeshire up to 2031[18]. The key policies relating to drainage, water quality and climate change are (the below is not exhaustive):

Policy ENV 4: Energy and water efficiency and renewable energy in construction - All applicants will be required to demonstrate how they have considered maximising all aspects of sustainable design and construction, as set out in the Code for Sustainable Homes (or its successor). Developments of 5 or more homes are required to achieve Code for Sustainable Homes Level 4 (or its replacement pending implementation of the zero carbon homes requirement). All non-domestic developments of 1000m^2 or more are required to meet BREEAM Very Good standard or equivalent.

Policy ENV 8: Flood Risk - All developments and re-developments should contribute to an overall flood risk reduction.

The sequential test and exception test will be strictly applied across the district, and new development should normally be located in Flood Risk Zone 1. The modelled flood risk zones as identified in the SFRA and the Environment Agency Flood Maps will inform the application of the sequential test. Development will not be permitted where:

- It would intensify the risk of flooding during the lifetime of the development taking into account climate change allowances, unless suitable flood management and mitigation measures can be agreed and implemented.
- It would increase the risk of flooding of properties elsewhere during the lifetime of the development, taking into account climate change allowances, by additional surface water run-off or by impeding the flow or storage of flood water.
- It would have a detrimental effect on existing flood defences or inhibit flood control and maintenance work.

17 HM Government (2011) Localism Act 2011: Section 110. Accessed online at: http://www.legislation.gov.uk/ukpga/2011/20/section/110 on: 05/10/2017

18 East Cambridgeshire District Council (2015) Accessed online at http://www.eastcambs.gov.uk/local-development-framework/east-cambridgeshire-local-plan-2015

- The risk of flooding would cause an unacceptable risk to safety; or
- Safe access is not achievable from/to the development during times of flooding, taking into account climate change allowance.

A site-specific Flood Risk Assessment, endorsed by the Environment Agency, appropriate to the scale and nature of the development and the risks involved, and which takes account of future climate change, will be required for:

- Major and non-minor development proposals in Flood Zones 2 and 3 and 'Modelled Zone 3'; and
- Major and non-minor development proposals in Flood Zone 1, on sites of 1 hectare or greater, or where there is evidence of historic flooding set out in the SFRA and/or a Surface Water Management Plan.

All applications for new development must demonstrate that appropriate surface water drainage arrangements for dealing with surface water run-off can be accommodated within the site, and that issues of ownership and maintenance are addressed.

The use of Sustainable Drainage Systems will be required for new developments in accordance with the Cambridgeshire SuDS Design and Adoption Handbook (or successor document) unless, following an assessment of character and context, soil conditions and/or engineering feasibility dictate otherwise. SuDS may be incorporated within the Flood Risk Assessment. The updated Local Plan, currently at the "Further Draft" stage may update these policies for the period extending to 2036.

3.3.3 Infrastructure Delivery Plan

The latest Infrastructure Investment Plan (IIP) was produced in February 2013 and updated in October 2013 to form part of the evidence base for the Local Plan 2015.

The aims of the study are to:

- Look in detail at the likely infrastructures that are required to support the scale of development planned in the East Cambridgeshire Local Plan.
- Identify the likely cost of provision and any existing or potential funding for infrastructure (where known).
- Provide an update to the version of the Investment Plan produced in February 2013 and has been produced to accompany consultation on proposed major modifications to the submitted Local Plan (Oct. 2013).

The study does not intend to provide any prioritisation on what infrastructures should be delivered and on which funds should be allocated to each on them. These will be decided by the individual service providers and according to the Community Infrastructure Levy (CIL) allocated to them.

The study was conducted with the involvement of all stakeholders and delivery providers. The methodology was mostly based on the East Cambridgeshire Infrastructure Investment Framework (IIF).

3.3.4 Green Infrastructure Strategy

Cambridgeshire Green Infrastructure Strategy sets the framework for the creation and management of Green Infrastructure (GI) in the Cambridgeshire area[19]. The strategy has been developed in order to reverse the decline in biodiversity, mitigate and adapt to climate change, promote sustainable growth and economic development and support healthy living and wellbeing.

3.4 Environmental Policy

3.4.1 Urban Wastewater Treatment Directive (UWWTD)

The UWWTD is an EU Directive that concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of waste water from certain industrial sectors. The

19 Cambridgeshire County Council (2011) Cambridgeshire Green Infrastructure Strategy. Accessed online at: https://www.cambridge.gov.uk/sites/default/files/green-infrastructure-strategy.pdf on: 05/10/2017

objective of the Directive is to protect the environment from the adverse effects of the above mentioned wastewater discharges. More specifically Annex II A(a) sets out the requirements for discharges from urban wastewater treatment plants to sensitive areas which are subject to eutrophication. One or both parameters may be applied depending on the local situation. The values for concentration or for the percentage reduction shall apply. For specific information regarding concentration limits please refer to the UWWTD[20]. The Directive has been transposed into UK legislation through enactment of the Urban Waste Water Treatment (England and Wales) Regulations 1994 and 'The Urban Waste Water Treatment (England and Wales) (Amendments) Regulations 2003'.

3.4.2 Habitats Directive

The EU Habitats Directive aims to protect the wild plants, animals and habitats that make up our diverse natural environment. The directive created a network of protected areas around the European Union of national and international importance called Natura 2000 sites.

These sites include:

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

Special Protection Areas and Special Areas of Conservation are established under the EC Birds Directive and Habitats Directive respectively. The directive protects over 1,000 animals and plant species and over 200 so called "habitat types" (e.g. special types of forests, meadows, wetlands, etc.), which are of European importance.

3.4.3 The Water Framework Directive

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

River Basin Management Plans (RBMP) are required under the WFD and are strategies that should influence development plans and be influenced by them. The East Cambridgeshire district predominately falls within the Anglian River Basin District (RBD)[21]. Under the WFD the RBMPs, which were originally published in December 2009 were reviewed and updated in December 2015.

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 Final Anglian River Basin Management Plans.

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:

- "*To prevent deterioration of the status of surface waters and groundwater*
- *To achieve objectives and standards for protected areas*
- *To aim to achieve good status for all water bodies or, for heavily modified water bodies and artificial water bodies, good ecological potential and good surface water chemical status*
- *To reverse any significant and sustained upward trends in pollutant concentrations in groundwater*
- *The cessation of discharges, emissions and loses of priority hazardous substances into surface waters*

20 European Union (1991) Urban Wastewater Treatment Directive. Accessed online at: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31991L0271 on 05/10/2017

21 Environment Agency (2015) Anglian River Basin District River Basin Management Plan. Accessed online at:https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500463/Anglian_RBD_Part_1_river_basin_management_plan.pdf on: 05/10/2017

- *Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.*"

Local Planning Authorities (LPAs) must have regard for the WFD as implemented in the Environment Agency's River Basin Management Plans[22].

3.4.4 Protected Area Objectives

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

Article 4 of the WFD requires Member States to achieve compliance with the standards and objectives set for each protected area by 22 December 2015, unless otherwise specified in the Community legislation under which the protected area was established. Some areas may require special protection under more than one EC Directive or may have additional (surface water and/or groundwater) objectives. In these cases, all the objectives and standards must be met.

The types of protected areas are:

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- Areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish);
- Bodies of water designated as recreational waters, including areas designated as 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 Directive (UWWTD); and
- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites.

Many WFD protected areas coincide with water bodies; these areas will need to achieve the water body status objectives in addition to the protected area objectives. Where water body boundaries overlap with protected areas the most stringent objective applies; that is the requirements of one EC Directive should not undermine the requirements of another.

The objectives for Protected Areas relevant to this study are as follows:

Drinking Water Protected Areas

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

Economically Significant Species (Freshwater Fish Waters)

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

Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

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

22 Environment Agency (2009) River Basin Management Plan for the Anglian River Basin District. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/309814/River_Basin_Management_Plan.pdf on: 05/10/2017

Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

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

Natura 2000 Protected Areas (water dependent SACs and SPAs)

The objective for Natura 2000 Protected Areas identified in relation to relevant areas designated under the Habitats Directive or Birds Directive is to:

- Protect and, where necessary, improve the status of the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site's natural habitat types and species of Community importance in order to ensure the site contributes to the maintenance of, or restoration to, favourable conservation status.

Groundwater Source Protection Zones

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

Zone 1 (Inner protection zone)

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

Zone 2 (Outer protection zone)

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

Zone 3 (Total catchment)

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

Zone of special interest

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

The Environment Agency's approach to Groundwater protection[23] sets out a series of position statements that detail how the Environment Agency delivers government policy on groundwater and protects the resources from contamination. The position statements that are relevant to this study with regard to discharges to groundwaters, include surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g. lorry parks) and from treated sewage effluent.

3.4.5 River Basin Management Plans

River Basin Management Plans are required under the WFD and are strategies that should influence development plans and be influenced by the. East Cambridgeshire District is entirely covered by the Anglian RBMP[24].

23 Environment Agency (2017) The Environment Agency's approach to groundwater protection. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598778/LIT_7660.pdf on: 05/10/2017

24 Environment Agency (2015) Part 1: Anglian river basin district River basin management plan. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500463/Anglian_RBD_Part_1_river_basin_management_plan.pdf on: 05/10/2017

The WFD has a number of objectives which are summarised at the start of Section 3.3.3. One is that water bodies must have "no deterioration" and a second 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.

One of the biggest challenges facing the Anglian RBD is water resource management. Parts of the district are extremely dry, receiving only two thirds of the UK's average rainfall. Many of the wildlife sites are reliant on a good supply of water and it is also vitally important to public water supplies, agriculture (of which there is a large amount within the region) and industry. Flooding is also a challenge for the region with one fifth susceptible from inland or coastal flooding. Sea level rise and climate change will pose an increasing risk to people and property.

The most significant pressures identified within the Anglian RBMP are as follows:

- Phosphorus
- Physical modifications
- Pollution from waste water
- Pollution from towns, cities and transport
- Changes to the natural flow and level of water
- Negative effects of invasive non-native species
- Pollution from rural areas"

A number of these pressures, specifically waste water and pollution from towns, cities and transport, are a result of increased development and hence sewage effluent discharge, therefore it is important that future growth is carefully planned to ensure water companies can make upgrades to address this issue where necessary.

3.4.6 European Derived Legislation and Brexit

Much of the legislation behind the regulation of the water environment derives from the UK enactment of European Union (EU) directives. Following the referendum decision of June 2016 that the United Kingdom would leave the EU, the UK Government announced that it would introduce a "Great Repeal Bill" to repeal the European Communities Act 1972 and to transpose European Union law into domestic law "wherever practical". At the time of writing this Bill is at the "second reading" stage in Parliament and subject to change. A White Paper published in March 2017[25] states the following objectives for the Bill:

- Repeal of European Communities Act (ECA) 1972
- Conversion of EU law into UK law
- Conversion of directly applicable EU laws into UK law
- Preservation of secondary legislation made under the ECA

EU regulations - as they applied in the UK the moment before the country leaves the EU - will be converted into domestic law by the Bill and will continue to apply until legislators in the UK decide otherwise.

"The Great Repeal Bill will ensure that the whole body of existing EU environmental law continues to have effect in UK law. This will provide businesses and stakeholders with maximum certainty as we leave the EU. We will then have the opportunity, over time, to ensure our legislative framework is outcome driven and delivers on our overall commitment to improve the environment within a generation. The Government recognizes the need to consult on future changes to the regulatory frameworks, including through parliamentary scrutiny."

It is therefore assumed for the purposes of this study that European Union derived environmental legislation, most significantly the Water Framework Directive, will continue to be a key driver for environmental planning during the plan period for the LP. Should this situation change, a review of this Water Cycle Study may be required considering any new emerging regulatory requirements.

25 UK Government (2017) "Our Approach to the Great Repeal Bill". Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/604516/Great_repeal_bill_white_paper_accessible.pdf on: 05/10/2017

3.5 Water Industry Policy

3.5.1 The Water Industry in England

Water and sewerage services in England and Wales are provided by 10 Water and Sewerage Companies (WaSCs) and 12 'water-only' companies. The central legislation relating to the industry is the Water Industry Act 1991[26]. The companies essentially 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 - these are 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
- Enabling developers to make connections to water and sewerage systems

3.5.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies;

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

Every five years the industry submits a Business Plan to OfWAT for a Price Review (PR). These plans set out the company's operational expenditure (OPEX) and capital expenditure (CAPEX) required to maintain service standards, enhance service (for example where sewer flooding occurs), to accommodate growth and to meet environmental objectives defined by the Environment Agency. OfWAT assesses and compares the plans with the objective of ensuring what are effectively supply monopolies and operating efficiently. The industry is currently at the beginning of the Asset Management Plan 6 (AMP6) which runs from 2015 to 2020.

When considering investment requirements to accommodate growing demand, water companies are required to ensure a high degree of uncertainty 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 reports on their 25-year Strategic Direction Statements (SDS) and WRMPs.

3.5.3 Developer Contributions

Developments with planning permission have a right to connect to the public water and sewerage systems, although this does not preclude the requirement for early engagement with suppliers to ensure that sufficient capacity is in place prior to connection.

Developers may either requisition a water supply connection or sewerage system, or self-build the assets and offer these for adoption by the water company or sewerage undertaker. Self-build and adoption are usually practiced for assets within the site boundary, whereas requisitions are normally used where an extension of upgrading the infrastructure requires construction on third party land.

The cost of requisitions is shared between the water company and developer as defined in the Water Industry Act 1991.

Where a water company is concerned that a new development may impact upon their service to customers or the environment (for example by causing foul sewer flooding or pollution) they may

26 UK Government (1991) Water Industry Act 1991. Accessed online at: http://www.legislation.gov.uk/ukpga/1991/56/contents on: 05/10/2017

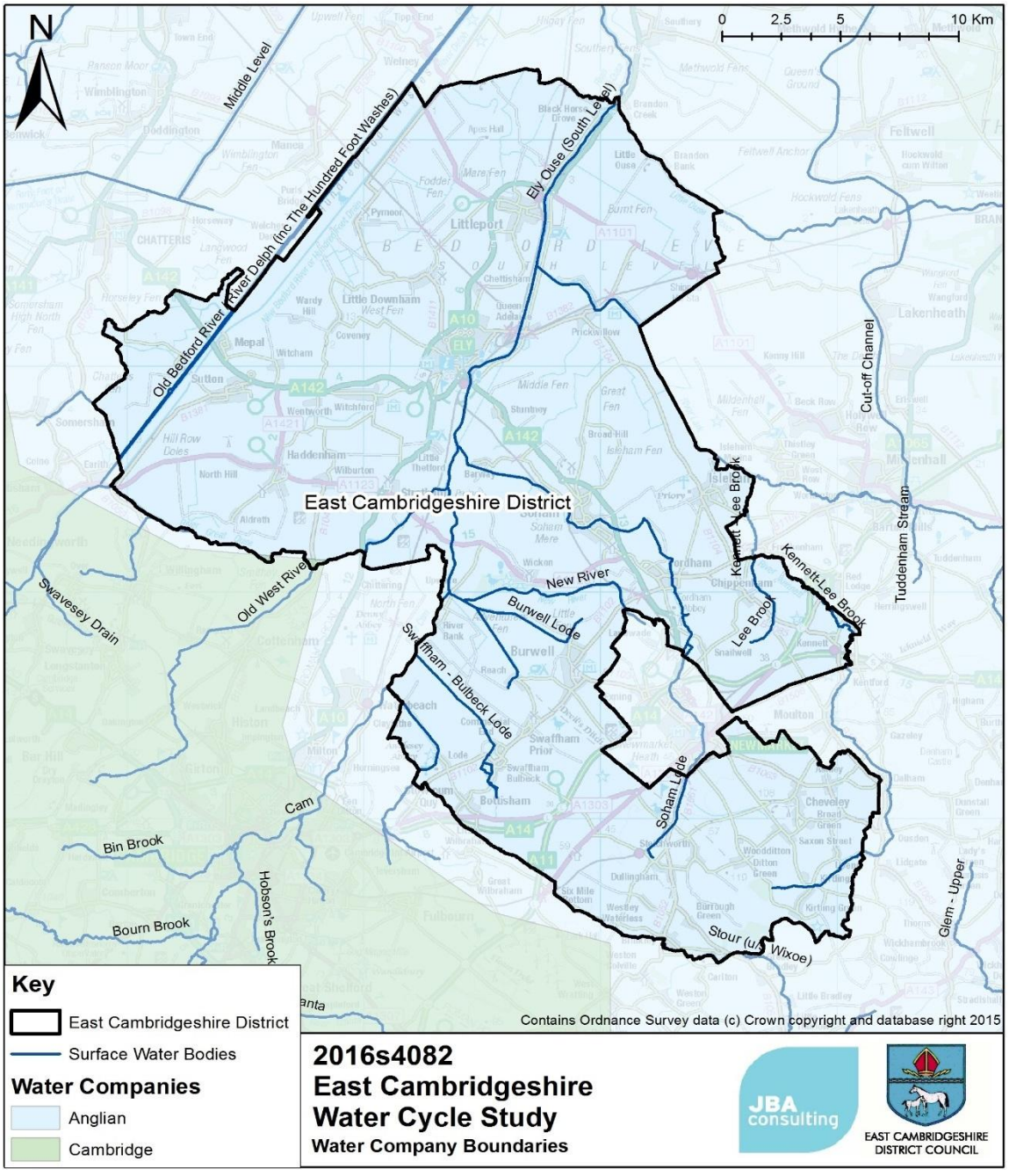
request the LPA to impose a Grampian condition, whereby the planning permission cannot be implemented until a third party action, for example the water company upgrading a sewer, is complete.

The Town and Country Planning Act Section 106 agreement and Community Infrastructure Levy agreements may not be used to obtain funding for water or wastewater infrastructure.

4 Water Resources and Water Supply

Anglian Water (AW) is responsible for supplying water to the District as illustrated in Figure 4-1.

Figure 4-1: Water Supply Company Boundaries



4.1 Availability of Water Resources

The Catchment Abstraction Management Strategy (CAMS) is prepared by the Environment Agency. This Licensing Strategy sets out how water resources are managed in different areas of England and contributes to implementing the Water Framework Directive (WFD). The CAMS provide information on the resources available and what conditions might apply to new licenses. The licenses require abstractions to stop or reduce when a flow or water level falls below a specific point as a restriction to protect the environment and manage the balance between supply and demand for water users. The CAMs is published in a series of documents known as Abstraction License Strategies (ALSs), but for clarity the term CAMS will be used in this report.

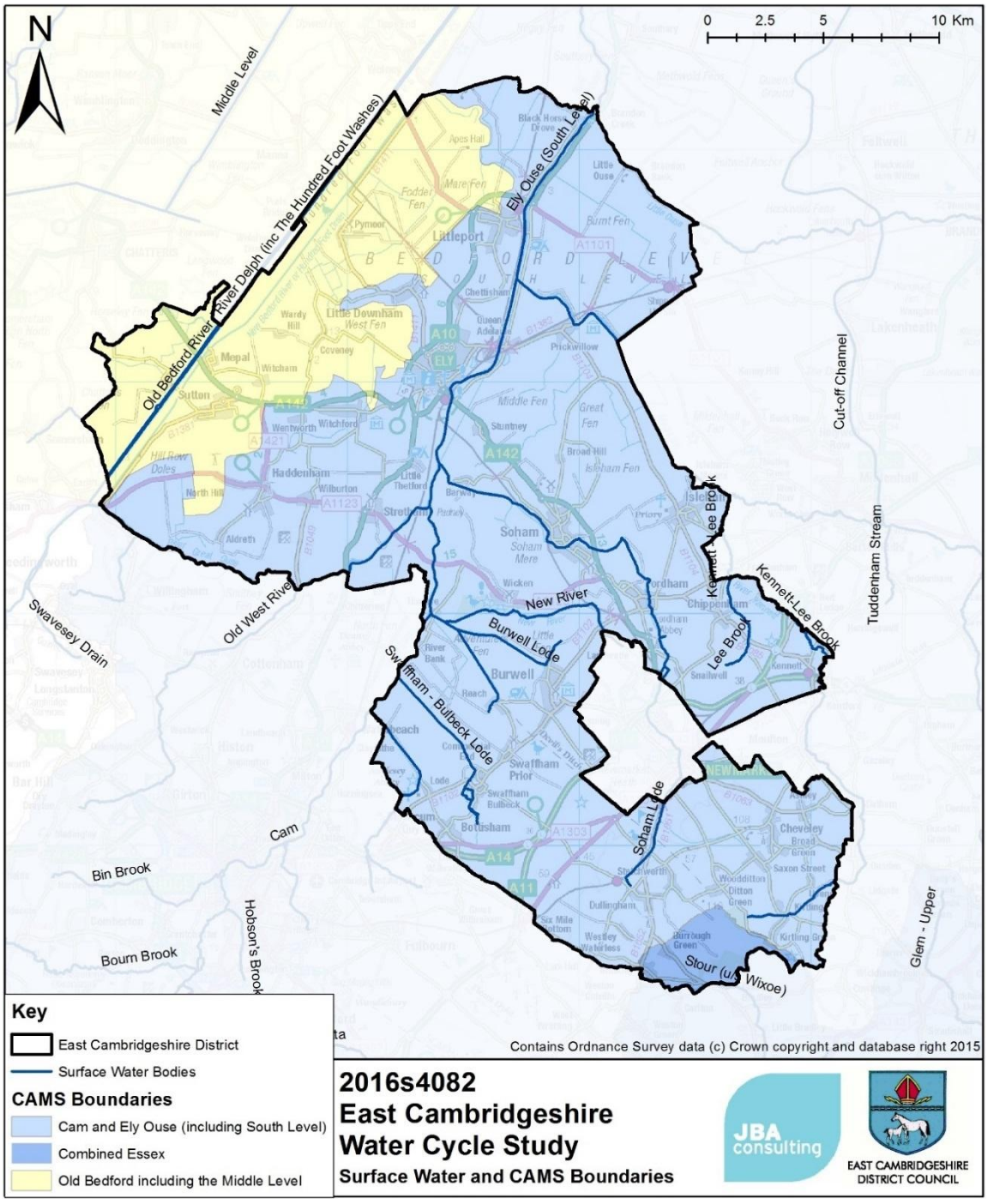
New and varied licences are usually time limited, which allows for the periodic review of the area as circumstances may have changes since the licences were granted. These are generally given for a twelve-year duration, but shorter or longer licences can be accepted. This is usually dependant on local factors such as the lifetime of the infrastructure, the availability of resources and future plans or changes. The licences are then replaced or renewed near to the expiry date.

The CAMS is important in terms of the Water Resource Management Plan (WRMP) as this helps to determine the current and future pressures on water resources and how the supply and demand will be managed by water companies[27].

East Cambridgeshire is covered by three CAMS; the Cam and Ely Ouse (including South Level), the Old Bedford including Middle Level and a small area of the Combined Essex in the south of the district. Figure 4-2 shows the CAMS in the East Cambridgeshire District. Consequently, the abstraction licenses are slightly different due to the local characteristics of the water bodies. For the whole region, abstraction licences are required if more than 20m³/day of water is withdrawn from a river, lake, reservoir, pond, spring or an underground source. The licence is granted dependant on the amount of water available.

27 Environment Agency (2016) Managing Water Abstraction. Accessed Online at: https://www.gov.uk/government/publications/managing-water-abstraction on: 05/10/2017

Figure 4-2: Abstraction Licences Strategy Boundaries for East Cambridgeshire District Council



4.1.1 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 is allowed. 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 6 years) in relation to the Environmental Flow Indicator (EFI). Results are displayed using different water resource availability colours, which are explained in Table 4-1. 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) condition on a licence. Groundwater availability is based on the corresponding surface water availability unless better information on principle aquifers is available or local issues that need to be taken into account.

Table 4-1: Implications of Surface Water Resource Availability Colours.

Water Resource Availability Colour	Implications for Licensing
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.
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.
Restricted water available for licensing	Fully Licensed flows fall below the Environmental Flow Indicator (EFI). If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted. It may also be appropriate to investigate the possibilities for reducing fully licensed risks. Water may be available via licence trading.
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.
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.

4.1.1.1 Cam and Ely Ouse

There are over 800 current abstraction licenses in the Cam and Ely Ouse CAMS, 35.5% is for public water supply and 25.5% is for water transfers. There is also extensive recreational use of watercourses in the catchment. The CAMS report contains the natural Ely Ouse system but also the South Level Fenland which is a Level Dependant Environment (LDE). This LDE is actively drained and managed by drains and dykes and has been divided into three Level Dependant Management Units (LDMUs). 66% of abstraction licences are time limited in this CAMS, the next common end date is the 31 March 2027[28].

At AP1 and AP17 and their associated LDMU's, there is no water available at low or medium flows and HoF conditions apply.

The Cam and Ely Ouse CAMS has two groundwater unites, a Chalk unit and the Woburn Sands. Where groundwater abstractions directly affect surface water flows, the impact is measured at the surface water AP. Where the source is confined, interactions between the groundwater and surface water occurs over a long timescale. Therefore, there is only one groundwater status regardless of season or river flow. The water resource status at the low flows (Q95) is taken as the groundwater status to ensure protection of the river environment when it is most vulnerable.

Where groundwater abstractions are likely to impact fens, or reduce baseflow to a river, HOF conditions may be applied to the abstraction. A summary of resource availability in the Cam and Ely Ouse CAMS is shown in Table 4-2.

28 Environment Agency (2017) Cam and Ely Ouse Abstraction Licensing Strategy. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289824/LIT7706_89dabb.pdf on: 05/10/2017

Table 4-2: Resource Availability for the Assessment Points within the Cam and Ely Ouse CAMS within the East Cambridgeshire district

AP	Name	Local resource availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)	Gauging station at AP?	Additional restrictions
1	Old West (LDMU)	Q30 Q50 Q70 Q95	Q33	120	35	No	Status reflects downstream critical AP17 - HoF set at Denver Sluice Old West LDMU level based restrictions apply
17	Denver Sluice	Q30 Q50 Q70 Q95	Q33	120	1040.3	Yes	South level LDMU, level based restrictions may apply

(1) Hands off Flow restriction (Q value)
(2) Number of days per annum abstraction may be available
(3) Approximate volume available at restriction (Ml/D)

4.1.1.2 Old Bedford Including Middle Level

The Old Bedford including Middle Level CAMS catchment is divided into three Level Dependant Management Units (LDMU) and two small areas of elevated natural watercourse that feed the LDMUs. The three LDMUs are:

- The Hundred Foot LDMU
- The Middle Level LDMU
- The Counter Drain LDMU

The Hundred Foot Drain is located along the north-western border of the East Cambridgeshire district. The main use of abstracted water is for the irrigation of agricultural land, where there are 340. In addition, there are industrial licences granted, but public water supplies are all sourced outside this CAMS area. 12% of the licences in Old Bedford including Middle Levels are non-varied Licences of Right with no expiry date. All other licences in this catchment are time limited. The current Common End Date is 31 March 2025[29].

The availability of water for abstraction in the three Middle Level areas has been determined by a water level bases strategy as it is not possible to assess LDMUs with regard to flow. For all three LDMUs, there is no surface water available in the summer. Surface water may be available in the winter subject to conditions within each LDMU.

Within the CAMS area, there are no significant principle aquifers and therefore there is little available groundwater. Some groundwater may be available from Secondary aquifers, but this is assessed on a case by case basis. Table 4-3 summarises the availability of water resources within the Hundred Foot LDMU.

Table 4-3: Resource Availability for the Hundred Foot LDMU within the Old Bedford Including Middle Level CAMS

29 Environment Agency (2017) Old Bedford Including Middle Level. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289821/LIT_7705_cc41a8.pdf on: 05/10/2017

LDMU	CAMS SW Colour- Summer	CAMS SW Colour - Winter	Licensing Strategy	Additional Comments
Hundred Foot	Red	Green	No surface water available in the summer. Surface water may be available in the winter subject to conditions. Trading of licensed quantities may be possible Groundwater may be available from Secondary aquifers and will be assessed on a case by case basis	Existing licences that are time limited will be treated with a presumption of renewal with the same terms and condition subject to the renewal tests.

4.1.1.3 Essex

There are many key factors within the Essex CAMS report including the Ely-Ouse to Essex Transfer Scheme, significant infrastructural developments, unsustainable groundwater abstraction and significant population growth leading to a much greater future water demand. In the Essex CAMS, 15% of the licences are time-limited. The next common end date for this catchment is in 2016 and the subsequent one is in 2028[30].

Within the Essex CAMS, the status of the surface waterbody also applies to the groundwater immediately beneath it. Due to the need to prevent groundwater abstractions impacting on surface water flows below the hands-off flow, and the difficulty of assessing this on a large scale basis, each application for groundwater will be assessed on its own merits and impacts. Only a small portion of East Cambridgeshire is located within the Essex CAMS report.

4.1.2 Recommendations for Better Management Practices

The area covered by the Essex CAMS has been altered since the last round of CAMS to fit with the River Basin Management Plan (RBMP) areas for the Anglian and Thames regions. Essex CAMS covers 2920 km^2 and factors such as the Ely-Ouse to Essex Transfer Scheme impact this catchment along with other issues affecting water supply.

These underline the need to reduce abstraction by using more efficient management practices, increasing the sustainability of water usage and reduce the environmental impacts.

The main options for this identified in the CAMS are to adopt water efficiency and demand management techniques including:

- Testing the level of water efficiency before granting an abstraction licence
- Promoting efficient use of water
- Taking actions to limit the demand
- Reducing leakage.
- Embedding policies for low-water consumption design in new buildings into spatial plans.

This would ultimately cut the growth in abstraction and limit the impacts on flow and the ecology.

4.1.3 Water Stress

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

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

- "The current household demand for water is a high proportion of the current effective rainfall which is available to meet that demand; or

30 Environment Agency (2017) Essex Abstraction Licensing Strategy. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289840/LIT_7740_6e1970.pdf on: 05/10/2017

- The future household demand for water is likely to be a high proportion of the effective rainfall available to meet that demand.

The assessment[31] has classified Anglian Water, which covers the entirety of East Cambridgeshire as a region of "serious" water stress. This has two key consequences:

- Under water industry regulation, water companies in areas classified as seriously water stressed need to evaluate compulsory metering alongside other options when preparing water resource management plans (WRMPs).
- Under the "Planning Practice Guidance: Housing - Optional Technical Standards" (see section 3.1.4), LPAs are permitted, where there is a "clear local need" to opt for the lower per-capita consumption figure of 110litres/person/day in new housing. The designation of the area as being at "serious" water stress provides the evidence base for this local need.

4.2 Water Resource Assessment: Water Resource Management Plans

When new development within a district is planned, it is important to ensure that there are sufficient water resources in the area to cover the increase in demand without risk of shortages in the future on during periods of high demand.

Anglian Water is responsible for supplying the vast majority of the East Cambridgeshire District with water. Cambridge Water also supplies water to a small area located in the west of East Cambridgeshire District, however none of the proposed development sites are supplied by this company.

The aim of this assessment is to flag up where the housing numbers proposed by ECDC exceeds that number that Anglian Water have considered whilst planning for future demand so that actions can be implemented and resources planned to overcome future shortages.

The water resources assessment has been carried out utilising two approaches; initially by reviewing the Anglian Water Water Resource Management Plan (WRMPs), and secondly by providing the water company with growth scenarios for each settlement allowing them to assess each settlement and the housing yields proposed.

For the purposed of water resource planning, Anglian Water's supply area is divided into 19 Water Resource Zones (WRZs) which vary in size and have different water resource concerns. East Cambridgeshire and the associated proposed development sites are located within 3 WRZs; Ely, Newmarket and Cheveley. A small portion of the Ruthamford North WRZ is found in the north of the district but no developments are proposed within this zone.

4.2.1 Methodology

The AW Water Resource Management Plan (WRMP) was reviewed and attention was mainly focussed upon:

- The available water resources and future pressures which may impact the supply element of the supply/demand balance
- The allowance within those plans for housing and population growth and its impact upon the demand side of the supply/demand balance

4.2.2 Data Collection

The datasets used to assess the water resource capacity were:

- Site locations in GIS format (provided by ECDC)
- Site details including location, proposed use and housing yields (provided by ECDC)
- Water company and water resource zone boundaries (provided by AW)
- Water Resource Management Plan (provided by AW)

31 Environment Agency and Natural Resources Wales (2013). Water stressed areas - final classification. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf on: 05/10/2017

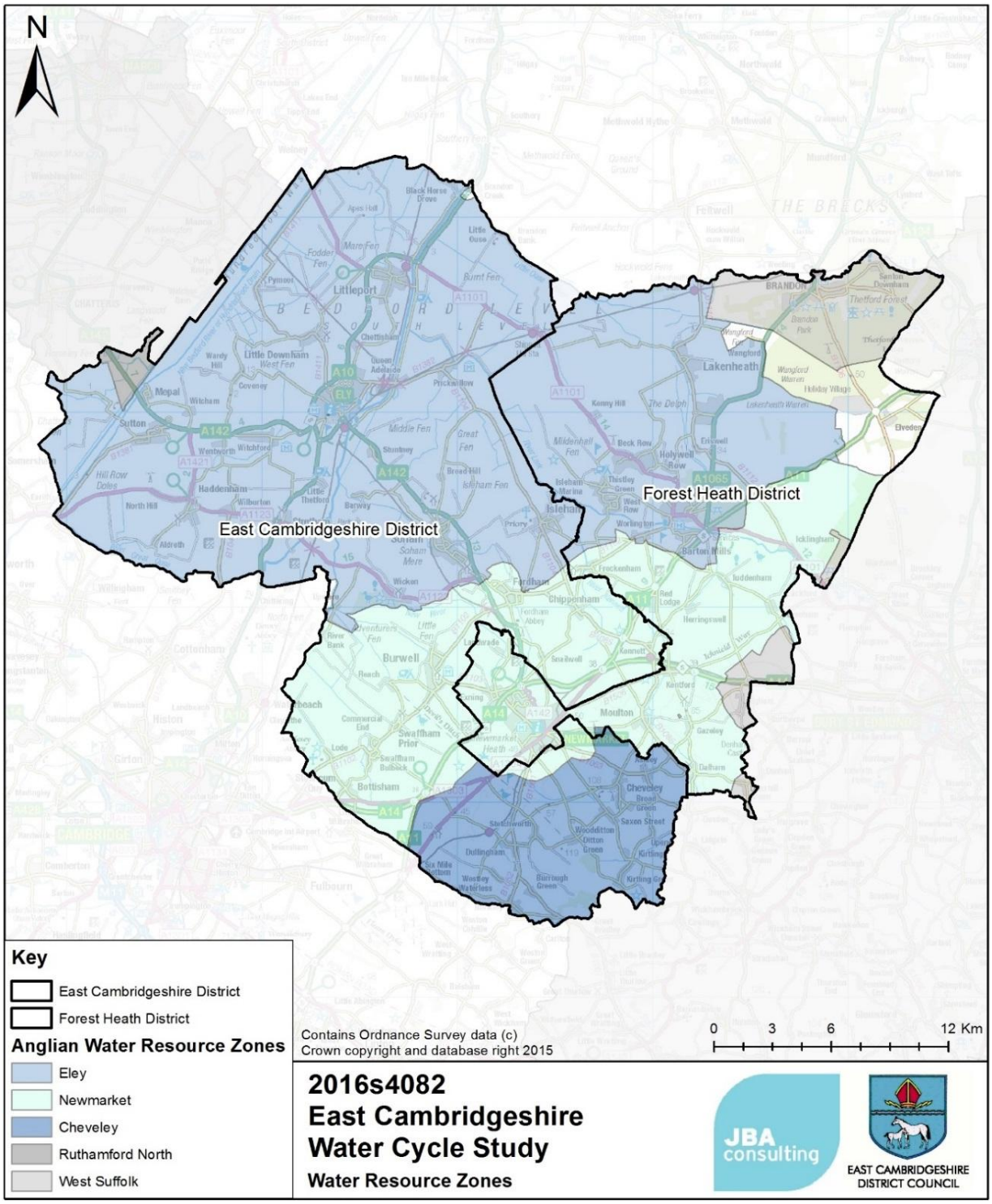
4.2.3 Results

Anglian Water manage water resources in 19 Water Resource Zones (WRZs). The Ely, Newmarket and Cheveley WRZs cover the majority of the East Cambridgeshire District and Forest Heath District to the east. The WRZ coverage of the district is illustrated in Figure 4-3.

AW's 2015 Water Resources Management Plan (WRMP)[32] aims to set out the company's 25-year strategy for maintaining the balance between supply and demand in a region at risk from population growth, climate change and growing environment needs. The Anglian region, due to a high population density and below average rainfall, is classed as being in severe water stress. Without investment to maintain the balance between supply and demand, the Ely, Cheveley and several other WRZs will be deficit by 2039-40.

32 Anglian Water (2015) Water Resources Management Plan. Accessed online at: http://www.anglianwater.co.uk/environment/our-commitment/our-plans/water-resource-management.aspx on: 05/10/2017

Figure 4-3: Anglian Water's Ely, Newmarket and Cheveley Water Resource Zones Supplying the East Cambridgeshire District



4.2.3.1 Ely WRZ

- Ely WRZ is forecast to enter deficit in 2024/25, reaching an average deficit in 2039/40 of 3.9Ml/d under dry year annual average conditions
- No significant baseline climate change or levels of service sensitivities have been identified.
- Two WTWs in the RZ are targeted for likely sustainability reductions. These reduce average daily source-works output by 1.5 Ml/d
- Potential transfer scheme to transfer water from Fenland/Newmarket WRZ (AMP7)
- In the long term, increased connectivity and resource development with adjacent WRZs including East Suffolk and South Essex WRZ
- The worst-case sustainability reduction is a further reduction of 4.1 Ml/d at average and 7 Ml/d at peak.

Population and household growth: Across the Anglian Water region, growth scenarios of up to one million extra residents have been considered in the plan. Anglian Water forecasts new properties equivalent to around 500 per year within the Ely WRZ. This figure is based on recent trends in population growth and is higher than the recent rates of new build and the number of properties previously forecast by local authorities. In summary the WRMP is based on a forecast of 10,000 additional properties in the Ely WRZ between 2015 and 2035.

Table 4-4: Anglian Water WRMP and Local Authority Growth Estimates for the Ely WRZ

Household Growth Estimates	2001-06	2006-11	2015-20	2020-25	2025-30	2030-35	2035-40
Local Authority Policy Estimates			1,500	1,500	2,500	3,000	3,000
WRMP Trend Estimates			2,500	2,500	2,500	2,500	2,500
Annual Monitoring Report Data	2,500	2,000					

The preferred plan: Anglian Water have presented the following preferred plan for maintaining the supply-demand balance in Ely WRZ:

- **AMP6 (2015-20):** Anglian Water's focus for 2015-2020 is on demand management. In Ely this includes the completion of approximately 3,000 water efficiency audits, the fitting of 5,500 meters and around 4,000 customers opting on to metered billing. The baseline supply demand balance also includes leakage reduction.
- **AMP7 (2020-2025):** The transfer of water from Newmarket WRZ to Ely WRZ via a new 10km pipeline.

4.2.3.2 Newmarket WRZ

- This WRZ remains in surplus for the forecast period.
- Two WTWs in the newly formed Newmarket RZ are targeted for likely sustainability reductions. These may reduce average daily source-works output by 2.5 Ml/d.
- No significant baseline climate change or levels of service sensitivities have been identified
- In the long term, increased connectivity and resource development in East Suffolk and South Essex WRZs will benefit this catchment and the associated Ely and Cheveley WRZs within East Cambridgeshire
- A worst case 2.6 Ml/d climate change reduction in average daily source-works output is forecast. This would affect our abstraction from a drought vulnerable portion of the Chalk

Population and household growth: Anglian Water forecasts new development equivalent to around 250 new properties per year. This estimate is higher than the recent rates of new build and the future development previously forecast by local authorities. In summary the WRMP is based on a forecast of 4,000 additional properties in the Newmarket WRZ between 2015 and 2035.

Table 4-5: Anglian Water WRMP and Local Authority Growth Estimates for Newmarket WRZ

Household Growth Estimates	2001-06	2006-11	2015-20	2020-25	2025-30	2030-35	2035-40
Local Authority Policy Estimates			400	400	700	900	900
WRMP Trend Estimates			1,000	1,000	1,000	1,000	1,000
Annual Monitoring Report Data	650	500					

The preferred plan: Anglian Water have presented the following preferred plan for maintaining the supply-demand balance in Newmarket WRZ:

- **AMP6 (2015-20):** Anglian Water's focus for 2015-2020 is on demand management. This includes the completion of 1,800 water efficiency audits and the movement of around 1,600 customers to metered billing. The baseline supply demand balance also includes leakage reduction.
- **AMP8 (2025-30):** To support the transfer of water into the Newmarket WRZ, there are several upstream options including the augmentation of the River Lark flows, a resilience scheme involving transfers from the East Suffolk WRZ and water reuse in Ipswich.

4.2.3.3 Cheveley WRZ

- AMP8 deficits are forecast with deficits growing to 0.15 Ml/d under dry year annual average conditions and 0.18 Ml/d under critical conditions
- No significant baseline climate change or levels of service sensitivities have been identified.
- The probabilistic water balance indicates that there is a significant risk of a deficit by the end of the forecast period. This reflects the limited number of sources of supply that there are in this area, and the potential vulnerability of these to point sources of contamination

Population and household growth: WRMP forecasts new properties equivalent to around 40 per year, this figure is similar to both recent new builds rates and previous local authority forecasts. In summary the WRMP is based on a forecast of 750 additional properties in the Cheveley WRZ between 2015 and 2035.

Table 4-6: Cheveley WRMP Growth Estimates

Household Growth Estimates	2001-06	2006-11	2015-20	2020-25	2025-30	2030-35	2035-40
Local Authority Policy Estimates			150	150	250	300	300
WRMP Trend Estimates			180	200	190	180	180
Annual Monitoring Report Data	200	200					

The preferred plan: Anglian Water have presented the following preferred plan for maintaining the supply-demand balance in Newmarket WRZ:

- **AMP6 (2015-20):** The priority in this WRZ is lowering consumption levels. In Cheveley AW aim to complete 200 water efficiency audits and anticipate that around 200 customers will opt onto metered billing
- **AMP8 (2025-30):** AW aim to transfer water resources from Newmarket WRZ to Cheveley via 3km of new pipeline and a new pumping station. there are several upstream options including the augmentation of the River Lark flows, a resilience scheme involving transfers from the East Suffolk WRZ and water reuse in Ipswich.

Ely, Newmarket and Cheveley WRZs encompass the entirety of the East Cambridgeshire district and the majority of the Forest Heath District to the east (excluding the north-eastern corner which is located within the West Suffolk WRZ). In total, Anglian Water's WRMP forecasts a total of 14,750 additional properties within these three WRZs between 2015 and 2030-35.

During the preparation of this WCS, the publications of the East Cambridgeshire and Forest Heath Objectively Assessed Housing Needs reports were assessed as having the most up to date housing yield forecasts for the districts.

These reports highlight a significantly increased objectively assessed housing need compared to those figures used in Anglian Water's WRMP. The latest figures for East Cambridgeshire district and Forest Heath district, which make up the majority of the 3 WRZs in question, are collated in Table 4-7.

Table 4-7: Summary of forecast housing growth scenario within East Cambridgeshire and Forest Heath District

District	Housing Yield Forecast	Source
East Cambridgeshire District	12,900 (2014 to 2036) (586 per year)	East Cambridgeshire Objectively Assessed Housing Need October 2016[33]
Forest Heath District	6,800 (2011 to 2031) (340 per year)	Forest Heath Objectively Assessed Housing Need August 2016[34]
TOTAL		Approx. 19,700

4.2.4 Conclusions

Anglian Water's WRMP demonstrated the pressures on water resources in the water supply zones with increasing demand, population growth, resource uncertainty, the impacts of climate change and the need to transfer water to other catchments.

Analysis of the household growth estimates within Anglian Water resource WRZ has shown that current growth forecasts are significantly lower than those utilised in the housing yield forecasts made by East Cambridgeshire District. An investigation of the differences between these figures is recommended to ensure that water supply in the relevant WRZs will keep up with the future demand in the district adequately.

33 Cambridgeshire County Council (2016) East Cambridgeshire Objectively Assessed Housing Need October 2016. Accessed online at: http://www.cambridgeshireinsight.org.uk/EastCambs_OAN-Update-2016 on: 05/10/2017

34 Cambridgeshire County Council (2016) Forest Heath Objectively Assessed Housing Need August 2016. Accessed online at: http://www.cambridgeshireinsight.org.uk/ForestHeath_OAN-Update-2016 on: 05/10/2017

4.2.5 Recommendations

Table 4-8: Recommendations of WRMPs.

Action	Responsibility	Timescale
Where necessary, identify the scale of likely solutions to accommodate growth, and build the likely timescale for delivering the infrastructure into the overall delivery programme to identify key dates and potential programme constraints	AW	Ongoing
Undertake technical studies to understand options to provide sufficient bulk and local transfer capacity and communicate results to ECDC	AW	Ongoing
Developers seek early consultation with Anglian Water in order to ensure adequate time is available to provide local distribution main upgrades to meet additional demand.	Developers, AW	Ongoing

4.3 Water Resource Assessment: Water Resources and Water Supply Infrastructure Assessment

Increases in water demand adds pressure to the existing supply infrastructure. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrading 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 the water around a WRZ, and distribution infrastructure, smaller scale assets which convey water around settlements to customers. The following assessments focus on the supply infrastructure and the available water resources. It is expected that developers should fund assessments and the modelling of distribution systems to assess requirements for local capacity upgrades.

4.3.1 Methodology

Anglian Water were provided with the list of settlements within their management area and the potential housing numbers for each site. Using this information AW assessed each site using the different data sets they hold.

AW used the following R/A/G assessment definitions to score each site:

Capacity available to serve the proposed growth	Infrastructure and/or treatment upgrades required to serve proposed growth or diversion of assets may be required	Major constraints to provision of infrastructure and/or treatment to serve proposed growth

4.3.2 Data Collection

The datasets used to assess the water supply and distribution capacity are the following:

- Site locations in GIS format (provided by ECDC)
- Potential housing numbers for each site (provided by ECDC)
- Population equivalent using an occupancy rate of 2.3 p/h for AW.
- Water demand by multiplying the population equivalent by 133 l/p/d for AW.

The water supply infrastructure assessment has not been provided to date by Anglian Water.

5 Wastewater Collection and Treatment

Anglian Water (AW) is the Sewerage Undertaker (SU) for the whole district. The role of a sewerage undertaker includes collection and treatment of wastewaters from domestic and commercial premises, and in some areas drainage of surface water from building curtilages to combined or surface water sewers. It excludes unless adopted by AW, systems that do not connect directly to the wastewater network, e.g. SuDS or highway drainage.

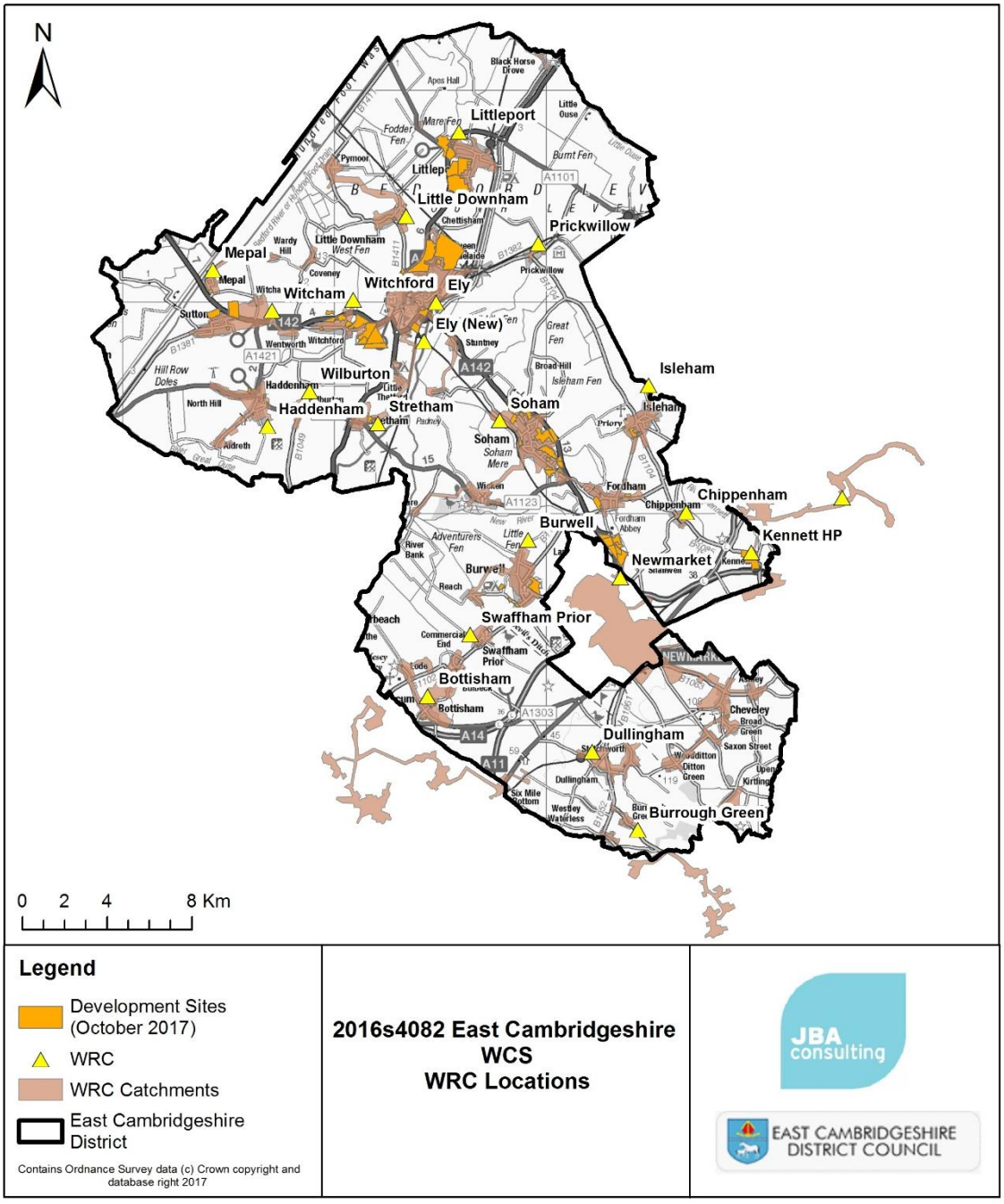
Increased wastewater flows into collection systems due to growth in population or per-capita consumption can lead to overload of infrastructure, increasing the risk of sewer flooding, and where present, increasing the frequency of discharges from Combined Sewer Overflows (CSOs).

Likewise, headroom at water treatment works can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity. As the volume 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 the consented effluent consents in order to achieve a "load standstill" i.e. ensuring that as effluent volumes increase the pollutant load discharged does not increase. Again, this would require investment by the water company to improve the quality of the treated effluent.

In combined sewerage systems, or foul systems with surface water misconnections, there is potential to create headroom in the system, thus enabling additional growth, by removal of surface water connections. This can most readily be achieved on redevelopment of brownfield sites with combined sewerage, where there is potential to discharge surface water vis sustainable drainage systems (SuDS) to groundwater, watercourses or surface water sewers.

Note that Anglian Water now uses the terminology Water Recycling Centres (WRCs) to underline the role of treatment works in recycling water to the natural environment. The term Water Recycling Centres is used generally in the report.

Figure 5-1: East Cambridgeshire WRCs and Catchments



5.1 Drainage Strategies

Sewerage undertakers have been required to undertake long-term planning for management of their sewerage systems. These are normally called Drainage Area Plans (DAPs) but also called Sewerage Management Plans (SMPs). These have traditionally been internal documents, not shared with other Risk Management Authorities (RMAs) and have mainly (though not exclusively), focused on foul and combined sewerage systems.

In 2013, OfWAT and the Environment Agency issued joint guidance[35] on how water companies should prepare public-facing Drainage Strategies, at a catchment scale, to demonstrate how they will deliver their AMP6 outcomes (for example reduced sewer flooding, reduced pollution incidents, capacity for growth etc.) within each catchment. Drainage strategies should focus on the water company's foul, combined and surface water sewers, but also work with other RMAs to play their part in addressing wider drainage issues including flooding and water pollution. The guidance describes the six guiding principles of a drainage strategy as:

- Partnership - to be optimal, strategies must be developed in partnership with customers, developers, LLFAs, planners and the EA
- Uncertainty - strategies should acknowledge uncertainty, for example in data and the impacts of climate change, and set out how these uncertainties will be addressed (for example adaptive approaches to climate change
- Risk-based - plans should consider the probability and consequences of inadequate drainage, and prioritise operations and investment where the risk is greatest
- whole-life costs and benefits - strategies should promote interventions which deliver outcomes to customers and the environment at the lowest cost to customers and the community. wider benefits (for example ecosystem services) should also be valued when selecting interventions.
- live process - strategies should be adaptable and reviewed periodically
- innovative and sustainable - strategies should evaluate alternatives to traditional engineering schemes, considering innovative approaches such as active system control, surface water disconnection, customer engagement and incentivisation.

5.1.1 Anglian Water Drainage Strategies

Anglian Water have not yet published details of their plan for preparing Drainage strategies, and no strategies have been published to date.

5.2 Sewerage System Capacity Assessment

New houses add pressure to the existing sewerage system. An assessment is required to identify the available capacity within the existing systems, and the potential to upgrade overloaded systems to accommodate growth. The scale and cost of upgrading works may vary very significantly depending upon the location of development in relation to the network and the receiving WRC.

It may be possible 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 to increase 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 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 to a site to the sewerage network across third party land are normally funded via developer contributions, as third- party arrangements between the developer and utility provider.

35 OfWAT and the Environment Agency (2013) Drainage Strategy Framework for water and sewerage companies to prepare Drainage Strategies. Accessed online at:
http://www.ofwat.gov.uk/wp-content/uploads/2015/12/rpt_com201305drainagestrategy1.pdf on: 05/10/2017

5.2.1 Methodology

In 2016 AW were provided with the list of sites and the potential housing numbers. Using this information AW assessed each site using the different datasets they hold and assigned a red / amber / green score (RAG) (defined below) for the foul sewerage network capacity and surface water network capacity.

Capacity available to serve the proposed growth	Infrastructure and/or treatment upgrades required to serve proposed growth or diversion of assets may be required	Major constraints to provision of infrastructure and/or treatment to serve proposed growth

This assessment has been re-run by JBA using the updated list of sites. The WRC capacity was based on the updated headroom assessment, and the RAG status for foul sewerage network capacity and surface water network capacity has been carried over from the original information provided by AW to the new sites based on location.

5.2.2 Data collection

The datasets used to assess the sewerage system capacity are the following:

- Site location in GIS format (provided by ECDC)
- Potential housing numbers for each site (provided by the ECDC)
- Population equivalent using an occupancy rate of 2.3p/h (calculated by AW)
- Water demand by multiplying the population equivalent by 133 l/p/d (calculated by AW)

5.2.3 Results

Foul network capacity:

In the 2016 study AW made the assumption that any development sites with 10 or more properties would require some enhancement to capacity and so these were assigned an "amber" status. This methodology has been applied to the new list of sites.

6 proposed sites have been given a green status. The remaining 97 sites have been given an amber status.

Surface water network capacity:

AW assigned a "red" status to every proposed site on the 2016 list with the note *"SW capacity assessment reflects Anglian Water's preferred method of surface water disposal of using a sustainable drainage system (SUDS) with connection to sewer seen as the last option. This is in line with Planning Policy Statement 25: Development and Flood Risk emphasises the role of SUDS and introduces a presumption that they will be used in all developments."* This status has been carried forward in this assessment.

5.2.4 Conclusions

Appendix A shows a site by site assessment of the foul network capacity and surface water network capacity within the study area.

The foul sewerage network has been given an amber status for most of the proposed developments on the assumption that any development of greater than 10 houses would require some enhancement of the network. However, no specific constraints to these enhancements have been identified.

Where sites are remote from the nearest sewer the options for foul drainage will need to be assessed in more detail.

5.2.5 AW policy (in line with Planning Policy Statement 25) is that disposal of surface water via the sewer system is a last resort. All sites have therefore been given a "red" status for surface water infrastructure.

5.2.6 Recommendations

Action	Responsibility	Timescale
Take into account sewerage infrastructure constraints in phasing development in partnership with Anglian Water	ECDC	Ongoing
Anglian Water to continue to assess growth demands as part of their wastewater asset planning activities and feedback to ECDC where concerns arise	AW	Ongoing
Further assessment required for sites remote from existing foul sewerage network	ECDC/AW/EA	

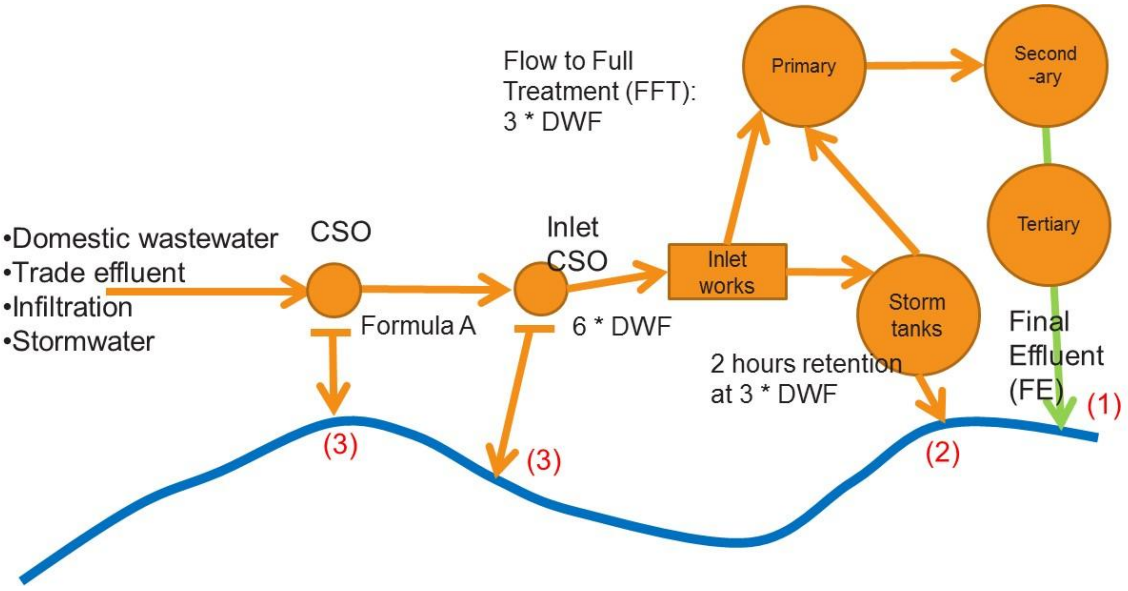
5.3 Water Recycling Centre Flow Permit Assessment

5.3.1 Introduction

The EA is responsible for regulating sewage discharge releases via a system of Environmental Permits (EPs). Monitoring for compliance with these permits is the responsibility of both the EA and the plant operators. Figure 5-2 summarises the different types of wastewater releases that might take place, although precise details vary from works to works depending on the design.

During dry weather, the final effluent from the Water Recycling Centre (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 5-2: Overview of typical combined sewerage system and water recycling centre discharges



Environmental permits are used 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 WRC 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 water recycling centre design, as a means of estimating the 'base flow' in sewerage modelling and for determining the flow at which discharges to storm tanks will be permitted (Flow to Full Treatment, FFT).

WRC Environmental Permits also consent for maximum concentrations of pollutants, in most cases suspended solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia (NH_4). Increasingly, phosphorus permit limits are also applied. The permit limits are determined by the Environment Agency with the objective of ensuring that the receiving watercourse meets its environmental objectives, in particular the requirements of the Water Framework Directive (WFD).

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 of flow consents.

5.3.2 Methodology

An assessment of the WRC capacity was carried out using measured flow data supplied by the EA and the following process:

- Calculate the current measured Dry Weather Flow (DWF). This is usually calculated as the 80-percentile exceedance flow, however only the 90-percentile data was available. This will therefore represent a conservative estimate of headroom.
- Potential development sites and existing commitments were assigned to a WRC using the sewerage drainage area boundaries.
- For each site, the future demand for waste water service was calculated assuming an occupancy rate of 2.3p/h, a per-capita consumption of 133 and that 95% of water used is returned to sewer (assumption provided by AW). Permitted headroom was used as a substitute for actual designed hydraulic capacity for each WRC being assessed. In some cases, permitted DWF might relate well to the actual designed hydraulic capacity of a WRC, in other cases it might not.

The sites were then given a red / amber / green status based on the definition below:

Capacity available to serve the proposed growth	Infrastructure and/or treatment upgrades required to serve proposed growth or diversion of assets may be required	Major constraints for the provision of infrastructure and/or treatment to serve proposed growth

RAG status has been assigned based on all of the proposed developments that feed into each WRC being built. The score is therefore the same across all developments that feed into a particular WRC. Further information on the scheduling of proposed developments is required in order to provide a more detailed assessment and advise the requirement and timing of WRC upgrades.

Where a WRC serving growth with the ECDC area was also serving growth from neighbouring districts, this additional demand was added to the future demand at that WRC.

5.3.3 Data Collection

The datasets used to assess the WRC capacity are the following:

- List of settlements (provided by ECDC)
- Planned housing numbers for each proposed site (provided by ECDC)
- WRC locations and sewerage drainage area boundaries (used by AW)
- Occupancy rate, water demand and % of water that reach the WRC (used by AW)
- Developments in neighbouring districts that would be served by WRCs within the study area

5.3.4 Results

The RAG status of the proposed developments can be seen in Appendix A. If all the proposed developments were to be built, then 4 of the 21 WRCs in the study area would require upgrades to capacity in order to Anglian Water provided an assessment of WRCs within East Cambridgeshire, the proposed housing numbers managed by each WRC and an assessment of how growth will affect the headroom capacity. The results of AW's assessment are shown in Table 5-1.

4 WRCs would require an upgrade in order to serve all of the proposed development.

One site (KEN.M1) lay within the sewage catchment for the Kennett HP WRC. This is a very small treatment works with minimal physical space for upgrades and so this site has been re-assigned to Newmarket WRC. No connection exists to this treatment works so would require an assessment.

Table 5-1: Anglian Water Wastewater Treatment Works Flow and Quality Consent Assessment

WRC	Permit reference	Permitted Maximum DWF (m3/d)	Housing growth over plan period (dwellings)	Employment growth over plan period (m2)	Observed 90%ile DWF (m3/d)	Additional flow from growth (m3/d)	Total future DWF (m3/d)	Remaining % of Permit
Bottisham	AW1NF302	820	162	143	708	60.66	769	6%
Burrough Green	AEENF1574	68	11	0	15	3.2	18	73%
Burwell	AW1NF1065	1214	511	525	897	198.37	1095	10%
Dullingham	AECNF10273	205	15	0	153	4.36	157	23%
Ely	AW1NF1176	4350	273	2943	2934	358.92	3293	24%
Ely (New)	AWCNF11352	1604	3019	8766	1175	1710.11	2885	-80%
Haddenham	AECNF1089	670	133	127	546	50.72	597	11%
Isleham	AECNF10271	423	188	127	222	66.7	289	32%
Kennett HP	AECNF10368	27						
Little Downham	AECNF10119	431	25	0	276	7.27	283	34%
Littleport	AECNF10518	2067	2466	2466	716	950.9	1667	19%
Mepal	AECTF11049	180	50	0	140	14.53	155	14%
Newmarket	AW1NF2476	6100	1480	4295	4909	838.12	5747	6%
Soham	AECNF1195	2500	2365	2276	2280	903.5	3184	-27%
Stretham	AECNF1213	500	100	0	229	29.06	258	48%
Swaffham Prior	AECNF1218	170	20	175	66	22.44	88	48%
Wilburton	AW1NF500A	225	60	0	174	17.44	191	15%
Witcham	AECNF1958	1100	285	2705	885	339.8	1225	-11%
Witchford	AECNF1402	550	1028	0	473	298.74	772	-40%

5.3.5 Conclusions

All of the WRCs are currently working within their permits, however 4 of the assessed WRCs would exceed their permit if all of the proposed development sites were delivered. These would therefore require infrastructure and / or treatment upgrades to accommodate all of the proposed growth.

6 WRCs would be within 20% of the permitted flow post development and so may require an upgrade in the future. The remaining WRCs are predicted to stay within the current permitted DWF.

It is worth noting that the flows from this assessment were taken from 2014. The observed flows for the year 2014 was a year of exceptionally high rainfall. Across the Anglian Region CEH[36] estimate that the annual rainfall had a 1 in 10-15-year return period. Consequently, river levels in the Great Ouse were 139% of the long-term average. In these conditions, many wastewater collection systems would be expected to exhibit higher than average infiltration flows and therefore this provides a conservative assessment of the impact on the WRCs. The EA has commissioned research (currently unpublished) into identifying periods of "unusual" rainfall which should be excluded from the calculation of actual DWF. This method has not been applied to the calculation of actual DWF in Table 5-1. It is therefore possible that the flows were atypical during 2014 and if so would lead to an underestimation of headroom at these WRCs.

5.3.6 Recommendations

Action	Responsibility	Timescale
Take into account the available WRC capacity in phasing of development going to the same WRC	ECDC	Ongoing
Provide annual updates to AW detailing projected housing growth	ECDC	Annually
AW to assess growth demands as part of their wastewater asset planning activities and feedback to ECDC where concerns arise.	AW	Ongoing
AW, ECDC and the EA will work closely to ensure the timely delivery of any necessary WRC upgrades	AW, ECDC, EA	Ongoing

5.4 Water Recycling Centre Odour Assessment

Where new development encroaches upon an existing Water Recycling Centre (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-fit to existing WRCs.

National Planning Policy Guidance recommends that plan-makers considering whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, in particular due to the risk of odour impacting residents and requiring additional investment to address.

5.4.1 Methodology

It is generally the case for water companies that a new development may need an odour assessment if the site is close to a WRC and is encroaching closer to the WRC than existing urbanised areas.

A GIS exercise was carried out by JBA to identify the distance between proposed development sites and WRCs. If there are no existing houses it is more likely that an odour assessment is needed. Another important aspect is the location of the site in respect to the WRC because the predominant winds blow from the south west.

The Anglian Water Asset Encroachment Risk Assessment Methodology[37] was applied with each WRC being classified by population served (based on population equivalent calculated from

36 Centre for Ecology and Hydrology (2015) Hydrological Summary for December 2014. Accessed online at: http://nora.nerc.ac.uk/509404/1/HS_201412.pdf on: 05/10/2017

37 Anglian Water (2012) Asset Encroachment Risk Assessment Methodology: Guidance document. Accessed online at:

consented DWF). A risk category for each development was then assigned based on both the distance from the nearest WRC and its relative size.

A red / amber / green assessment was applied:

Site is unlikely to be impacted by odour from WRC	Site location is such that an odour impact assessment is recommended	Site is in an area with confirmed WRC odour issues

5.4.2 Data collection

The datasets used to assess the impacts of odour from a WRC were:

- Sites location in GIS format (provided by the ECDC)
- WRC locations (provided by AW)
- "Consented discharges to controlled waters with conditions" database

5.4.3 Results

The site summary spreadsheet in Appendix A contains a full list of distance and direction from WRC for each site. Once risk categories were assigned, no development sites required additional odour screening. Conclusions

The odour screening assessment concluded none of the proposed sites are likely to be impacted by odour from WRCs. If the capacity of a WRC is upgraded the population served may increase causing a corresponding increase in the risk category. If upgrade works are planned, an odour impact assessment may be required.

5.4.4 Recommendations

Table 5-2: Wastewater treatment odour actions

Action	Responsibility	Timescale
Carry out an odour impact assessment on WRCs where upgrades are planned.	AW	Ongoing

http://www.anglianwater.co.uk/_assets/media/121212_Asset_Encroachment_Risk_Assessment_Methodology_publish(1).pdf on: 05/10/2017

6 Water Quality

6.1 Introduction

The increased discharge of effluent due to a growth in population served by a Water Recycling Centre (WRC, former known as Waste Water Treatment Works - WwTW) may impact on the quality of the receiving waterbody. The Water Framework Directive (WFD) does not allow a watercourse to deteriorate from its current class (either water body or element class).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourse. Where the scale of development is such that a deterioration is predicted, a new Environmental Permit (EP) may be required for the WRC to improve the quality of the final effluent, so that the extra pollution load will not result in a deterioration in the water quality of the watercourse. This is known as a "no deterioration" or "load standstill".

It is the objective of the WFD that all water bodies should meet Good Ecological Status (GES), or where they have been highly modified meet Good Ecological Potential (GEP). It is therefore also necessary to assess whether the proposed increase in effluent could prevent a watercourse from meeting GES or GEP.

If a watercourse fails the GES target, further investigations are needed to define the 'reasons for fail' and which actions could be implemented to reach such status.

For each development site, the receiving WRC was identified and the total future DWF calculated for each WRC. This assessment has also taken into account demand from development outside of the ECDC area, but which is served by the same WRC.

The EA has reviewed the list of WRCs and has suggested that a water quality assessment should be undertaken using Monte Carlo/RQP on the following:

- Bottisham
- Burwell
- Ely
- Ely (New)
- Newmarket
- Soham

All other WRCs receiving waste water from the new developments underwent a simpler initial assessment to assess whether 'load standstill' permit limits are achievable by conventional treatment methods.

The Environment Agency operational instructions on water quality planning and no-deterioration are currently being reviewed. Previous operational instructions[38] (now withdrawn) set out a hierarchy for how the no-deterioration requirements of the WFD should be implemented on inland waters. The potential impact of development should be assessed in relation to the following objectives:

- **Could the development cause a greater than 10% deterioration in water quality?** This objective 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"[39] 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.

38 Environment Agency (2012) Water Quality Planning: no deterioration and the Water Framework Directive. Accessed online at http://www.fwr.org/WQreg/Appendices/No_deterioration_and_the_WFD_50_12.pdf on 08/08/2017

39 European Court of Justice (2015) PRESS RELEASE No 74/15 Accessed online at: https://curia.europa.eu/jcms/upload/docs/application/pdf/2015-07/cp150074en.pdf on 08/08/2017

- **Could the development alone prevent the receiving watercourse from reaching Good Ecological Status or Potential?**

Is GES possible with current technology or is GES technically possible after development with any potential WwTW upgrades.

Full details of the water quality assessment methodology and results are included in Appendix B. This section provides a summary of the methodology, results and conclusions.

6.2 Methodology

To complete the assessment, future effluent flows were calculated to represent the future growth at proposed developments provided by ECDC.

6.2.1 RQP Assessment

The Environment Agency's RQP tool was used to assess how the volumetric flows impacted upon the water quality at the six WRCs and identify whether this causes a deterioration in the receiving watercourse. Deterioration is defined by the EA where any of the following conditions apply:

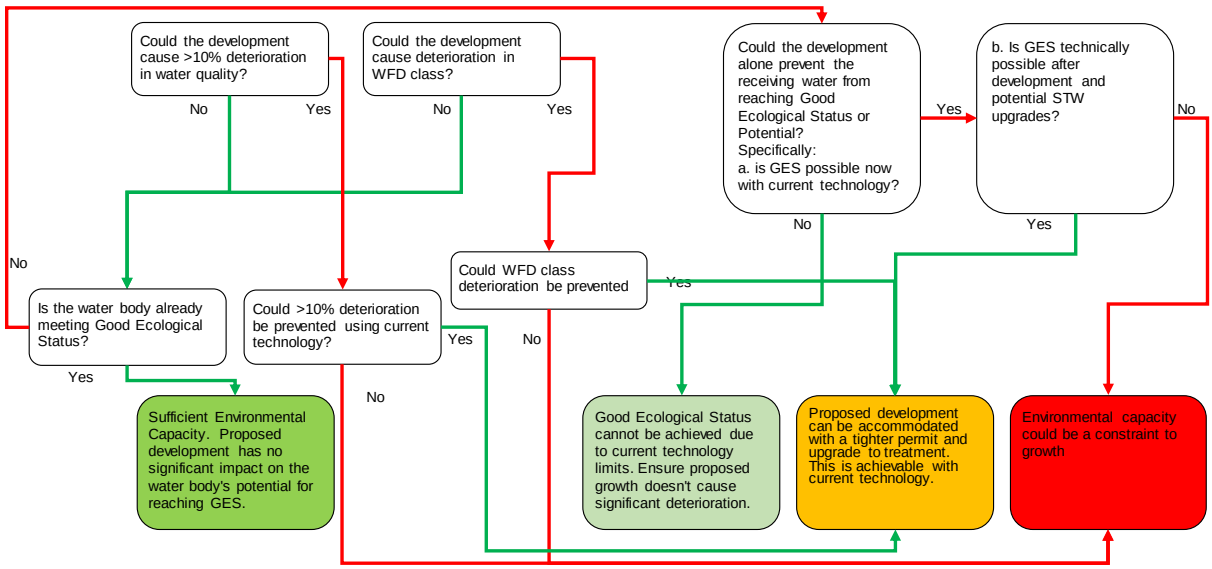
- A class deterioration: For example, if an increased load of ammonia from a WRC led to a water body currently defined as "Moderate" ecological status dropping down to "Poor" status.
- A deterioration of more than 10%. For example, if the present-day 95 percentile BOD downstream of a WRC is 2.0mg/l, but as a result of an increased WRC discharge this rose to 2.3mg/l, this would be a deterioration of 15%.
- Any deterioration of a water body classed as "Bad". Where the water body is currently of "Bad" ecological status (the lowest WFD status), then no further deterioration is permitted.

Where deterioration was predicted, the model was rerun to test whether upgrading the treatment works to use Best Available Technology (BAT) could prevent deterioration.

Where the receiving watercourse downstream of the treatment works was predicted to not meet Good status for one or more determinants, the models were rerun to test whether the application of Best Available Technology (BAT) treatment processes could enable the receiving watercourse to meet the physico-chemical requirements to achieve good Ecological Status or Potential. Where they could, this was then retested with the additional effluent flows due to growth. In cases where GES could be achieved at present, but would be prevented from being achieved in the future due to the growth alone, it is considered that environmental capacity may be a constraint on growth. This assessment process has recently been set out in a guidance document by the Environment Agency's West Thames Area[40]. Whilst this document has no national status it provides a useful summary of how to interpret the results of the water quality assessment. This guidance is summarised in the flow chart below:

40 Environment Agency West Thames Area (2015) Water Cycle Study Guidance and Requirements - West Thames Area.

Figure 6-1 Water quality assessment flow chart



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

- BOD (95%ile) = 5mg/l
- Ammonia (95%ile) = 1mg/l
- Phosphorus (mean) = 0.5mg/l

Note that phosphorus removal is the subject of ongoing national trials investigating novel techniques and optimisation of existing methods. This major study, which involves all UK water companies, is not due to report until 2017, therefore this assessment is based on the current assumption of BAT for phosphorus. This study assumes a 0.5mg/l as BAT until the study's results will be available.

This assessment did not consider the feasibility of upgrading each existing WRC.

6.2.2 Load Standstill Assessment

The load standstill assessment is a simpler mass balance assessment of water quality. The current, consented and future loads for each determinand are calculated using the observed, consented and future flows multiplied by the permit level for each determinand. The future load is then compared with the consented load to check if it is likely to exceed its permit.

Best available technology is then applied to each of the future loads to see whether it is possible to reduce the future load to the same as the current load.

6.3 Results - RQP Assessment

6.3.1 Summary

Table 6-1 summarises the modelling results for each WRC assessed for passing or failing the following targets:

- 'Good status'
- 'No 10% deterioration'
- 'No class deterioration'

Table 6-1: RQP results summaries for passing or failing targets of 'Good Status', 'No >10% Deterioration' and 'No Class Deterioration'

Watercourse (WwTW discharging into it)	Scenario	Achieves 'Good status' target?			Achieves 'No > 10% deterioration' target?			Achieves No 'Class deterioration' target?		
		BOD	NH4	P	BOD	NH4	P	BOD	NH4	P
Key		Achieves good status			No deterioration			No class deterioration		
		NA			Up to 10% deterioration			NA		
		Fails good status			More than 10% deterioration			Class deterioration		
Bottisham	Present day	no	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	no	no	no	26%	32%	33%	no	no	yes
Burwell	Present day	yes	yes	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	yes	no	no	13%	98%	62%	yes	no	yes
Chippingham	Present day	no	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	no	no	no	27%	44%	52%	no	yes	yes
Ely (Old)	Present day	yes	yes	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	yes	yes	no	4%	28%	7%	yes	yes	yes
Ely (New)	Present day	yes	yes	yes	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	yes	yes	no	13%	131%	400%	yes	yes	no
Newmarket	Present day	no	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	no	no	no	-9%	-14%	40%	yes	yes	yes
Soham	Present day	yes	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	no	no	no	68%	127%	116%	no	no	yes
Tuddenham	Present day	yes	yes	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future growth	yes	no	no	22%	55%	62%	yes	no	yes

6.3.2 Best Available Technology (BAT) Assessment

Table 6-2: Summary of results assuming BAT is applied

Key	Sufficient Environmental Capacity. Proposed development has no significant impact on the water body's potential for reaching GES	Good Ecological Status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.	Proposed development can be accommodated with a tighter permit and upgrade to the treatment. This is achievable with current technology.	Environmental capacity could be a constraint to growth.

WRC	Could the development cause a greater than 10% deterioration in WQ?	Could the development cause a deterioration in WFD class of any element?	Could the development prevent the water body from reaching GES?
Bottisham	Less than 10% deterioration for each determinand.	No class deterioration is predicted.	Good Ecological Status cannot be achieved due to individual status of NH4 and P which cannot be improved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
Burwell	The development causes greater than 10% deterioration in P which cannot be mitigated with BAT. Environmental capacity could be a constraint to growth.	No class deterioration predicted.	Good Ecological Status cannot be achieved due to individual status of P which cannot be improved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
Ely (Old)	Less than 10% deterioration for each determinand.	No class deterioration predicted.	Good Ecological status cannot be achieved due to the individual status for P which cannot be improved due to current technological limits. If "good" status could be achieved upstream then P status could be improved in both present and future scenarios and GES would be achievable.
Ely (New)	A 33% deterioration is predicted for P. Proposed development can be accommodated with a tighter permit and upgrade to the WRC and is achievable using BAT.	Class deterioration has been predicted P. Class could be maintained through application of BAT.	Good Ecological Status can be achieved if individual status of P is maintained in future scenario through application of BAT.
Newmarket	Less than 10% deterioration for each determinand.	No class deterioration predicted.	Good Ecological Status is not achievable due to individual status for NH4 and P which cannot be improved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
Soham	Predicted deterioration is more than 10% for NH4. Proposed development can be accommodated with a tighter permit and upgrade to the WRC. This is achievable with BAT.	No class deterioration predicted.	Good Ecological Status is not achievable due to individual status for NH4 and P which cannot be improved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.

6.4 Load standstill assessment results

Table 6-3 shows the results of the load stand still assessment. It can be seen that future waste water demand from growth may cause Witcham and Witchford WRCs to exceed their permit value for all three determinands.

The application of best available technology to each of the WRCs could allow the load from the future growth scenario to return to the same level as the present-day load in all cases except Littleport WRC which may give an increased load for BOD and P. It should be noted that permit levels are not predicted to be exceeded for this WRC.

Table 6-3 Load standstill assessment results

	Permit Level			Future Growth		Current Load			Consented Load			Predicted Future Load			Within permitted value after future growth			Load after application of BAT			"No deterioration" achieved after application of BAT		
WRC	**BOD 95%ile (mg/l)**	**NH_4 95%ile (mg/l)**	**P Annual Mean (Mg/l)**	**Additional flow (m3/d)**	**Total flow (m3/d)**	**BOD Load (kg/d)**	**NH_4 Load (kg/d)**	**P Load (kg/d)**	**BOD Load (kg/d)**	**NH_4 Load (kg/d)**	**P Load (kg/d)**	**BOD Load (kg/d)**	**NH_4 Load (kg/d)**	**P Load (kg/d)**	**BOD**	**NH_4**	**P**	**BOD Load (kg/d)**	**NH_4 Load (kg/d)**	**P Load (mg/d)**	**BOD**	**NH_4**	**P**
Burrough Green	20	20	1	3.20	18.20	0.30	0.30	0.02	1.36	1.36	0.07	0.36	0.36	0.02	Y	Y	Y	0.09	0.02	0.01	OK	OK	OK
Dullingham	20	15	1	4.36	157.36	3.06	2.30	0.15	4.10	3.08	0.21	3.15	2.36	0.16	Y	Y	Y	0.79	0.16	0.08	OK	OK	OK
Haddenham	20	5	1	50.72	596.72	10.92	2.73	0.55	13.40	3.35	0.67	11.93	2.98	0.60	Y	Y	Y	2.98	0.60	0.30	OK	OK	OK
Isleham	45	8	1	66.70	288.70	9.99	1.78	0.22	19.04	3.38	0.42	12.99	2.31	0.29	Y	Y	Y	1.44	0.29	0.14	OK	OK	OK
Little Downham	15	10	1	7.27	283.27	4.14	2.76	0.28	6.47	4.31	0.43	4.25	2.83	0.28	Y	Y	Y	1.42	0.28	0.14	OK	OK	OK
Littleport	10	3	1	950.90	1666.90	7.16	2.15	0.72	20.67	6.20	2.07	16.67	5.00	1.67	Y	Y	Y	8.33	1.67	0.83	NOT ACHIEVABLE	OK	NOT ACHIEVABLE
Mepal	40	25	1	14.53	154.53	5.60	3.50	0.14	7.20	4.50	0.18	6.18	3.86	0.15	Y	Y	Y	0.77	0.15	0.08	OK	OK	OK
Stretham	20	20	1	29.06	258.06	4.58	4.58	0.23	10.00	10.00	0.50	5.16	5.16	0.26	Y	Y	Y	1.29	0.26	0.13	OK	OK	OK
Swaffham Prior	25	30	1	22.44	88.44	1.65	1.98	0.07	4.25	5.10	0.17	2.21	2.65	0.09	Y	Y	Y	0.44	0.09	0.04	OK	OK	OK
Wilburton	20	N/A	1	17.44	191.44	3.48	N/A	0.17	4.50	N/A	0.23	3.83	N/A	0.19	Y	N/A	Y	0.96	N/A	0.10	OK	N/A	OK
Witcham	12	6	1	339.80	1224.80	10.62	5.31	0.89	13.20	6.60	1.10	14.70	7.35	1.22	N	N	N	6.12	1.22	0.61	OK	OK	OK
Witchford	20	12	1	298.74	771.74	9.46	5.68	0.47	11.00	6.60	0.55	15.43	9.26	0.77	N	N	N	3.86	0.77	0.39	OK	OK	OK

6.5 Conclusion

The following conclusions are drawn from this water quality impact assessment:

RQP Assessment

- All WRCs are currently working within their DWF permits, with the exception of Ely (New) which exceeds its permit for phosphate.
- The proposed growth is predicted to lead to deterioration greater than 10% and/or class deterioration at Burwell, Ely (New) and Soham WRCs. In the case of Ely (New) and Soham this can be accommodated through an upgrade to the WRC (application of BAT) and a tightening of permits, however for Burwell, the deterioration in phosphate cannot be reduced to less than 10% using BAT. In this case environmental capacity is considered to be a constraint to growth.
- All receiving watercourses at all WRCs with the exception of Ely (New) fail to meet their targets for phosphate in the present day situation. Bottisham and Newmarket also fail to achieve the WFD target for BOD and NH_4 in the present day scenario.
- At Ely (Old) GES could be achieved in the receiving watercourse if the upstream water quality could be improved to GES, and if the treatment works is upgraded to BAT.
- At Ely (New) GES could be achieved for the future growth scenario in the receiving watercourse if the individual status of P were improved through application of BAT.
- At all other works assessed by RQP, modelling predicts that GES cannot be achieved due to current technology limits for treatment of phosphate at Burwell and phosphate and ammonia at Bottisham, Newmarket and Soham. In these cases, technology is considered to be the reason for not achieving GES, not the proposed growth.

Load standstill assessment

- At WRCs assessed using the load standstill method, the future demand may cause the permit level for the three assessed determinands to be exceeded at Witcham and Witchford WRCs. Application of BAT would reduce these values to within the permitted levels. All other WRCs are predicted to operate within their permits.
- Application of BAT may allow future loads to return to the present day levels for all WRCs with the exception of Littleport.

6.6 Recommendations

Table 6-4: Water Quality Assessment recommendations

Action	Responsibility	Timescale
Consider the water quality constraints when allocating and phasing development sites	ECDC	Ongoing
Where the water quality assessment indicates that permits may require a higher standard of treatment than currently achievable using Best Available Technology, provide clear advice to sewerage undertakers on: • The approach to permitting • Requirements for any additional studies (for example additional water quality sampling for the sites missed, modelling, macro-invertebrate surveys etc.), • Advise ECDC where water quality constraints may limit the potential for growth.	EA	Ongoing
Where necessary, identify the scale of likely solutions to accommodate growth and build the likely timescale for delivering the infrastructure into the overall delivery programme to identify key dates and potential programme constraints	ECDC, AW	Annually

7 Flood Risk Management

7.1 Assessment of Additional Flood Risk from Increased WRC Discharges

Flood risk to potential development sites is considered within the Strategic Flood Risk Assessment (SFRA). Therefore, this assessment focuses on the potential risk of increased flood flows in watercourses due to additional flows of sewage effluent.

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

7.2 Methodology

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

- Identify which WRCs will be receiving additional flows;
- Calculate the additional foul flow as a result of planned growth;
- Identify the point of discharge of these WRCs;
- At each outfall point, use the FEH CD-ROM v3.0 to extract the catchment descriptors;
- Use ReFH[41] method to calculate peak 1 in 30 (Q30) and 1 in 100 (Q100) year fluvial flows;
- Calculate the additional foul flow as a percentage of the Q30 and Q100 flow.

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

Additional flow ≤5% of Q30. Low risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q30. Moderate risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q100. High risk that increased discharges will increase fluvial flood risk

7.3 Data Collection

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

- Current and predicted future DWF for each WRC
- Location of WRC outfalls
- Catchment descriptors from FEH CD-ROM v3.0[42]

7.4 Results

Table 7-1 shows that at most WRCs the effect of the increased effluent flow due to the future development has a significant effect on the predicted flow for events with return periods of 30 and 100 years. Note that this is a simple assessment of flood flow suitable for the purpose of this assessment. These flood estimates are not prepared to a suitable level of confidence for use in flood risk modelling.

41 Note: ReFH2 was released in February 2015. This implements improvements which are mainly relevant to permeable and urbanised catchments. As the study catchments are not permeable or highly urbanised, and that the ReFH method is not being used to generate hydrographs in this case, ReFH1 has been used.

42 FEH CD-ROM v3.0 © NERC (CEH). © Crown copyright. © AA. 2009. All rights reserved.

Table 7-1: Summary of the impact of additional effluent discharges on flood risk

WRC	Receiving Water Body	ReFH Q30 (m3/s)	ReFH Q100 (m3/s)	Additional Flow (m^3/d)	Additional Flow (m3/s)	Additional Flow as a % of Q30 Peak Flow	Additional Flow as a % of Q100 Peak Flow
Bottisham	Swaffham Bulbeck Lode	0.07	0.09	60.66	0.00070	1.00%	0.78%
Burwell	Burwell Lode	0.1	0.13	198.37	0.00230	2.30%	1.77%
Dullingham	Soham Lode	3.8	5.03	4.36	0.00005	0.00%	0.00%
Ely	Ely Ouse	62.67	76.2	358.92	0.00415	0.01%	0.01%
Ely (New)	Ely Ouse	62.57	76.07	1710.11	0.01979	0.03%	0.03%
Haddenham	Drain	0.3	0.4	50.72	0.00059	0.20%	0.15%
Isleham	Ely Ouse	19.79	25.64	66.70	0.00077	0.00%	0.00%
Little Downham	Drain	0.9	1.2	7.27	0.00008	0.01%	0.01%
Littleport	Drain	0.29	0.38	950.90	0.01101	3.80%	2.90%
Mepal	Drain	0.4	0.53	14.53	0.00017	0.04%	0.03%
Newmarket	Public Drain	5.55	7.12	838.12	0.00970	0.17%	0.14%
Soham	Soham Lode	5.45	6.57	903.50	0.01046	0.19%	0.16%
Stretham	Old West River	0.58	0.79	29.06	0.00034	0.06%	0.04%
Swaffham Prior	Drain	0.12	0.15	22.44	0.00026	0.22%	0.17%
Wilburton	Grunty Fen Catchwater	1.52	2.02	17.44	0.00020	0.01%	0.01%
Witcham	Drain	0.83	1.12	339.80	0.00393	0.47%	0.35%
Witchford	Drain	7.16	9.29	298.74	0.00346	0.05%	0.04%

7.5 Conclusion

The impact of increased effluent flows is unlikely to have a significant impact upon flood risk in the receiving watercourses at any of the sites.

7.6 Recommendations

No additional flow permits are needed for any of the WRCs as increased effluent flows are not likely to have significant impacts on the flood risk.

8 Environmental Constraints and Opportunities

8.1 Introduction and Methodology

A series of maps have been created for the East Cambridgeshire district to visually identify environmental risks and opportunities associated with proposed development in the district. The maps identify the presence of environmental features within or close to the sites of proposed development.

These maps have been used to identify key distances between sites and environmental features. The distance at which the feature becomes significant to the development of the site depends on the type, nature and potential sensitivity of different environmental designations and the features of the development sites themselves. Table 8-1 shows the environmental features assessed and Table 8-2 highlights the approximate distances at which a feature may become significant to a development site. The potential adverse impacts associated with the development of these sites were then considered in relation to these features and potential environmental opportunities.

This environmental assessment provides an overview of the wider environment within the ECDC area and the potential risks and opportunities associated with development.

8.2 Data Collection

Information was collected on a range of environmental features, as shown in Table 8-1. This information has been provided by the Environment Agency, East Cambridgeshire District Council or sourced from OS OpenData. Environmental features have been grouped into seven topic areas: Biodiversity, the Historic Environment, Landscape, Water, Geology and Soils, Air and Waste.

Table 8-1: Environmental Designations and Features

Environmental Feature	Description
Aquifer - Bedrock / Superficial Deposits	Aquifers are split into: Superficial (Drift) - permeable unconsolidated (loose) deposits. Bedrock - solid permeable formations e.g. sandstone, chalk and limestone. These classifications are further split into the following: Principle Aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability. Secondary Aquifers include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage.
Groundwater Source Protection Zones	Source Protection Zones (SPZs) are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.
Local Nature Reserve	Local Nature Reserve (LNR) is a statutory designation. To qualify for LNR status, a site must be of importance for wildlife, geology, education or public enjoyment. LNRs are of local, but not necessarily national, importance. LNRs are almost always owned by local authorities, and they often pass the management of the LNR onto County Wildlife trusts.
National Nature Reserve	A National Nature Reserve (NNR) is one of the finest sites in England for wildlife and/or geology. A NNR is given protection against damaging operations, and any such operations must be authorised by the designating body. It also has strong protection against development on and around it.
Ramsar Site	Ramsar sites are wetlands of international importance, designated under the Ramsar Convention 1971. As a matter of UK Government policy, Ramsar sites are protected as European sites (as set out in the Habitats Regulations).

Environmental Feature	Description
Site of Special Scientific Interest	Protected under a range of UK legislation, a Site of Special Scientific Interest (SSSI) is an area of land of special interest by reason of any of its flora, fauna, geological or physiographical features. An SSSI is given certain protection against damaging operations, and any such operations must be authorised by the designating body.
Special Area of Conservation / Sites of Community Importance	A Special Area of Conservation (SAC) is an area which has been given special protection under the European Union's Habitats Directive (as transcribed into UK law under the Conservation of Habitats and Species Regulations 2010 (As amended) – known as the 'Habitats Regulations'). SACs provide increased protection to a variety of wild animals, plants and habitats and are a vital part of global efforts to conserve the world's biodiversity.
Special Protection Area	A Special Protection Area (SPA) is an area of land, water or sea which has been identified as being of international importance for the breeding, feeding, wintering or migration of rare and vulnerable bird species found within the European Union. SPAs are European designated sites, classified under the European Wild Birds Directive.
Watercourse	A river, stream or other riparian feature i.e., ditch, as shown on OS mapping.
Water Framework Directive (WFD) classification	The Water Framework Directive (WFD) requires that all 'water bodies' (rivers, lakes, estuaries, coastal waters and groundwater) achieve good ecological potential by 2015. Under the WFD, all waterbodies are classified by their current and future predicted water quality, and specifically their ecological and chemical status.

Table 8-2: Approximate distance at which an environmental feature becomes significant to the development of a proposed site

Topic	Environmental feature	Buffer (m)
Biodiversity	Site of Special Scientific Interest (SSSI)	1000m
	Special Area of Conservation (SAC)	2000m
	Special Protection Area (SPA)	2000m
	Ramsar site	2000m
	National Nature Reserve	1000m
	Local Nature Reserves	100m
Water	Watercourse	200m
	Water Framework Directive (WFD) classification	No Buffer applicable
	Groundwater source protection zones (SPZ)	No Buffer applicable
	Aquifer Maps - Superficial Deposits Designation	No Buffer applicable
	Aquifer Maps - Bedrock Designation	No Buffer applicable

8.3 Environmental Features of East Cambridgeshire District

East Cambridgeshire is predominately rural in character, covering an area of around 665 km2 and the mid-2012 population was around 85,000. This district contains 3 main market towns Ely, Soham and Littleport, and it also contains the fringe areas of Newmarket. Agriculture remains the dominant land use across the district. Key environmental features of East Cambridgeshire are listed below.

- There are 20 Sites of Special Scientific Interest (SSSI) within the ECDC study area. 8 of these sites are located within 1000m of a proposed development sites and could

therefore potentially be affected by pollution or a reduction in water resources as a result of developments.

- There are 2 National Nature Reserves (NNRs) that are based in the centre of East Cambridgeshire. One of these, Chippenham Fen is situated close to proposed development sites south of Fordham.
- There are 4 Special Areas of Conservation within the study area. Of these, 2 (Ouse Washes and Fenland) are within 2000m of proposed development sites.
- There is one special protection area within the study area; Ouse Washes, however another; Breckland, lies just outside the study area, 1 km to the east. Both of these are within 2000m of proposed development sites.
- Ouse Washes to the North West, and Chippenham Fen and Wicken Fen towards the centre of the study area are the designated Ramsar sites. Proposed developments are located within 2000m of Chippenham Fen and Ouse Washes.
- There are 3 Local Nature Reserves (LNRs), however they are not located within 100m of any proposed sites.
- There are 25 areas designated as Ancient Woodland, none of these areas are within 100m of a proposed development site.
- Agricultural land quality within the district varies but is predominately of grade 1 and 2 which relates to very good to good quality land. A relatively small proportion of the area is non-agricultural land to the east of East Cambridgeshire.

8.4 Key Water Cycle Features of East Cambridgeshire District

- River quality classification in East Cambridgeshire is generally classified as "Moderate". The exception being the Kennett - Lee Brook which is classified as poor.
- The south-eastern region of the district is classified as a Principal Aquifer, while the north west of the study area is underlain by an unproductive aquifer. A small secondary aquifer is present to the north west of Wicken Fen.
- There are several groundwater Source Protection Zones (SPZs) within the Principal Aquifer, these SPZs identify groundwater deposits that are sensitive to contamination, and within which pollution prevention measures may apply. Some sites are located within SPZs 1 and 2 where there may be a greater risk of major developments leading to groundwater pollution[43]. There may be restrictions on the use of infiltration SuDS in SPZs, although the risk of groundwater contamination from SuDS can be effectively managed.

8.5 Water Cycle Risks and Opportunities

A number of the proposed development sites have a watercourse or drainage ditch running through them or along the proposed site boundary. Potential adverse impacts on the water environment from the development of the draft allocation sites and associated water supply/sewerage infrastructure improvements include:

- Habitat loss and species disturbance in areas associated with developments;
- Increased surface runoff and sediment loading leading to increased turbidity in receiving watercourses;
- Pollutants in chemicals and sewage effluent affecting water quality in surface waters and groundwaters;
- Increased pressure on water resources within water resource zones due to over-abstraction for water supply;
- Increased flood risk at the sites of proposed development or increased flood flows in watercourses due to increased rates of surface water runoff and additional flows of sewage effluent.

43 Environment Agency (2009) Groundwater Source Protection Zones - Review of Methods. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290724/scho0309bpsf-e-e.pdf on: 05/10/2017

Where a proposed development site has a watercourse running through the site or along its boundary, it may be required to restrict development in the areas of the site that fall within the fluvial flood zones to maintain flood storage areas and provide a number of other environmental opportunities such as biodiversity and recreational benefits.

River corridors form natural wildlife corridors and are an important feature of the landscape in the District, requiring adequate buffer zones free of development. An assessment should be made of the impact of site development on the WFD status of each waterbody that site water will drain into. The assessment should consider both water quality and quantity. As a bare minimum measures will need to be provided to avoid any impact on water quality or channel morphology in these waterbodies, but all opportunities should be taken to enhance those features.

The council should aim to set back development a minimum of 6m from watercourses (wider buffers of 7-8m are set by the EA regions for Main Rivers), providing buffer strip to 'make space for water' and allow additional capacity to accommodate climate change. Developments should look at opportunities for river restoration, de-culverting and river enhancement as part of the development. Such measures could provide an important contribution to the WFD objectives for the watercourse.

Many of the proposed development sites are located on a Principle Aquifer; geology that exhibits high irregular and/or fracture permeability, usually providing a high level of water storage. Many sites also fall within at least a Zone 3 Source Protection Zone (SPZ). Some sites are also on superficial deposits, mainly categorised as 'Secondary A', which are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases, form an important source of base flow to rivers. Therefore, many, if not all sites, may require measures to avoid the risk of groundwater contamination.

There may be restrictions on the use of infiltration SuDS in SPZs, although the risk of groundwater contamination from SuDS can be effectively managed. The use of SuDS also provides an opportunity to improve (or maintain) recharge of the aquifer. SuDS can have numerous benefits by creating wildlife habitats, recreation and amenity areas and improvements to the local landscape. The suitability of SuDS will need to be assessed on a site by site basis through a risk assessment which would require approval from the LLFA and EA.

8.6 Management Options and Policies

The following management options outline how the proposed site allocations can minimise their impact on the neighbouring watercourses by reducing both diffuse and point sources of pollution.

New developments are required to attenuate surface water runoff and SuDS are the recommended approach as stated in NPPF, paragraph 51[44] of the Planning Practice Guidance and Building Regulations H. The implementation of SuDS schemes can:

- Mitigate the impact on receiving waters by holding and treating urban surface water run-off at or near to the source;
- Slow down surface runoff during heavy rain, reducing flooding problems;
- Provide new still water (i.e., ponds and ditches) and wetland habitat to benefit biodiversity;
- Offer recreational and amenity opportunities to local residents; and
- Enhance the local landscape character.

HR Wallingford's study, '*Maximising the Ecological Benefits of Sustainable Drainage Schemes*' (2003)[45], advises that the maximum ecological benefits derived from SuDS may come from improvements to the still water aquatic environment and that the best that can often be achieved for the receiving waters is to prevent further deterioration. However, research indicates that whilst ponds and ditches may support quite rich wildlife communities, most SuDS schemes do not fulfil their ecological potential. This is due to inappropriate design features or a lack of maintenance of the structures leading to poor water quality and domination by common plant species. The design of a SuDS scheme would need to be specific to the development site and would need to meet the topographic and hydrological characteristics present there.

44 DCLG (2015) Planning Policy Guidance (revision date 23.03.2015). Accessed online at: http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/reducing-the-causes-and-impacts-of-flooding/why-are-sustainable-drainage-systems-important/#paragraph_051 on: 05/10/2017.

45 HR Wallingford Maximising the Ecological Benefits of Sustainable Drainage Schemes December 2003

Impermeable surfaces in urban areas reduce rates of infiltration and therefore reduce rates of recharge to the underlying aquifers. Additional impermeable surfaces in areas with poor groundwater status will potentially reduce groundwater recharge further. The use of SuDS can help return water to groundwater by slowing down rainfall runoff in soakaways, permeable surfaces, ponds and wetlands. It is therefore recommended that SuDS are used wherever possible and particular in areas assessed as having poor groundwater status. SuDS can also provide ecological gain and in doing so have the potential to contribute towards the green infrastructure network in the District. East Cambridgeshire has a comprehensive Green Infrastructure Strategy[46] to aid the Districts development of green infrastructure.

8.7 Opportunities

There are several environmental opportunities that could be considered for each of the proposed development sites. Implementation of these opportunities would have the potential to help mitigate the environmental impacts of development of each site and deliver environmental benefits, particularly in relation to biodiversity and water quality. The nature and scale of any environmental benefits achieved would depend upon the site characteristics and sensitivity of the surrounding environment. These environmental opportunities are summarised in Table 8-3.

Table 8-3: Environmental opportunities and benefits

Environmental opportunity	Potential environmental benefits
Allocation of green space for the provision of SuDS	• Potential to provide flood risk benefits through interception of surface runoff. • Reduced sediment loading in receiving watercourses and improved water quality. • Amenity value.
Retention and enhancement of existing water features on the site i.e., ponds, ditches and streams through creation of vegetated buffer strips.	• Increased biodiversity value, particularly for amphibians, invertebrates and small mammals. • Potential to provide flood risk benefits through interception of surface runoff. • Increased amenity value.
Creation of new water features on site i.e., ponds, ditches and streams.	• Increased biodiversity value, particularly for amphibians, invertebrates and small mammals. • Potential to provide flood risk benefits through interception of surface runoff. • Provision of amenity resource.
Terrestrial and marginal vegetation planting along river corridors to increase vegetation cover and improve water quality.	• Reduced river bank erosion. • Reduced water temperatures. • Increased biodiversity value, particularly for birds, invertebrates and fish. • Reduced sediment loading in receiving watercourses and improved water quality.
Planting of native broadleaved trees and retention of existing mature trees.	• Increased rainfall interception and reduced surface runoff. • Reduced sediment loading in receiving watercourses and improved water quality. • Increased local biodiversity, particularly in relation to birds, invertebrates and small mammals. • Increased shading and reduced heat-island effect. • Improved local air quality. • Increased amenity value.
Habitat creation and provision of amenity areas	• Maintain floodplain connectivity. • Increased biodiversity value of floodplain, particularly for

46 Cambridgeshire County Council (2011) Cambridgeshire Green Infrastructure Strategy. Accessed online at: https://www.cambridge.gov.uk/sites/default/files/documents/RD-NE-020%20Main%20document.pdf on: 05/10/2017.

Environmental opportunity	Potential environmental benefits
in location at risk of flooding.	birds, invertebrates and small mammals. • Reduced flood risk to people and properties. • Reduced sediment loading in receiving watercourses and improved water quality. • Increased amenity value.

8.8 Recommendations

This study has provided a high-level assessment of the potential environmental risks and opportunities associated with the proposed development in the study area. More detailed assessment of the environmental issues associated with the development of each site should be undertaken prior to the approval for development to commence. Table 8-4 highlights the environmental constraints and opportunities recommendations.

Table 8-4: Environmental Constraints and Opportunities Recommendations

Action	Responsibility	Timescale
Undertake consultation with ECDC ecologist and heritage officer in relation to the development of each site to further identify environmental risks and opportunities and to determine specific requirements for mitigation measures.	Developers and ECDC	Ongoing
Developers should seek to maximise the water quality and amenity/ecological benefits when installing SuDS for surface water flood management.	Developers and ECDC	Ongoing
Good design principles should be applied to all developments, particularly those located in sensitive or protected landscapes so as to minimise the impact on landscape character and visual amenity. Design advice provided by ECDC should be applied and consultation with the Council's landscape officer should be undertaken to inform the design of the development of a site.	Developers and ECDC	Ongoing

8.9 Conclusion

Development of the proposed sites has the potential to cause a range of adverse impacts. Further environmental surveys and more detailed assessment are required for each of the sites as part of the planning process to determine potential impact of the development and hence their acceptability and to inform the requirement for mitigation measures.

An initial screening has been carried out in this WCS. Appendix C includes a series of maps that indicate the proximity of the proposed sites to significant environmental features. Where sites are close to few environmental features it should not necessarily be assumed that they are automatically suitable for development. Likewise, sites with a greater number of environmental features in close proximity should not be assumed unsuitable for development it may be possible that constraints could be appropriately addressed with reasonable mitigation measures.

9 Climate Change Impact Assessment

9.1 Introduction and Methodology

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made in this water cycle study. This has been done using a matrix which considers both the potential impact of climate change on the assessment in question, and the degree to which climate change has been considered in the information used to make the assessments contained within the WCS (see Table 9-1).

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

Table 9-1: Climate change matrix

		Impact of pressure		
		Low	Medium	High
Have climate change pressures been considered in the assessment	Yes - quantitative consideration			
	Some consideration but qualitative only			
	Not considered			

9.2 Results

Table 9-2: Scoring of Climate Change Consequences for the Water Cycle Study

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the assessment?	Climate Change Score
Water resources	High (1 and 2)	Yes - qualitative within WRMP and RMBP	
Water supply infrastructure	Medium (2) - some increased demand in hot weather	Yes - qualitative consideration within WRMP	
Sewerage system Capacity	High (3)- Intense summer rainfall and higher winter rainfall increases flood risk	No - not considered in AW assessment	
Wastewater treatment	Medium (3) - Increased winter flows and more extreme weather events reduces flow headroom	No - not considered in AW assessment	
WRC odour	Low	No - not considered	
Water quality	Nutrients: High (1) Sanitary determinands: Medium (1)	No - not considered	
Flood risk (fluvial and pluvial)	High (4)	Yes – climate change modelling and mapping	
Flooding from increased WRC discharge	Low	No - not considered	

Sources:

(1) River Basin Management Plan Anglian River Basin District - Annex H: Adapting to climate change

(2) Anglian Water's Water Resource Management Plan 2015

(3) Anglian Water Our Plan 2015-20

(4) ECDC Strategic Flood Risk Assessment

9.3 Recommendations

Table 9-3: Climate Change Actions

Action	Responsibility	Timescale
When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, AW, ECDC	As required
Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts.	ECDC, Developers	As required

10 Summary and Recommendations

This Water Cycle Study (WCS) was carried out in cooperation with the Environment Agency, East Cambridgeshire District Council and Anglian Water. Table 10-1 summarises the conclusions and recommendations from the assessments included in this WRC report. In addition, Appendix A includes a table of the proposed development sites and WRC that have been included in this WCS.

Table 10-1: Summary of Conclusions and Recommendations

Assessment	Conclusion	Recommendations
Development Scenarios and Policy Issues	ECDC are required to construct up to 12,900 new residential developments to meet demand. 104 housing and employment sites have been assessed in this WCS.	
Water Resource Assessment	There is a current pressure on water resources in the WRZs with increasing demand, population growth and the impacts of climate change. Growth forecasts for the WRMP are lower than those given by East Cambridgeshire District, thus an investigation is needed to ensure the water supply will keep up with the future demand.	Identify scale of solutions to accommodate growth and build timescale for delivering the infrastructure. Undertake studies to understand options to provide capacity and communicate results to ECDC. Developers should seek early consultation with AW to ensure time is available to provide upgrades and meet demand.
Water Supply Infrastructure Assessment	This assessment was not provided to date by AW.	Ensure that the available water supply infrastructure is assessed for all future developments
Sewerage System Capacity Assessment	The foul sewerage network has been given an "amber" assessment for the majority of the proposed developments on the assumption that developments of 10 or more houses would require some enhancement to the network. No specific constraints to these enhancements have been identified. Where sites are remote from the nearest sewer, the options for foul drainage will need to be assessed in more detail. AW policy is that disposal of surface water via the sewer system is a last resort resulting in a "red" status for surface water infrastructure for all developments. SuDS should be incorporated into development proposals to manage surface water.	Consider sewerage infrastructure constraints in phasing development AW should continue to assess growth demands as part of wastewater asset planning and feedback to ECDC where concerns arise. Surface water management solutions such as SuDS should be prioritised to reduce the pressure on the AW surface water system.
Flow Permit Assessment	All the WRCs are currently working within their permits, however 4 WRCs will require a capacity upgrade in order to serve all of the proposed developments.	ECDC should provide annual updated of projected housing growth AW should continue to assess growth demands as part of wastewater asset planning and feedback to ECDC where concerns arise. AW, ECDC and the EA will work closely to ensure the delivery of any necessary WRC upgrades
Odour Assessment	None of the proposed sites are likely to be impacted by odour from WRCs. If the capacity of a WRC is upgraded this may cause a change in the risk category, and the odour assessment may need to be re-visited.	An odour impact assessment may be required on WRCs where upgrades are planned.
Water Quality Assessment	All WRCs are currently working within their DWF flow permits with the exception of Ely (New) which exceeds its permit for Phosphate. The proposed growth is predicted to lead to a deterioration greater than 10% and/or class deterioration in WFD determinands at Burwell, Ely (New) and Soham WRCs. In the case of Soham this can be accommodated through an upgrade to the WRC (Application of BAT)	Take water quality constraints into account when allocating and phasing development sites. The EA should advise where water quality constraints may limit the potential for growth. Developers should seek early consultation with AW to ensure time is available to provide upgrades to the works to ensure that GES targets can be met.

	and a tightening of permits, however for Burwell the deterioration in phosphate cannot be reduced to less than 10% using BAT. In this case environmental capacity is considered to be a constraint to growth. The load standstill assessment suggests that application of BAT at the remaining WRCs can allow future loads to return to present day levels for each WRC with the exception of Littleport.	
Flood Risk Assessment	The impact of increased effluent is unlikely to have a significant impact upon flood risk in the receiving watercourses at any of the sites	No additional flow permits are needed for any of the WRCs based on flood risk.
Environmental Constraints and Opportunities	Further environmental surveys and more detailed assessments are required for each of the sites to determine the acceptability of their development. It should not be assumed that sites shown to not be close to environmental features are automatically suitable for development and likewise those with many environmental features should not be automatically defined as not suitable for development	Undertake consultation with ECDC ecologist and heritage officer to further identify environmental risks and opportunities to determine specific requirements and mitigation measures. Developers should seek to maximise amenity and ecological benefits when installing SuDS.
Climate change Impact Assessment	Most assessments have not included a climate change aspect in them, but there has been some qualitative research based on AWs WRMP.	Consider the latest climate change guidance when undertaking detailed assessments Take "no regrets" decisions in the design of developments

Overall, the WCS has identified that are some important areas where further investigation and planning will be required to ensure that the planned scale and location of the development within the East Cambridgeshire District can be managed in terms of water supply and wastewater services. The following constraints have been highlighted that may limit individual sites:

- There is current pressure on water resources in the WRZ which will increase with population growth and the impacts of climate change. An investigation is needed to ensure water supply will keep up with the future demand and that supplies can be managed in the future.
- The WCS has identified that the foul sewerage network would need to be upgraded to accommodate the planned growth. Consideration of surface water management through application of SuDS should be made. Timely planning and provision of infrastructure upgrades should be undertaken through regular engagement between ECDC, AW, the EA and developers.
- Future developments will cause four WRCs to exceed their current DWF permit, careful planning of the phasing of development in these areas is required.
- Future developments are predicted to cause deterioration of water quality of the receiving waterbodies at many of the WRCs assessed which unmitigated would lead to a breach of environmental legislation. In most cases this can be mitigated through the application of BAT, however at Burwell the environmental capacity of the receiving watercourse represents a constraint to growth.

Appendices

A Potential Housing and Economic Development Sites (Site Summary Spreadsheet)

B Water Quality Assessment

C Environmental Opportunities Maps

C.1 Sites with environmental designations

C.2 Aquifer designations

C.3 Groundwater source protection zones

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Glasgow
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
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