Haven Gateway Water Cycle Study

Stage 2 Report

Haven Gateway Partnership

November 2009

Final Report

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IMPORTANT GUIDANCE TO THE USE OF THIS WATER CYCLE STUDY

The Haven Gateway water Cycle Study was undertaken as a sub-regional study which covered a number of local authority areas. As such the level of detail entered in to for the study may be lower than a study carried out at a local planning authority or development area.

The Stage 2 of the study was prepared over a period of 18 months from May 2008 to October 2009. During this period there have been a number of developing initiatives, particularly within the planning policy development, and the local authorities are at various stages within the processes which has meant that differing levels of information have been available across the sub-region.

The report is based primarily on data valid at the end of 2008 and has not, in general, included changes to data or policies since that date.

Key areas which are known to have changed are:

- Issue of final Water Resource Management Plans by the Water Companies to Ofwat. There may also be further changes as a result of the determination of the PR09 submissions to Ofwat.
- Latest guidance from the Environment Agency on the production of Water Cycle Studies (Water Cycle Study Guidance, January 2009).
- Development scenarios in the short term due to changes in the economic climate.

In addition it has been commented that in some areas the Urban Waste Water Directive (UWWTD) sets limits on pollution discharge that may be lower than those set under the Water Resource Act and so may impact on the apparent pollution consent headroom discussed within the report. This will need further investigation, either in local studies or within the next update of the study.

Furthermore, solutions to both wastewater discharge and water supply issues have not been considered in detail and there may well be alternatives solutions to improve the use of water (such as effluent re-use) that have not been discussed in the current report.

The conclusions of the report have adopted a precautionary principle in that they have been based on no future action, and therefore highlight that action is needed, irrespective of whether this action is already planned, or needs to be planned before development takes place.

The intention of the report is to encourage and focus dialogue between the development partners to ensure that the various components of the water cycle are considered by all. It is expected that some local authorities or individual developers may need to take the water cycle studies into additional detail and develop strategies for implementing any actions required prior to, during and after development to ensure the longer term security of the water cycle.

The Water Cycle Study is a living document and it is intended that regular reviews and updates of the document will be undertaken and that comments received on this initial study will be incorporated into the first review.

EXECUTIVE SUMMARY

The Haven Gateway Partnership commissioned a Water Cycle Study to ensure that water supply, water quality, sewerage and flood risk management issues can be properly addressed and thus enabling the substantial growth proposed in the East of England Plan to 2021 to be accommodated in a sustainable way.

The study considered the Haven Gateway sub region which covers all of Colchester Borough, Ipswich Borough and Tendring District Council and parts of Babergh District, Mid Suffolk District and Suffolk Coastal District Councils.

Current and future development in the sub region is centred on the two large urban centres of Ipswich and Colchester together with a number of smaller market towns, whereas the focus of employment is on the two ports of Felixstowe and Harwich. In total the draft regional Spatial Strategy identified the need for around 51,000 new homes to be built across the region between 2001 and 2021.

The study commenced in 2007 and followed a staged approach to delivery. Stage 1 outlined the available data together with a broad assessment and was published in June 2008. The Stage 2 report looked in more detail at the water cycle and the impacts of development within specific areas on water supply, wastewater collection and disposal and flooding and was published in October 2009.

METHODOLOGY

The development of the water Cycle Study followed the concept of state - pressure - impact - management. The study set out to understanding the present state, assessed and presented the impact of proposed development pressures on it the water cycle and developed high level approaches and recommendations for accommodating the development within the capacity and environmental constraints of the water cycle and associated infrastructures.

The study was based on information provided by the stakeholders, in particular the local planning authorities and water companies. It initially involved a strategic level review of Water Resources and Supply, Water Quality, Wastewater Collection and Treatment and Flood Risk.

Three water companies supply the sub region with fresh water, Anglian Water Services, Tendring Hundred Water Services and Essex and Suffolk Water Services. All three companies have prepared draft Water Resource Management Plans which were used during the preparation of this report. Final Water resource Management plans are now being prepared but were not available for reference at the time this report was prepared.

Water quality was assessed in terms of both the receiving watercourses and sensitive sites and the impacts of changing sewage discharges on these receiving watercourses. In addition it considered whether technology was available to improve the treatment of discharge to maintain a net zero increase in pollutant load.

Wastewater collection and treatment was considered in terms of the discharge rates to be applied for new development, both residential and employment, which were then used in the more detailed analysis of each treatment works affected by the proposed development.

Finally flood risk was considered by reference to the work being carried out by the Environment Agency and the local planning authorities on fluvial, tidal, surface water and groundwater flooding, together with looking at the impact of flood reduction measures on water abstraction areas and groundwater.

Following the strategic view, a more detailed planning authority by planning authority assessment was made, looking in more detail at the same parts of the cycle, but considering development areas and sewage treatment catchments and establishing areas where there were issues that would require further investigation and action before development should take place in a sustainable way.

SUMARY OF FINDINGS

Water supply - all three of the water supply companies were confident that they had sufficient resources to supply the demands of the region over the forthcoming period and had plans in place to be able to realise these resources. There was a general assumption that the demand on water would reduce per capita due to metering, reduction in leakage and householder efficiencies and additional capacities would be addressed within their current improvement plans.

Wastewater - in general wastewater infrastructure and wastewater treatment and discharge are reasonable constrained within the sub-region. There are numerous areas where the existing infrastructure is currently at capacity with no room for growth. In addition a number of the treatment works are at, or will reach capacity with the projected growth, and therefore will require increases to their allowed discharge together with potential extensions to the works.

Water Quality - increases in discharge from sewage treatment works need to be accommodated within the receiving watercourses without adverse impacts. There are areas within the region where treatment improvements will be required to avoid any increase in pollution loads within the receiving water bodies.

Flooding - the understanding of fluvial and tidal flood risk is reasonably understood within the sub-region and the majority of the proposed development falls outside of the defined higher flood risk areas. There is some development within brown field sites adjacent to water bodies that may be dependant on future flood defences to provide some degree of protection in conjunction with selection of appropriate development types. The consideration of surface water drainage and the adoption of suds techniques for drainage will apply to all sites.

The detailed report summary shows the results of the analysis, rolled up to a single line for each development area. The overall analysis has adopted a precautionary approach which therefore tends to show a worst case scenario. The table shows the majority of the sites potentially requiring significant action before development can take place. The summary does not show the individual assessments which are shown in more detail in the local planning authority sections and show which of the six parameters analysed is affecting the ability of the site to accept development. For each development area and local planning authority a key set of actions has been identified to address these constraints.

However, what the table actually represents is the uncertainty in the information available for evaluating the water cycle in detail, and the need for continued dialogue between the planning authorities, the water companies and the statutory bodies to reduce the issues and provide a more balanced picture of the issues relating to development across the sub region. Many of the sites identified as having significant issues from this analysis may, following discussion and possible further more detailed review, be acceptable for development over the planning period.

FURTHER WORK

The Haven Gateway Water Cycle Study is a snapshot in time and will need to be updated and enhanced in the future as more data becomes available from the stakeholders, as development pressures change and evolve, and as the guidance and legislation supporting and driving the planning and water cycle evaluation processes evolves. In addition some of the issues identified within this report but not incorporated within the analyses due to the timing of the report should be considered and these may add additional detail to the results.

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CONTENTS

1 INTRODUCTION

1.1 Background

The Haven Gateway sub-region (HGSR), which comprises the Local Authorities of Tendring, Colchester, Ipswich, part of Suffolk Coastal, and part of Babergh, falls within the Counties of Essex and Suffolk. The Haven Gateway sub-region was awarded New Growth Point Status in October 2006 and the sub-region receives core funding from the East of England Development Agency as a sub-regional Economic Partnership. It is of national and regional importance, providing a strategic transport gateway for trade and tourism between the UK, Europe and the rest of the world. The HGSR covers an area of approximately 1200km^2 of north east Essex and south east Suffolk and extends over six local authority areas. The sub-region currently has a population of approximately 900,000 in 400,000 dwellings.

There are two large urban centres in the sub-region, Colchester and Ipswich. There are also a number of smaller market towns. The sub-region is extensively rural with 40 miles of Heritage Coastline. The ports of Felixstowe and Harwich are the focus of the growth in employment within the sub-region. The draft Regional Spatial Strategy (RSS) has identified the need for 50,840[1] new homes across the sub-region, averaging at 2,542 each year between 2001 and 2021. It must be noted that this allocation only includes the areas of Babergh, Mid Suffolk and Suffolk Coastal Districts which are included within the Haven Gateway sub-region, in addition to the Boroughs of Colchester and Ipswich and Tendring District. The total RSS allocation for the total area of all six Local Authority Areas (Babergh District, Mid Suffolk District, Suffolk Coastal District, Colchester Borough, Ipswich Borough and Tendring District) is 65,100. The extent of the Haven Gateway sub-region, together with the local planning authority boundaries within the sub-region are shown in Figure 1.1 at the end of this section.

A sustainable approach to development planning and investment programming will be essential to create sustainable communities and economic prosperity within the HGSR. Therefore, Essex County Council on behalf of the Haven Gateway Partnership commissioned Royal Haskoning to undertake a Water Cycle Study (WCS) for the sub-region.

The study was commissioned in order “to ensure that water supply, water quality, sewerage and flood risk management issues can be properly addressed, thus enabling the substantial growth proposed in the East of England Plan (EEP) to 2021 to be accommodated in a sustainable way.” (Source: Project Brief) It is intended for this study to contribute to the evidence base for the emerging Local Development Framework documents.

It is intended that this Water Cycle Study for the HGSR assists the Haven Gateway Partnership with the development of investment programmes to help ensure that:

a) adequate water supply and waste water infrastructure are in place to support housing and employment growth planned for HGSR to 2021 in the emerging

[1] East of England Implementation Plan, Draft Plan for Consultation, April 2009

East of England Plan and the Haven Gateway Programme of Development Framework for Growth;

b) any additional infrastructure is provided in accordance with a strategic rather than a piecemeal approach;
c) there is a strategic approach to the management and use of water;
d) the environment has sufficient capacity to receive increased waste water discharges;
e) the potential for grey water reuse and implementation of Sustainable Drainage Systems (SUDS) is fully realised.

1.2 Objectives of Water Cycle Study

The WCS considers the following issues, addressing the constraints that they may pose to future development and discusses the improvements necessary to achieve the required level of development:

- Wastewater Collection and Treatment;
- Water Resources and Supply;
- Water Quality and Environmental Issues;
- Flood Risk; and
- Demand Management.

The WCS process also provides a benefit to the water companies by providing them with a more detailed indication of the potential development within the sub-region. This will reduce the number of assumptions that are necessary in making decisions in relation to future planning of resource and infrastructure requirements.

1.3 Project Structure

This Water Cycle Study has been developed in a number of stages with a series of deliverables. Because of the developing nature of the project, and the timescale of its production, some of the data within the earlier stages may well have changed before incorporation into this report.

The project was divided into two Stages;

- Stage 1 - Outline Study
  - Inception report
  - Stage 1 Report
- Stage 2 - The Main Study

During its development the project has been directed by a Steering Group consisting of representatives of Haven Gateway Partnership, Anglian Water Services, Tendring Hundred Water, the Environment Agency, Essex County Council and Suffolk County Council.

In addition to the Steering Group a Strategic Consultee Group was also set up which included the Steering Group plus representatives of the local planning authorities, Natural England and Essex and Suffolk Water Company.

1.4 Summary of Stage 1

The Stage 1 of the Water Cycle Study was undertaken to provide indications of the current situation within the sub-region with regard to water capacity, flood risk, river capacity, water efficiency and wastewater disposal and treatment. It considered at a Regional or Local Authority scale development scenarios, wastewater collection and treatment, water resources and supply, water quality, flood risk management and demand management before drawing global conclusions for the sub-region.

1.4.1 Key Communications

- The water cycle in the Haven Gateway sub-region is close to capacity, and will require investment to accommodate growth.
- Ipswich, Felixstowe and Colchester are the largest growth areas in the HGSR, and are the areas with most water, waste water and flooding issues.
- There are a large number of oversubscribed sewage treatment works across the sub-region.
- The development of employment land is a key factor in the ability of the water cycle to accommodate the growth in the sub-region.

1.4.2 Recommendations

- A Stage 2 study should be carried out to confirm the outstanding issues from Stage 1 and develop solutions for the water cycle study areas with inadequate infrastructure to support proposed growth to 2021.
- Obtain and evaluate outstanding data to ensure the current situation is addressed.
- Carry out a further detailed assessment of sewage treatment capacity in the areas most affected by growth.
- Consider the impact of discharge consents on all HGSR Sewage Treatment Works in respect of increased volumetric discharges and the quality related discharge limits.
- Carry out further assessment of the environmental impact of growth, as further information has now been received.
- Promote a Surface Water Management Plan to deal with the multiple sources of surface water flood risk in Ipswich.
- Consider the use of Sustainable Drainage Systems and other demand management techniques to manage water demand and surface water runoff.

1.5 Format of Stage 2 Report

The Stage 2 report has been designed to be used by the planning departments within each of the authorities and has been structured so that sections relevant to each authority are together within the report. The hard copy version of the report has been prepared as a loose leaf document to allow for future updates.

Section 2 - Methodology
Section 3 - Strategic Assessments
Sections 4-9 - Council Specific Results
Section 10 - Guidance Documents
Section 11 - Conclusions and Recommendations
Section 12 - Future Updating

A digital version has also been prepared and is available on CD. This version links the sections together and allows navigation within the document.

1.6 Guidance on the use of this Study

This Water Cycle Study was prepared over the period of 2007 to 2008 with the draft report being issued in January 2009. Over this period both the methodologies for developing water cycle studies and the supporting data have been developing alongside this report, and are continuing to develop and change.

In addition the Local Authorities, who are at different stages within their planning cycles, are continuing to develop their development strategies and have differing levels of information available to support the water cycle study and also have differing and changing needs from the study.

This report, therefore, can only represent a snapshot in time and has to acknowledge that the supporting data and best practices are ever changing. The report will need to be periodically reviewed and updated to bring it in line with the latest data and best practices.

The majority of the data used within this report was that available at the end of 2008. In particular the Water Companies had only prepared their draft Water Resource Management Plans (dWRMP) which had yet to be scrutinised and amended. The final Water resource Management Plans are due to be published in 2009 but any changes from draft to any future final versions have not been included within this Water Cycle Study.

Furthermore, the Environment Agency published its guidance on the production of Water Cycle Studies in January 2009. Although this study follows many of the principles outlines in the guidance it does not follow the guidance completely. Further updates of the study should look to follow the guidance closer.

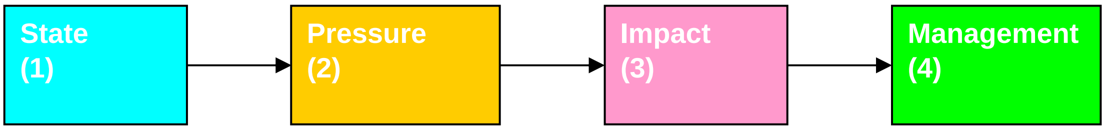
The scale of this study is such that it falls between the Stage 1 and 2 studies described in the Environment Agency's guidance and as such the level of detail may be inadequate in some areas to provide prescriptive evidence to support Core Strategies. Individual Councils should consider the evidence presented here, and in consultation with the Water Companies and the Environment Agency, determine whether additional or more recent information should be considered, or if further detail is required to support the detailed planning process.

This report does not remove the need for planning authorities and developers to consult with the water companies, the Environment Agency and other statutory bodies to confirm the validity of information and any other impacts that development may have on the water cycle, particularly in details at a local level, that this study may not have identified.

2 METHODOLOGY

2.1 Overview

A sequential approach was adopted within the production of this WCS and followed the high level model shown:



1. Firstly, the current status of the water management infrastructure was assessed in order to gain an insight into the current demands placed upon it as well as existing management strategies;
2. Secondly, using information available at the time of writing, the likely trends of future growth, environmental targets and possible external threats (e.g. climate change) were established.
3. Thirdly, the impact of the identified pressures on the existing water infrastructure and other environmental assets was assessed.
4. Finally, sustainable management strategies were proposed in order to manage the identified problems.

The following areas have been considered in evaluating the water infrastructure within the above model:

- Housing growth and employment - future trajectories
- Wastewater collection and treatment
- Water quality and environmental issues
- Water resources, supply and demand management
- Flood Risk

The following sections broadly outline how each of these areas has been evaluated for this study. Specific details will be included in later sections, either at a Strategic (HGSR level), at a Local Planning Area level or at a development area level.

2.2 Data Collection

Over the duration of the study much data has been requested, received and reviewed from the project consultees. Because of the nature and duration of this study some of this information has become superseded by more recent data as the project has progressed. In addition, there will be additional information that is now available which has not been included in this report due to its production or publication after the majority of this report was prepared.

Any limitations of the data are discussed further in the relevant sections of the report.

2.3 Housing growth and employment - future trajectories

Initially growth areas were identified from research carried out by The Landscape Partnerships, the Haven Gateway Regeneration Study (Royal Haskoning January 2006), and the Haven Gateway Programme of Development - A Framework for Growth (Haven Gateway Partnership October 2007). This information was combined and represented on Ordnance Survey mapping for each area, and used as a basis for discussion with each constituent authority area, along with the Annual Monitoring Report for each area.

The Planning and Compulsory Purchase Act 2004 requires every local authority to produce an Annual Monitoring Report (AMR) for submission to the Secretary of State by 31st December each year. This report contains information on the implementation of the Local Development Scheme (LDS) and the extent to which the policies set out in Local Development Documents (LDDs) and local plans are being achieved.

The status and dates for the various "development plans" for each Local Authority is given in **Table 2.1** below. Shaded cells represent completed items.

Table 2.1 - Local Planning authority Development Plan Status (November 2008)

LPA	Issues & Options	Preferred Options	Submission	Examination	Adoption
Babergh DC					
- Core Strategy	April-May 2008	Feb-Mar 2009	Nov 2009	July 2010	March 2011
- Site Specific documents	May-June 2009	Jan-Feb 2010	Dec 2010	Sept 2011	May 2012
Local Plan 2006-2016					June 2006
Colchester BC					
- Core Strategy	March- April 2006	Nov-Dec 2006 (Amendments: May-June 2007	Nov 2007	June 2008	Dec 2008
- Site Specific documents	Nov-Dec 2006	Jan-Feb 2009	Nov 2009	April 2010	Aug/Sept 2010
Local Plan 2001-2011					March 2004
Ipswich BC					
- Core Strategy	Jan 2005 & June 2006	Jan - March 2008	March 2010	July 2010	Nov 2010
- Site Specific documents	Jan 2005 & June 2006	Jan - March 2008	April 2011	Sept 2011	Jan 2012
Local Plan 1988-2006 *					Nov 1997
Mid-Suffolk DC					
- Core Strategy				May 2008	Sept 2008
- Site Specific documents	Aug-Sept 2008	Feb-Mar 2009	Dec 2009	Apr 2010	June 2010
Local Plan 1998-2006 *					Sept 1998

LPA	Issues & Options	Preferred Options	Submission	Examination	Adoption
Tendering DC					
- Core Strategy*	Mar- April 2009	Feb 2010	June 2010	Early 2011	Late 2011
- Site Specific documents *	Aug-Sept 2009	April-May 2010 subject to review	Aug 2010	Dec 2010-Jan 2011	Late 2011
Local Plan 1996-2011					Dec 2007
Suffolk Coastal DC					
- Core Strategy		Dec 2008	June 2010	Sept 2010	Feb 2011
- Site Specific documents		Sept 2010	Feb 2011	Jun 2011	Sept 2011
Local Plan (1st & 2nd Alteration) 1998-2006					Feb 2001 & March 2006

Notes: **Babergh DC** LDS July 2007; **Colchester BC** LDS Sept 2007; **Ipswich BC** LDS May 2007**; Mid-Suffolk DC** LDS March 2008; **Tendering DC** LDS August 2008. Information provided by local authority staff is marked with an *

The most recent Annual Monitoring Report was collected from each authority and, where available, Housing Land Availability studies. Along with face to face meetings and the information already identified, a trajectory was produced for each council and hence for the whole of the Haven Gateway sub-region. It should be noted that not all of the Mid Suffolk District and Babergh District areas are included in the Haven Gateway sub-region, and so the irrelevant development areas were removed from the trajectory figures.

A similar exercise was also carried out with employment land. However, the Annual Monitoring Report does not specify such stringent requirements for employment land data, and therefore no trajectories were available for use. In order to make an assessment of the impact of employment land, a trajectory spreadsheet was produced. The starting point for the spreadsheet was the data contained in Appendix A of the Haven Gateway Programme of Development: A Framework for Growth (October 2007), and the Haven Gateway Employment Land study. Some authorities had produced an assessment of available employment land or employment land study, which was used to identify land areas. Combining this with information in existing Local Plans, a trajectory was formulated. However, this identified a quantitative area of land, and not a number of jobs. It also does not identify at present exact land uses.

Further work was undertaken to categorise land into different employment use, as it was seen that some large areas of development (such as the Port of Felixstowe) adversely influenced the results of the water supply and wastewater collection analysis. However it was found that even where classifications were available for employment land there was insufficient detail to make informed global decisions (the groupings were sufficiently broad that usage could not be realistically estimated). Therefore the impacts of specific large areas of proposed employment development have been considered on a development area basis within the sensitivities to water supply and wastewater collection and presented in the detailed sections of the report.

The final data used in the analysis is presented in **Appendix A**.

In the Stage 1 report a 10km buffer zone around the Haven Gateway boundary was included. Development within this area, and the impact of that development on the HGSR was considered. This buffer included the towns of Framlingham, Stowmarket, Sudbury and Halstead, all identified growth areas. It was established during Stage 1 that these areas of growth did not have a significant impact on the capacity of the water cycle within the Haven Gateway to accommodate growth. Therefore this buffer has been excluded from the final study.

2.4 Wastewater collection and treatment

Anglian Water Services (AWS) are responsible for most domestic and a small percentage of trade wastewater treatment within the Haven Gateway sub-region. Information regarding the wastewater collection and treatment infrastructure within the HGSR has been provided by AWS. This includes details of the sewerage network and specific Sewage Treatment Works (STW), details such as receiving watercourses, Consented Dry Weather Flow (CDWF), current (2007) flow data and catchment areas.

The impact on the STWs was identified by considering the developments identified in the development trajectories and then identifying the wastewater treatment works catchment area in which they are located. The increase in calculated DWF figure in each year is based upon the following assumed design flows (shown within **Table 2.2**) obtained from Anglian Water. The base was taken as the measured DWF in 2007.

Table 2.2 – Water Usage Design flows

Flow Element		Design Flows		
		Litres	Cubic metres	
Residential Development		145 litres/capita/day	0.145	m³/capita/day
Industrial Development:				
	Domestic Element	46660 litres/hectare of developable land/day	46.66	m³/ha developable land/day
	Trade effluent	58750 litres/hectare of developable land/day	58.75	m³/ha developable land/day
Infiltration		40 litres/capita/day	0.04	m³/capita/day

These standard figures, particularly for the non-residential development will give rise to unusual results in some areas where the development is not "standard". Comment has been made that the design flow rates for the industrial development may be a higher estimate than expected. However, these rates were agreed during the development of the water cycle study and have been used throughout for consistency. Any future update of the study should reconsider the flows used to assess the impacts on receiving watercourses and treatment works.

A particular example of unusual results would be the Port of Felixstowe where the potential area of development is large, but the quantity of water to be treated from the site will be low compared with the standard value. These anomalies will be considered within the development sections if appropriate, however in many cases the type of non-residential development is unknown and therefore the standard values will be used. In addition much of the trade (industrial) waste is currently not treated directly by Anglian Water and much of the new development will not impact directly on their ability to treat effluent, but may impact on the capacity of the receiving watercourses to accept additional flows.

Due to the location of the Haven Gateway sub-region on the east coast of England, it is a popular holiday destination. There are a number of large caravan parks on the coastline, most noticeably at Clacton, Jaywick, St. Osyth, Walton on the Naze, Dovercourt, Felixstowe, West Mersea and Leiston. Seasonal demand, as an effect of the influx of holiday makers, affects both water supply and wastewater collection, especially in the areas of larger tourist population (Clacton and St. Osyth).

The impact of the holiday influx, based on a population equivalent figure (supplied by Anglian Water) was included in the wastewater collection assessment, and the demands included in the evaluation.

The calculated DWFs were then compared with the current Consented Dry Weather Flows for each STW to establish the "headroom" at the works for each year of the study period. The headroom evaluations have been based on the Consented DWF from the STW rather than the actual process capacity of the works, which may be significantly different. This is as the consented discharge is the key limiting factor on the capacity of the works. However, AWS have supplied additional information on some of their sites where they consider that the current works could not accommodate the projected increase in capacity and that additional works would be required to increase the process capacity in addition to any changes in consented DWF. In addition the Environment Agency require that the sites are normally operated at 90% of their consented dry weather flow to allow for seasonal variations in flow.

Details of specific STWs, issues with headroom over the study period, projected process improvements and CDWF changes are discussed in the detailed sections of this report.

Due to data limitations, it was not possible at this stage to undertake a detailed analysis of the capacity or condition of the wastewater infrastructure. AWS have provided brief comments regarding the capacity of the sewer systems and the future capacity of treatment works, but no detailed modelling has been undertaken. Therefore only limited consideration has been given at this point as to infrastructure limitations (i.e. the ability for the existing drainage infrastructure to carry the wastewater to the STWs).

This is a valuable and critical element of the water cycle; it is recommended that detailed modelling of key locations is carried out in the future to support any update to this study once the necessary data is available. Increases in discharges to combined sewer overflow systems will need to be considered particularly carefully as increases of discharge in these systems will impact on the receiving watercourses and is unlikely to be acceptable.

To highlight this shortcoming, the comments from AWS have been included within the discussion of the STWs and development areas and an additional 'greyed out' row has been added to the traffic light colour coded tables in the conclusion of each of the Local Authority specific sections to indicate a requirement for additional analysis to be incorporated at a later date.

2.5 Water quality and environmental issues

Environmental capacity is an important consideration when planning growth within the HGSR. It is also a central constraint in the principle of sustainable development. Although there are various definitions of environmental capacity, it is essentially an assessment of the amount of development the various elements of the environment can accommodate. This ‘capacity’ can be hard to define, since it involves a level of subjectivity; the level of change that can be accommodated often depends on the level of impact, or decline in quality or services, that is felt to be acceptable. This WCS has been limited to considering those effects of development that relate to the water environment. Within this environment no decrease in quality is considered acceptable.

2.5.1 The current situation, and water quality assessments

A study on environmental capacity in the HGSR (Land Use Consultants 2008) determined that measures of environmental capacity regarding water quality are established by compliance with River Quality Objectives and Bathing Water Standards. Under the Water Framework Directive there will also be a requirement for all inland and coastal waters to achieve ‘good ecological status’ by 2015.

Although river quality in the HGSR is generally good to fair, and there is 100% compliance with Bathing Water Standards, concerns have been raised as to the ability of some STW to accommodate demands associated with new development. These concerns are addressed in this assessment, where possible future discharges from STW and their potential for negative impacts on the receiving water environment have been considered. Due to the large number of sewage treatment works in the study area, assessments have been limited to those sites which the modelling has identified will breach their discharge consent at some point in the plan period (i.e. to 2021). This modelling accounts for an increase in both residential and non residential flows.

The water quality assessments consider the current consented flows and the consented pollutant concentrations. They also outline the current state of the receiving water course or surrounding environment, and identify particularly sensitive areas. It then considers the increases in flow that would be required by proposed development, and identifies potential future issues.

In each case we have modelled the pollutant load under the assumption that that sanitary limits set in the consents are met and not surpassed. Therefore at the point that the volumetric consent is breached, the model will indicate that the existing pollutant load needs to be reviewed.

This approach is conservative since in most cases the STW performance, in terms of pollutant load in discharged water, is significantly better (below) this. Therefore where the modelling indicates that there is an issue with water quality, this should be interpreted cautiously. Current performance is summarised against the consented pollutants for each STW; the extent to which this can be depended upon, and its resilience to future discharge and inputs requires an additional level of knowledge about the technical performance of each STW and further consultation with AWS will be required.

Once the pollutant limit is reached we have assessed whether the volumetric consent can be increased whilst maintaining the total pollutant load within the current consented limit by tightening the sanitary consent. This assesses the ‘headroom’ between the sanitary level current required by the consent, and that which is possible by technologies up to the standard currently accepted as BATNEEC, or currently accepted as BAT, can achieve the required sanitary standards. It should be noted that these are considered as limits of performance, rather than suggesting that a particular technology is required.

This study has used figures provided by the Environment Agency which have been taken to represent the standards achievable by implementing Best Available Technology Not Entailing Excessive Cost (BATNEEC), and Best Available Technology (BAT). These concentrations are shown below.

Pollutant	BATNEEC concentration	BAT concentration
Ammonia	3mg/l	1mg/l
BOD (Biochemical Oxygen Demand)	10mg/l	5mg/l
P (phosphorus)		1mg/l (sites over 1000 population equivalent) 2mg/l (sites 250-1000 population equivalent)

In locations where limits are already tight, increased performance will require significant investment; at those sites where sanitary standards are less constrained, increased performance may be met more easily. For each STW comments are provided as to the current consented load, current performance, and possible future loads and sanitary requirements.

If increases in consent are required it will be necessary for a consent variation application to be made. At this time the consent limits will be reviewed and if necessary tightened.

The current lack of water supplies in the sub-region is also noted by Land Use Consultants (2008); however due to limitations in data availability it has not been possible to consider the environmental implications of any increased abstraction requirements. We instead suggest that this be factored into future consideration of impacts. Subsequent studies would then also be able to consider the in-combination impacts of changes to both abstraction and discharge.

2.5.2 Limitations

This study identifies those STW which represent ‘pinch points’, and which may represent environmental constraints on expansion (e.g. increased discharge). The assessment of possible impacts on the environment, and constraints on development that these may impose, has been based on the modelled future flows used elsewhere in the WCS. It is therefore subject to the same constraints and caveats. Due to the potential issues with the data provided it is possible that further pinch points will be identified in subsequent studies.

During consultation with the Environment Agency, an issue has been raised regarding outstanding increases in consented discharge from a number of sites (namely Hadleigh; Sproughton; Copford; Melton; Brightlingsea; Jaywick; and Tiptree). These sites are to have their DWF consented value modified to better reflect the higher existing discharge and to make allowance for seasonal variation in flows. These proposed changes have come to light following a flow compliance review. All of these sites should be considered to be currently 'at capacity'. These proposed increases in consented dry water flow which are currently in review are not considered to relate to additional headroom, or to provide capacity for additional growth; rather they are being adjusted to reflect the current conditions and to allow for seasonal variations in flow. In the case of Tiptree there is also a requirement to tighten the sanitary conditions of the consent.

2.6 Water resources and supply

There are three water companies that serve the Haven Gateway sub-region – Anglian Water Services Limited, Essex and Suffolk Water and Veolia Water East.

Due to the heightened security around water supply resources, this study has not been able to gain details about the location of water abstraction points, water treatment works, or water networks from the water companies. This means that making an independent accurate assessment on the impact of growth on the water infrastructure is particularly difficult.

Initial global assessments of water availability were made using the Catchment Abstraction Management Strategies (CAMS) and the draft Water Resource Management Plans (dWRMP), comparing total available abstraction licenses with projected demand, based on the trajectories developed for this study. The new final WRMPs contain further information that should be referenced in terms of water supply and infrastructure and which supersedes the dWRMPs used for the preparation of this study.

A review of the information supplied by the water companies and an interpretation of these are provided in the Section 3. More detailed evaluations, although difficult with the heightened security, have been undertaken, both at a water company level and in some instances to a LPA or development area level. These evaluations are discussed in later sections of this report.

Water supply infrastructure is a critical part of the water cycle and should be evaluated on a development area basis in the same way as wastewater or flooding. The report has been structured to enable this detail to be added at a later date if required.

2.7 Flood risk

The flood risk considerations for the Water Cycle Study has consider, where possible, tidal and fluvial flooding from watercourses along with the potential for flooding from surface water and ground water.

Key sources of information for this were the Strategic Flood Risk Assessments (SFRAs) prepared by the Councils to support their LDF submissions and applications within the

PPS25 guidelines. In addition the Environment Agency has provided data from their Flood Map showing the Flood Zones together with other flooding related data.

The current status of SFRAs within the Local Planning Authorities is shown in **Table 2.3** below. The identification of Level 1 and Level 2 SFRAs relates to the requirements of PPS25 - Development and Flood Risk which suggests the use of a global coarse SFRA (Level 1) supported by a more detailed assessment (Level 2) in those areas where the Exception test may be needed to assess new development proposals.

Table 2.3 - Status of SFRAs within the Haven Gateway area (December 2008)

Council	**SFRA - Level 1**	**SFRA - Level 2**	**Notes**
Ipswich Borough Council	Yes		Not yet approved by EA
Colchester Borough Council	Yes	Yes	Part of Mid Suffolk
Suffolk Coastal Borough Council	Yes	Yes	
Mid Suffolk District Council	Yes	Yes	
Babergh District Council	Scoping		Level 1 awarded Dec 2008
Tendring District Council	Scoping		Level 1 awarded Dec 2008 Harwich SFRA and Jaywick Flood Study complete.

In those areas where only Scoping Studies have been completed, flood risk has been assessed using the EA's flood mapping together with global assumptions on climate change. In areas where either Level 1 or Level 2 SFRAs have been completed then these have been used to evaluate the impacts of flooding on the proposed development area, and to outline where strategic flood management options may be required in the future.

2.8 Development Area Actions

Within the individual planning authorities a number of key development areas have been identified and these have been discussed in more detail within the individual Local Authority sections. The discussion covered the key areas of water supply, wastewater and flood risk. The key issues for development now and in the future were also identified and possible solutions suggested.

The current situation, projected into the future, is displayed as a "traffic light" system in four yearly blocks. The colours, green, amber and red have been set to provide a visual display of when development may become a problem if action is not taken. A set of criteria were used for each of the areas indicated below which sets the colours.

An example table is shown below.

Table 2.4 - Traffic Light System for development area issues

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Water Supply Infrastructure				

Wastewater Infrastructure				

2.8.1 Water Supply

Green – Demand management only or no action required
Amber – Some additional supply required, e.g. reservoir extension
Red – Major additional supply required e.g. transfer from one zone to another, discharge reuse etc.

2.8.2 Wastewater Treatment - Quantity

Green – No known problems with STW consent or capacity.
Amber – Additional DWF consent required for employment use and/or need for storm water limits or surface water storage (uncertainty about discharges from employment land - levels of discharge, methods of treatment etc.). Significant flow increases on small watercourse.
Red – Additional DWF consent required for housing, process increase required or extension to STW.

2.8.3 Flooding

Green – No historical flooding problems and not situated within flood zones. SUDS recommended as general best practice.
Amber – SUDS and/or FRAs required due to proximity to flood zone, SPZ or in a location of surface water flooding or maintenance of flood defences needed.
Red – Location in FZ2/3 means sequential or exception tests are required, flood defence improvements required or upgrade of drainage system or area identified in SFRA as being at risk of flooding.

2.8.4 Environment – Water Quality

Note: The grading on water quality has been based on the current discharge from a sewage treatment works being at consented limits. This is a conservative approach as many of the existing works will have existing treatment capacity which would allow additional flow to be treated and still maintain the absolute pollutant load.

Green - Where there are no increases in flow beyond current consents.
Amber - Where additional technology up to BATNEEC (Best Available Technology Not Entailing Excessive Cost) could be used to maintain the overall pollutant load within current consented discharge limits alongside an increased consented volume of flows.
Red - Where additional technology up to BAT (Best Available Technology) could be used to maintain the overall pollutant load within current consented discharge limits alongside an increased consented volume of flows (but with potentially high costs) or where BAT could not maintain the pollutant load within current consented discharge limits, and a change in consent may be required.

2.8.5 Water Supply Infrastructure

Note: Cannot be commented on in most cases due to current lack of information. Where comment can be made, no colour code will be displayed at this stage, just the note. To be reviewed in future updates.

2.8.6 Wastewater Infrastructure

The wastewater infrastructure assessment is based primarily on the comments provided by AWS. As this is not a detailed study the grading of this item has been shown in pale as it will require further investigation in the future to confirm the detail. In sites where no information is available then the line has been left greyed out.

Pale Green - OK to proceed
Pale Amber - Restrictions on locations of development or improvements required for growth
Pale Red - No capacity or major capacity issues

2.9 Data limitations

As with all studies of this nature, the analysis relies heavily on data and information supplied by third parties. This is augmented by work carried out directly for the study. The Haven Gateway Water Cycle Study has pulled together much data from many parties to enable this report to be prepared. However there are some limitations with the process which should be noted, and some points for future projects relating to the data.

Firstly, much of the data has come from the local planning authorities as part of their ongoing planning submissions and other work. As shown in **Table 2.1** all the Councils are at different stages of their planning submissions and therefore the level of detail and extent of information varies. In addition, with development projected up to 15 years in the future some locations are as yet unknown in detail and only the concepts of development in generic areas was available.

Furthermore, much of this data is not static and is regularly being updated and revised as new information is collected or trends in development change. This study reflects a point in time and will need to be reconsidered at a later point. This study is based on data available at the end of 2008 and does not include changes to data such as measured STW discharges or revised development scenarios introduced since then. Reference has been made in specific sections where new data is known to exist, but this data has not generally been included. Future revisions of the study to accommodate any changes will be required on a regular basis. This is discussed further in Section 12.

3 STRATEGIC ASSESSMENTS

3.1 Water Resources and Supply

The Water Resource Management Plan Regulations (2007) require all water companies to publish a Water Resources Management Plan. These are relatively new regulations, and the first draft plans were issued for public consultation in May 2008. All three water companies within the Haven Gateway sub-region have published draft plans, and the following represents a review of the information contained within these. The plans explain how each company expects to supply water to its customers over the 25 year period from 2010 to 2035. They will also form part of the five yearly business plans each company must submit to Defra, the latest of which was submitted in August 2008.

Since the preparation of the draft Stage 2 report all three water companies have received comments from Defra on their draft WRMP's and have prepared a Statement of Response to the comments which have been submitted to Defra. At this point the WRMP's have not been finalised and therefore this study does not include information from any final WRMPs and once produced these documents should be referenced in conjunction with this study to confirm any results of this study.

All three water companies are promoting the Twin Track Approach – management of water resources through investing in demand management alongside water resources development.

3.1.1 Anglian Water Services

Anglian Water (AWS) have been very proactive, and attempted to provide information requested where possible, within the remit of their security guidelines. They are the largest water provider within the Haven Gateway and also provide the majority of the residential wastewater services and a proportion of the non-residential as well. Of the proposed growth within the HGSR, 82% of development will be provided with water by AWS. All of this falls within AWS' East Suffolk and Essex Water Resource Zone, also referenced as Water Resource Zone 10 (ES&E WRZ), and is the third largest zone in all of AWS' area. Within this zone, AWS are predicting an annual increase of 2,500 residents per year, of which only a part is located within the Haven Gateway. Current demands within the HGSR are focussed in the towns of Ipswich and Colchester. With the projected growth in the East Suffolk and Essex Water Resource Zone, domestic demand is expected to increase from 82 Ml/d in 2010 to 90 Ml/d in 2035. It is upon this figure that their assessment of water supply and resources has been based and should developments exceed this figure then additional resources will be required.

AWS published their draft Water Resource Management Plan (dWRMP) in April 2008, which identifies how AWS propose to accommodate the additional demand from this growth. The Statement of Response to comments on the dWRMP was issued to Defra in April 2009 and a final WRMP will be published once Defra have approved the plan. This study has been based on the dWRMP. Their Strategic Direction Statement was published in December 2007, which outlines the direction in which the company is heading in the future and their draft Business Plan was submitted to Ofwat in August

2008 (and a final version issued in April 2009), which identifies the reasoning for increasing price tariffs in order to pay for the planned improvement works.

As noted in Section 1.5 this study was based on the draft WRMP and a final version of the plan is now available and should be used to clarify issues with water supply within the AWS area.

From the dWRMP, it has been possible to make an assessment of the impact of the new development areas on the water supply situation. Furthermore, it has been possible to identify constraints to development over the study time frame which could restrict the projected growth until the issues are resolved.

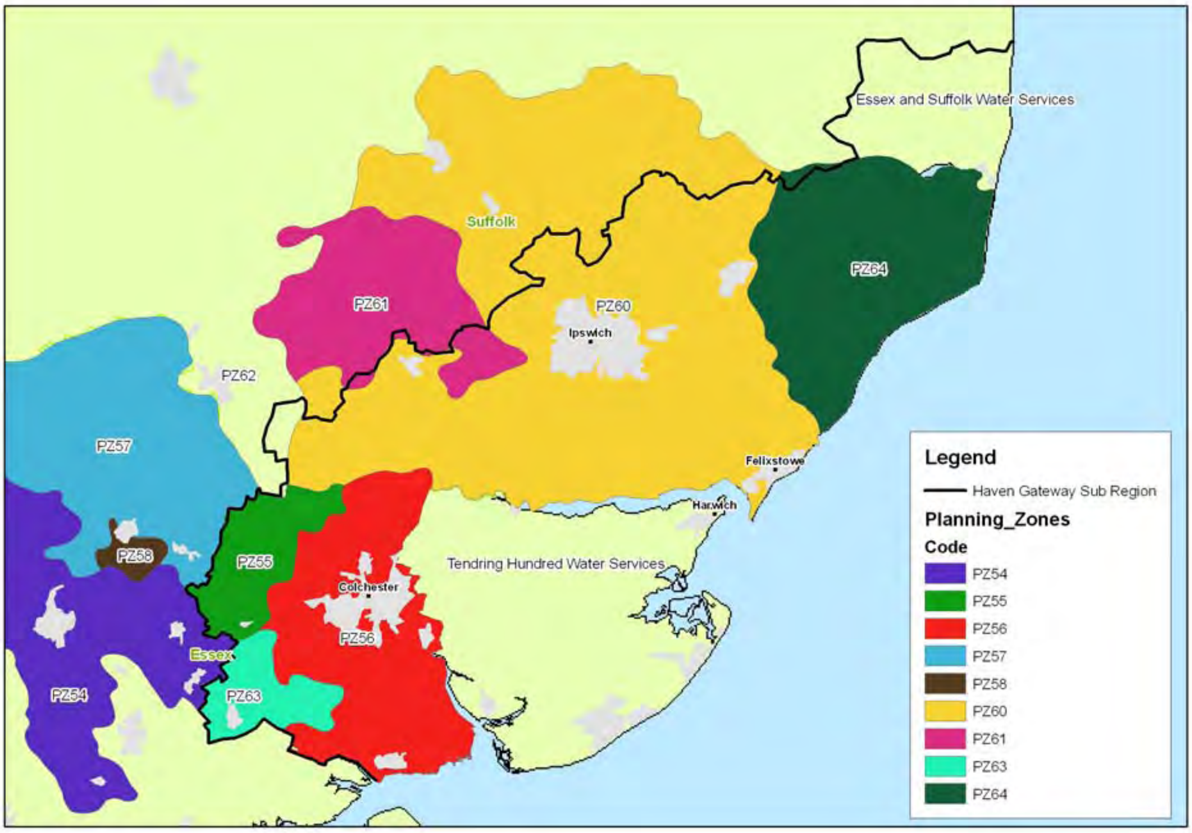
The East Suffolk and Essex Water Resource Zone is supplied mostly by groundwater from the underlying chalk aquifer. Compared to other areas of East Anglia, development of resources from this aquifer has been maximised due to the fact that it has been subject to only minimal environmental restriction. The zone also has surface water supplies, through the joint raw water storage reservoir at Ardleigh, which was developed in partnership with VWE, and the AWS raw water storage reservoir at Alton Water.

Ardleigh reservoir relies upon the treated effluent from towns along the Colne valley and baseflow from the underlying sand and gravel aquifers. It can be augmented during periods of low river flow by abstraction from a high fluoride borehole in Colchester, which is not suitable for direct supply. The EA can further augment flows by the transfer of water from the Ely Ouse to Essex Transfer Scheme (EOETS), into the River Colne. This is not currently used due to operational problems. A further bulk supply agreement is in place with Essex and Suffolk Water, which currently provides additional supply in Tiptree, although statutes are in place to take further supply in Colchester. This is not presently used. There are currently proposals in place to extend Ardleigh Reservoir. The supply from this aquifer is shared with Tending Hundred Water Services and is discussed in further detail at the end of this section.

Alton Water is larger than the Ardleigh Reservoir and is filled from the River Gipping, although this can be subject to low baseflow and has to be supplemented by the return of treated effluents upstream of the abstraction point. Alton Water can be further augmented during periods of low river flow, with water from Mill Stream at Bucklesham, which has been pumped under the Orwell Estuary.

The dWRMP states that the East Suffolk and Essex Water Resource Zone is forecast to have a small surplus of available water against target headroom at the start of the planning period decreasing to a deficit by the end of AMP5 (2015). This implies that the projected peak demand does not exceed the quantity of potable water available to be put into supply. Within the East Suffolk and Essex Water Resource Zone there are nine Planning Zones of which five have a major impact on the Haven Gateway sub-region. The planning zones are shown in **Figure 3.1** below. The figure identifies which areas fall within HGSR. It also shows the two areas which are supplied by Veolia Water East and Essex and Suffolk Water, both of which are reviewed later in this section.

Figure 3.1: AWS Planning Zones within East Suffolk and Essex Water Resource Zone (10).



The following five key Planning Zones are located within the HGSR:

- PZ55 – Bures
- PZ56 – Colchester
- PZ63 – Tiptree
- PZ60 – Ipswich
- PZ64 – Woodbridge

In addition a small part of Planning Zone 61 - Semer from the East Suffolk and Essex Water Resource Zone and Planning Zone 62 - Sudbury from the Cambridgeshire and West Suffolk Water Resources Zone also fall within the HGSR. These small areas have not been considered further in this study as their impact on total water supply has been taken as not significant in terms of the proposed development.

All of these zones are identified within the dWRMP as being forecast to "have headroom deficits against dry year average and/or critical peak period forecasts by the end of the planning period", as follows:

Table 3.1: Forecast Deficits of AWS Planning Zones within the Haven Gateway Study Area

	Forecast Deficit in 2035-36	
	Dry Year Average (Ml/d)	**Critical Peak Period (Ml/d)**
PZ55 – Bures	-0.14	+0.35
PZ56 – Colchester	-4.91	-1.17
PZ63 – Tiptree	-1.16	-1.92
PZ60 – Ipswich	-16.68	+9.20
PZ64 – Woodbridge	-2.51	+0.62

Source: dWRMP - AWS 2008

To overcome these deficits and to support the proposed growth, additional water supply must be found and within their dWRMP, AWS identifies the following feasible options considered for development in the period to 2034/35:

Table 3.2 Feasible Options for Addressing Headroom Deficits

PZ	**Option**	**Output (Ml/d)**	
		Average	Peak
55 Bures	Colchester PZ transfer	2.60	2.60
56 Colchester	Colchester re-use with enhanced metering	17.00	17.00
	Ipswich PZ transfer with enhanced metering	11.00	11.00
	Commission Great Horkesley borehole	0	2.00
	Ardleigh reservoir extension	3.00	3.00
60 Ipswich	Uprate Whitton WTW	0	2.00
	Uprate Raydon WTW	0	2.00
	Bucklesham Aquifer Storage Recovery scheme	4.00	4.00
	Ipswich discharges re-use	25.00	25.00
63 Tiptree	Colchester PZ transfer	1.20	1.20
64 Woodbridge	Ipswich PZ transfer	2.60	2.60

However, there are a number of assumptions included within this, which, if not realised will impact upon the supply of water available. However AWS have confirmed that they would not be permitted to propose a strategy where there are deficits against target levels and that they will develop alternatives if any of the above options cannot be delivered so as to maintain the target levels of headroom.

In both Ipswich and Colchester, additional treatment of Sewage Treatment Works discharges are proposed in order to augment river flows for downstream abstractions, for Alton Water and Ardleigh reservoirs respectively. A trunk main between Ipswich and Colchester has been constructed in order for an increased Ipswich discharge to be available in Colchester.

Although the dWRMP shows a number of water resource schemes, a great deal of emphasis is being placed on demand management, through leakage control, household metering and the promotion of water efficiency. The dWRMP states that alternatives for this WRZ are limited. However, AWS state that the "well connected and flexible supply systems…..offer some additional security of supplies through conjunctive use". The other proposed schemes for the period 2010 – 2035 are summarised in **Table 3.3** below.

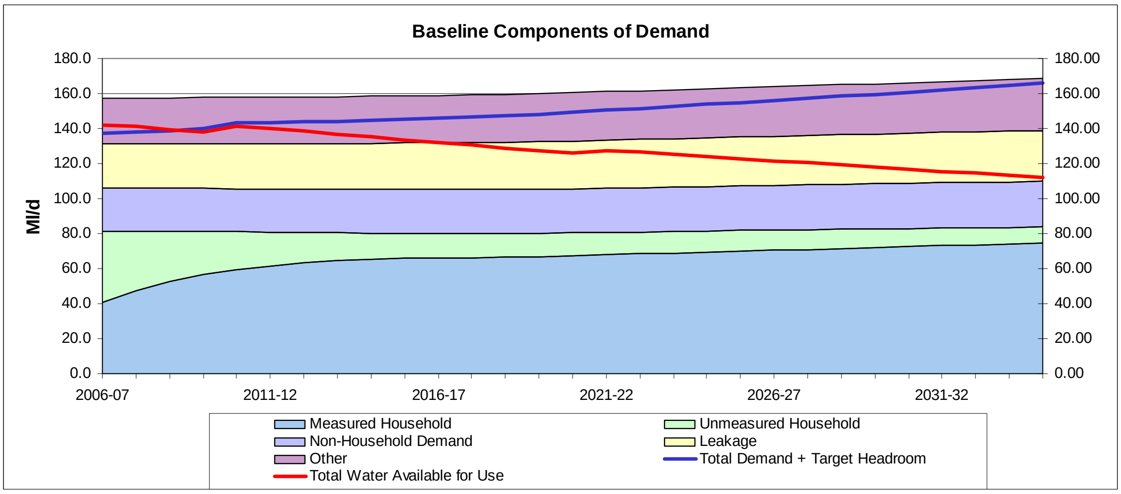
Table 3.3 Preferred Water Management Option - timeline

	PZ	AMP 5	AMP6	AMP7	AMP8	AMP9	Activity
Colchester Water Supply Area	55						General demand management
							Transfer from PZ56 - Colchester
	56						General demand management
							Ardleigh Reservoir Extension
							Transfer from PZ60 - Ipswich
	63						Transfer from PZ56 - Colchester

	PZ	AMP 5	AMP6	AMP7	AMP8	AMP9	Activity
Ipswich Water Supply Area	60						General demand management
							Bucklesham ASR Scheme
							Ipswich discharge re-use
	64						Transfer from PZ60 - Ipswich

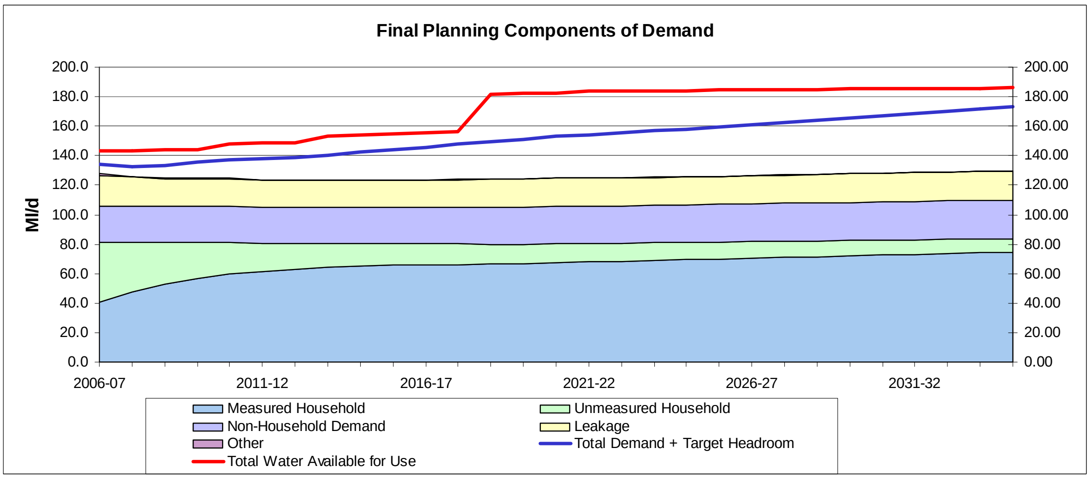
The overall plan has made a number of assumptions within the East Suffolk and Essex Water Resource Zone, the most significant of which is the assumption that it will be possible to "use the growth in existing discharges or new discharges that augment the flows of the Rivers……Gipping and Colne for water supply." If this additional flow is not available, development of supply from an additional, alternative water source would be necessary. Many of the assumptions are also dependent upon the acceptance of the PR09 price increases, proposed by AWS in their draft Business Plan, by Ofwat for the AMP5 period, 2010-15. If the funds are not available for the required improvements to take place then the conclusions of the dWRMP may require review. This is summarised by the graphs produced by AWS as part of their dWRMP, below. Both represent the 'dry year' scenario, with the first indicating the baseline, current situation whereby no schemes are utilised. The second represents the dry year situation with the schemes shown in Table 3.3 implemented. These show the importance of the proposed schemes and the resulting situation if some, or all, cannot be implemented for any reason. The "other" category represents the current unknown water usage (i.e. the difference between the Distribution Input and the measured demand and leakage). In the final planning forecast this "other" usage has been assumed to be resolved and therefore it does not affect the demand.

Figure 3.2 – Dry Year Baseline Forecast for AWS' East Suffolk and Essex WRZ



(Taken from AWS dWRMP, 2008: Summary Dry Year Tables)

Figure 3.3 – Dry Year Final Planning Forecast for AWS' East Suffolk and Essex WRZ



(Taken from AWS dWRMP, 2008: Summary Dry Year Tables)

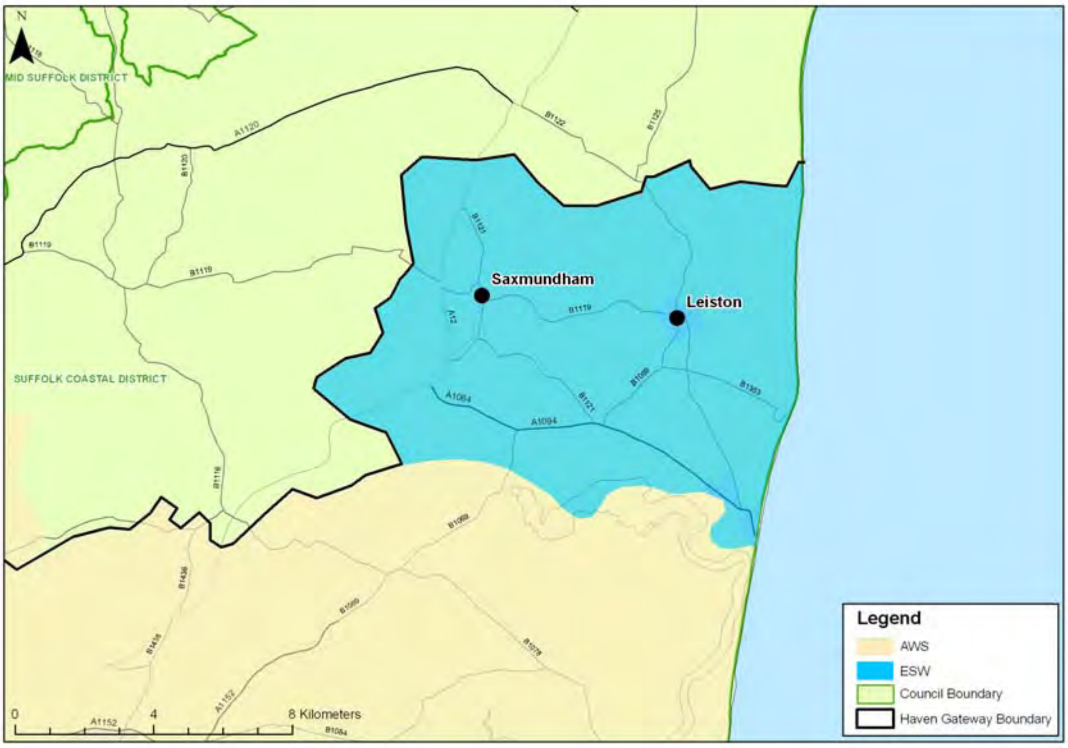
AWS conclude the dWRMP with the statement "As we have included target headroom in our demand forecasts and we have sufficient options to maintain the supply-demand balance, we are confident that we can manage the risks and uncertainties that are inherent in the 25-year plan we are proposing. Periodic reviews of the supply-demand balance will help us to monitor this situation and to ensure that any emerging risks are proactively managed."

Anglian Water Services have superseded the draft WRMP with both the final WRMP and their final Business Plan and these will need to contribute to future reviews of this water cycle study. In addition they are confident that they have sufficient options available within these final plans for the next 20 - 25 years to ensure that water supply is not a constraint to development within the Haven Gateway sub-region.

3.1.2 Essex and Suffolk Water

Essex and Suffolk Water (ESW) supply water to two geographically separate areas – one located within Essex and one within Suffolk. Only the Suffolk supply area is located partially within the HGSR area. The extent of HGSR within ESW is shown in Figure 3.4 below:

Figure 3.4 - Essex and Suffolk Water Area in HGSR



Essex and Suffolk Water will supply just 3% of the growth within the HGSR, all of which is situated within their Suffolk Blyth Water Resource Zone. This zone also supplies areas outside of the HGSR. The zone is predominately rural, although it does include the towns of Saxmundham and Leiston within the HGSR. ESW have only identified significant growth in demand to the north of their Suffolk catchment area, and have planned no new or additional supplies for the south, which includes the area within the HGSR.

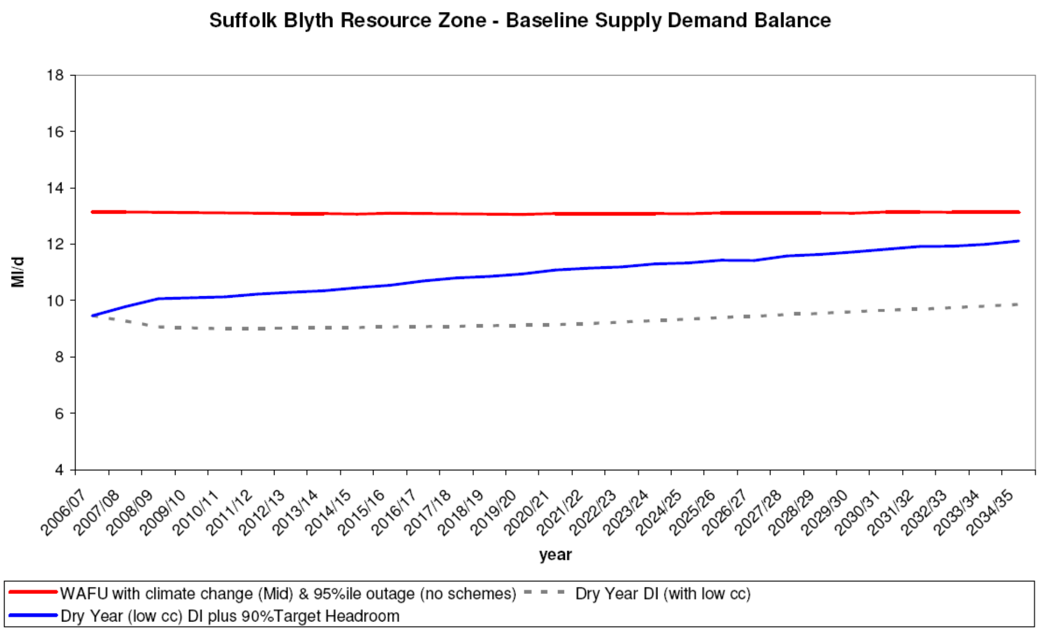
As ESW coverage within the HGSR is not as extensive as the other companies they have therefore not been as involved with this study as Anglian Water. Like Anglian Water, ESW draft 'Water Resources Management Plan' has been reviewed and its content used to make an assessment of the impact of new development. In addition it is acknowledged that the final WRMP should be available and that for future updates of this study, and in the final use of this document as planning evidence, the final WRMP should be used in preference to the draft version used in preparing this study.

Previous reports have indicated that during previous periods of drought, the underground water sources in the south Suffolk part of the Essex and Suffolk Water area were particularly affected. However, efforts have already been made to improve these areas.

The zone is supplied entirely with groundwater, sourced from a number of locations across the zone. The raw water is generally treated at the point of abstraction. As the treatment works are all groundwater fed, they are not affected by potentially disruptive issues such as algae, turbidity and nitrate, which could all have negative impacts on security of supply.

ESW do not consider the water resources in the Suffolk area to be 'scarce'. In fact, ESW predict that during the period 2010 – 2035, the Blyth WRZ, in which the HSGR is located, will have a surplus. From 2029, ESW are intending to transfer this water into the neighbouring Hartismere zone, to meet the need of the potential deficit in that zone. There should therefore not be a problem for the zone to accommodate the predicted growth.

Figure 3.5: Blyth WRZ Supply Demand Balance



(Taken from ESW dWRMP, 2008: pp282)

There is no proposal in place to seek new abstractions in the Blyth Water Resource Zone. Water resources will be managed by a combination of metering and other demand management techniques. Pressure reduction has already been used as a means of reducing the amount of water lost due to leakage. The dWRMP further states that "due to the flat topography of the Essex and Suffolk supply areas there is very little scope for any increased pressure reduction without impacting on customers' levels of service". The final conclusion, presented in ESW dWRMP was that "for the Suffolk Blyth resource zone no interventions are required as a predicted surplus in the balance of supply is predicted over the planning horizon."

Essex and Suffolk Water have superseded the draft WRMP with a revised draft WRMP submitted with their Statement of Response and their final Business Plan and these will need to contribute to future reviews of this water cycle study. In addition once indicated by Defra the final WRMP will be published and should be considered in further updates to the WCS.

3.1.3 Veolia Water East

Veolia Water East (VWE) is one of the smallest water supply companies within the UK, consisting of just one Water Resource Zone (WRZ) and supplying water to Tendring District and small areas of Colchester Borough. The extent of the VWE company is shown in Figure 3.6 below. This includes the growth points of Harwich, along with the seaside towns of Clacton, Jaywick, Dovercourt, St. Osyth and Walton-on-the-Naze. As with Essex and Suffolk Water, their coverage of the HGSR is not as extensive as Anglian Water's, however VWE does provide potable water services to 15% of the growth within the HGSR. In line with the other water companies serving the Haven Gateway, VWE published its draft Water Resource Management Plan (dWRMP) for consultation in April 2008 which identifies how Veolia Water East propose to accommodate the additional demand from this growth. Following comments, a Statement of Response was prepared in January 2009, and in August 2009 Defra asked VWE to publish their final WRMP. Their Strategic Direction Statement was published in December 2007, which outlines the direction in which the company is heading in the future and their draft Business Plan was published in August 2008, which identifies the reasoning for increasing price tariffs in order to pay for the planned improvement works.

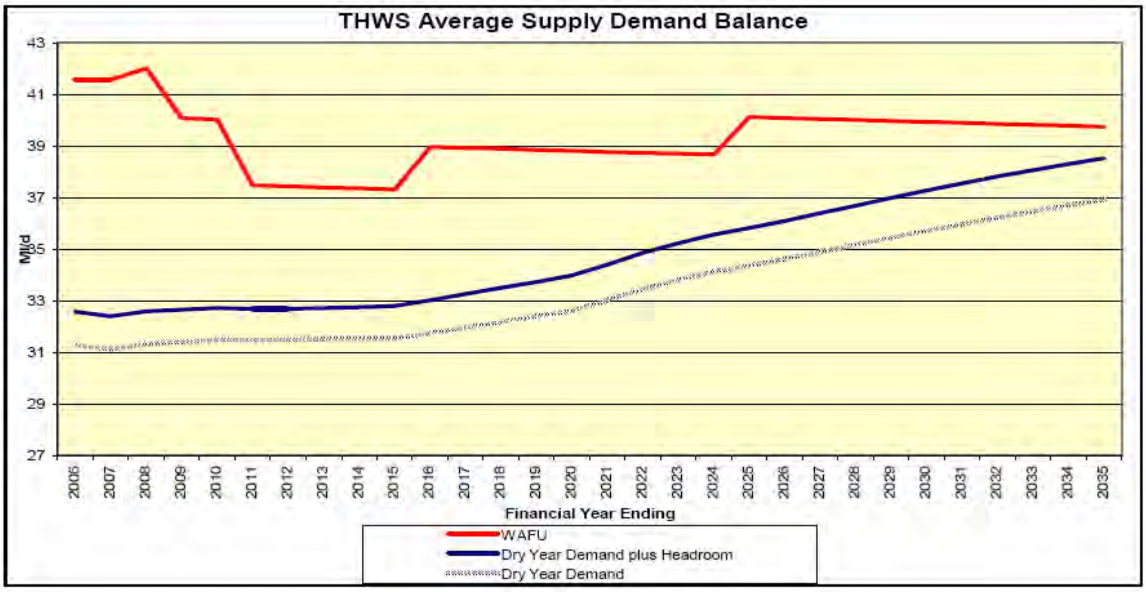
Figure 3.6 - Veolia Water East Area in HGSR

VWE predicted an increase of 11,600 houses within their Strategic Direction Statement but this was subsequently updated within their dWRMP to a predicted increase of 16,820 dwellings between 2010 and 2035, which indicates an indicative average of 673 houses per year. It is upon this figure that their assessment of water supply and resources has been based and should developments exceed this figure then additional resources will be required.

Most of the water supplied (approximately 80%) to VWE' customers is resourced from groundwater from a total of eleven confined aquifer chalk boreholes, the location of which was not divulged by VWE for security reasons. The rest of the supply is sourced from the River Colne and stored in the Ardleigh reservoir, which is a resource shared between VWE and AWS currently on a 40:60 ratio. Adleigh reservoir is discussed in more detail in Section 3.1.4. The rest of the infrastructure network consists of two Water Treatment Works, 18 pumping stations and eight treated storage sites and water towers. At present a total of 28.6 mega litres per day is pumped into the supply system with an average metered consumption of 118 litres/person/day and un-metered consumption of 134 litres/person/day, although the dWRMP expects this to increase to 131.8litres/person/day and 142.4litres/person/day respectively by 2035.

The dWRMP forecasts, at the predicted rate of growth, a stable future situation with surplus supply over demand until beyond 2035 without the need to invest in resource development. Figure 3.7 below has been taken from the dWRMP report and indicates that enough water available for use within the system to accommodate the dry year demand plus headroom.

Figure 3.7: Average Supply Demand Balance for VWE Supply Area



(Taken from VWE dWRMP, 2008: pp1)

However, to produce this estimate a number of assumptions have been made by VWE in their dWRMP which must be borne in mind, some of which were mentioned in the Stage 1 report.

Water Supply

1. Expectation of additional resources to be supplied by Ardleigh Reservoir by 2025. Both VWE and AWS are expecting additional supply to support growth from this reservoir which relies upon the construction of additional storage and therefore the necessary licences and agreements being obtained before the project can be initiated. At present Essex County Council have agreed to approve a planning application subject to conditions which is expected to be in place in the first half of 2008. The dWRMP does not state whether these conditions have been met. It also states that there will not be a requirement to increase the abstraction licence at the point of abstraction from the River Colne but does not state where the additional water supply will come from.

2. A proposed change in the ratio split between VWE and AWS from the Ardleigh Reservoir from 40:60 at present to 30:70 between 2010 and 2015 and to 50:50 beyond 2015. At present it appears that these ratio changes have only been agreed through discussion between the water companies and therefore maybe subject to change. The Deployable Output is also dependent upon the flow in the reservoir being supported by an AWS borehole, which VWE have factored into their dWRMP as being guaranteed until 2015. Should the ratios of water use for VWE decrease further, or not return to 50:50 after 2015 or if the borehole supply fails before 2015, the calculations shown in the scenario graphs above will change and may indicate a negative supply demand balance occurring earlier than predicted, possibly within the planning period of this WCS. Ardleigh Reservoir is discussed further in Section 3.1.4.

3. Bulk transfer scheme required after 2025 from the Ely-Ouse-Essex transfer in conjunction with Abberton reservoir raising works by Essex and Suffolk Water.

4. Retention of the abstraction licence for the currently unused TGBE gravel groundwater source so that supply can be increased at the appropriate time. This source is currently unused due to quality issues but this may be overcome using reverse osmosis treatment for use as a contingency measure in the Drought Management Plans.

5. That no Sustainability Reductions (which would result in a reduction on Deployable Output) will be necessary. VWE have been advised that reductions may be necessary beyond 2015 and it is possible that studies will need to be undertaken during the AMP5 period (2010-15). VWE anticipate that such studies will be defined for inclusion with in the final WRMP in 2009.

Water Demand

1. The population increase will not exceed 16,820 dwellings between 2010 an 2035.

2. At least 90% of domestic properties metered by 2015 to increase water efficiency. At present VWE are hoping to achieve this through voluntary metering, although they do admit that they may need to change to a compulsory

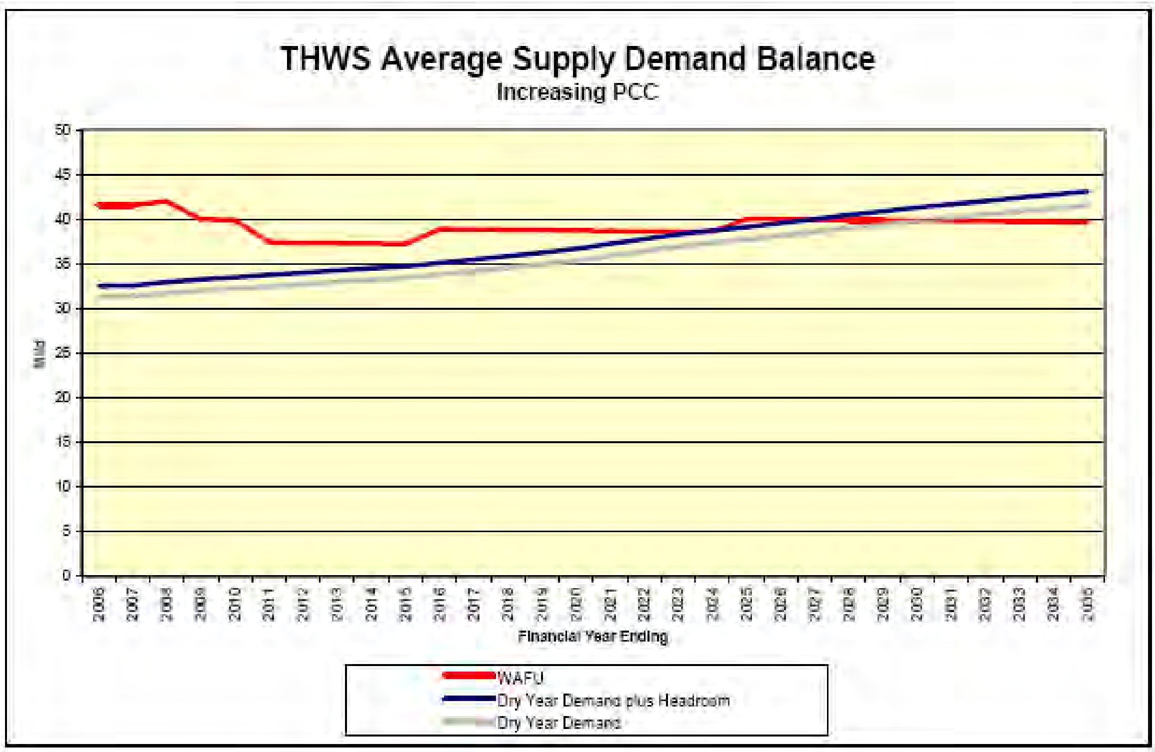
metering programme if the uptake is not as great as expected. Before the switch can take place VWE propose a period of comparative billing for its customers. Depending upon the efficiency of these schemes, the metering target may not be met in such a short time frame.

3. Continued customer water efficiency, which is reliant upon the attitudes and education of it's customers.

4. Maintenance of leakage below the economic level. As identified within the dWRMP, this is subject to VWE receiving the appropriate funding.

5. That the demographic will remain the same. As noted in the dWRMP, a change in the demographic (as a result of growth and a change in population type), resulting in a change in water using behaviour, is the most significant risk to the plan. VWE modelled a scenario of Average Supply Demand Balance using a much higher Per Capita Consumption of around 150litres/person/day in 2035 to determine the potential effects. Figure 3.8 shows the resulting scenarios and indicates that the Dry Year Demand plus Headroom supply-demand balance briefly becomes negative in 2023-24 and, stays negative from 2027. The Dry Year Demand scenario without Headroom becomes negative from 2030. Although these scenarios show a potential problem in the long term and may warrant a review of this plan they do not show a reason for concern within the planning period discussed within this WCS.

Figure 3.8: Average Supply Demand Balance Accounting for an Increased Per Capita Consumption



(Taken from VWE dWRMP, 2008: pp22)

Many of the assumptions are dependent upon the acceptance of the PR09 price increases proposed by VWE in their draft Business Plan by Ofwat for the AMP5 period, 2010-15. The actions outlined for AMP5 include the replacement of 30km of water supply mains, 5,600 communications pipes, the installation of 12,000 meters and the installation of a new treated water reservoir and pumping station at Dovercourt. If the funds are not available for these improvements to take place then the conclusions of the dWRMP may require a review.

Individually the separate assumptions listed above may not impact the predicted supply-demand balance very significantly within the planning period discussed within this WCS. However, if a number of them fail then a potential significant impact may be seen and limit the development that can take place. It is beyond the scope of this WCS to investigate these impacts further, but any reviews of the dWRMP made by VWE or the Environment Agency must be considered alongside the conclusions of this WCS.

The final conclusion of the VWE dWRMP is that “the updated Supply and Demand forecasts for this plan show that there is no need for substantial expenditure on resource development before 2034/35.”

Veolia Water East have superseded the draft WRMP with both the final WRMP and their final Business Plan and these will need to contribute to future reviews of this water cycle study.

3.1.4 Ardleigh Reservoir

Currently the Deployable Output from Ardleigh Reservoir and its associated Water Treatment Works is shared 40:60, between VWE and AWS respectively. This split has been in place since 2006, and will remain until 2010. Between March 2010 and March 2015 the split will change to 70AWS:30VWE. Beyond this date there is a discrepancy in the dWRMPs published by the two water companies. VWE state in their report that an agreement has been made with AWS that the supply from Ardleigh reservoir will revert to a 50:50 split in March 2015. However, in their dWRMP, AWS simply state that “the agreement will be reviewed in 2015”, implying that no such agreement has yet been made. They also state that “We have assumed for the purposes of supply-demand modelling that this agreement will continue beyond 2015”, referring to the 70:30 split in the water supply.

During the consultation period on the dWRMP it is understood that agreement has been reached between the two water companies and the discrepancy has been removed. There is now a proposal for the continuation of the 70/30% split beyond 2015.

The Ardleigh Reservoir Committee, who manages the reservoir on behalf of both AWS and VWE, are promoting an increase in raw water storage at the reservoir. It is proposed initially to abstract minerals from the site for the first 10-15 years, with the associated area then being used for additional water storage. This additional storage would not require any changes in abstraction licenses. The proposal is currently at planning stage, and, although AWS state that planning permission has been granted, will not realistically provide any additional water until towards the end of the planning period considered within this report.

At present, AWS support flow in the River Colne with water abstracted from one of their groundwater sources. This water is currently surplus to requirements elsewhere, and provides additional support to the reservoir's drought yield. AWS are hoping to increase this additional yield through a Colchester discharges re-use scheme whereby a portion of water currently discharged from Colchester WWTW to the tidal River Colne is returned after additional treatment and subsequently re-abstracted to refill Ardleigh reservoir.

The reservoir currently holds 2185 Ml when full, and can support a supply of 36Ml/d for a short period. This figure will reduce in the future due to effects of climate change.

3.1.5 Conclusions

All the three companies' dWRMPs have not identified new water resources as a priority. In fact, ESW and VWE have both identified that it will be possible to supply both existing and future demand from existing resources. The Environment Agency have identified AWS and EWS in this area as being 'Seriously Water Stressed Area', and VWE as an are under "medium water stress" .

Although the optimum use of the existing resources in the sub-region will be a priority, all companies do see bulk water transfer as a means to supply future demand. The Ely Ouse to Essex Transfer Scheme is expected to provide a future source of water for both Abberton and Ardleigh reservoirs, as well as supporting the water flow and subsequently water quality in the associated watercourses.

The 'twin track' approach has also been supported by all three undertakers, as a means to enhance the existing water supplies. ESW have the lowest per capita consumption figures, mainly due to the education of their customers and the high penetration of water meters in the area. ESW wish to continue building on this strong foundation in future years to further reduce the Per Capita Consumption.

VWE see the reduction of leakage, and high meter penetration as the main means to supply growth in demand.

AWS are the only company that has identified the need to significantly develop resources although to some degree Tendring Hundred are also using the future development of Ardleigh reservoir in this category. However, this is not the sourcing of new water resources, but the developing of existing resources. This includes construction of new, or improvement of existing, headworks or resolution of water resource support issues.

AWS have also identified the support of existing watercourses by the discharge of 'super treated' effluent as a means of supporting additional demand. The standard approach of additional metering, increased education and reduced leakage are also identified as means of supporting growth in demand.

All three water companies are continuing to develop their proposals for accommodating growth within this area, and reference should be made to both the final Business Plans and the final Water Resource Management Plans which are due to be published shortly.

In addition consultation with the water companies will also be required to accompany any further detailed studies.

3.2 Water quality

3.2.1 Review of River Water Quality

The River Water Quality data has been used to make an assessment of the impact of future changes to discharge licenses, both volumetrically and environmentally. Early indications show that the river quality within the HGSR is generally good, although the nitrate levels are generally between moderate and very high. However, this would be expected in an area where a large proportion of surface water runoff is from arable land.

Water abstracted from rivers in the HGSR generally is stored in reservoirs for future treatment. There are a limited number of points where water is abstracted for immediate treatment, and these are all high in nitrate content, with a number being high in phosphate content.

The existing quality of the river water will be of significant consideration where increases in discharge consents are required. These increases are most likely to be subject to more stringent chemical content consents, especially regarding nitrate and phosphate.

3.2.2 Environmental Assessment

The environmental assessments carried out during this study are not intended to act as an assessment under the Habitats Regulations. Instead in them we identify potential receptors and highlight any likely vulnerabilities and issues for future consideration. The watercourses receiving discharges from STW are identified on a site-by-site basis in the assessments. Areas designated at a European or international level for their conservation interest which have the potential to be affected by changes to STW discharge are identified, and these are described in more detail below. Where the discharge has the potential to influence Sites of Special Scientific Interest (SSSIs) along the watercourse, these are also mentioned. Sites downstream of the discharge point designated as freshwater fisheries (under the Freshwater Fish Directive), shellfisheries (under the Shellfish Directive) or areas for bathing (under the Bathing Water Directive) are identified where appropriate.

The European designated sites, and their points of interest and reasons for designation, are detailed below and shown in Figure 3.9 below.

Figure 3.9 - Location of Natura 2000 sites within the Haven Gateway sub-region

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3.2.3 Natura 2000 and Internationally Designated Sites in the Study Area

The Natura 2000 network is a suite of European network of sites which are designated and protected because they represent areas of the highest value for natural habitats and rare, endangered or vulnerable species. It consists of areas designated, or in the process of being designated, as;

- Special Areas of Conservation (SAC). These support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds), and are designated under the Habitats Directive; or
- Special Protection Areas (SPA). These are areas which support significant numbers of wild birds and their habitat, and are classified under the Birds Directive.

As well as these designated areas, Ramsar sites are wetlands of international importance designated under the provisions of the Ramsar Convention on Wetlands (1971). Some areas may become designated under SAC, SPA and Ramsar. Within the study area the following sites are identified:

<u>Alde-Ore Estuary SPA, Ramsar.</u>

The site comprises the estuary complex of the rivers Alde, Butley and Ore. The Alde River originally entered the sea at Aldeburgh, but now turns south along the inner side of the Orfordness shingle spit. It is relatively wide and shallow, with extensive intertidal mudflats in its upper reaches and saltmarsh accreting along its fringes. The Alde flows into the south-west flowing River Ore, which is narrower, deeper and with stronger currents. The smaller Butley River, which has extensive areas of saltmarsh and reedbed bordering mudflats, flows into the Ore shortly after Havergate Island.

There are a variety of habitats, including intertidal mudflats, saltmarsh, vegetated shingle (including the second largest and best preserved area in Britain at Orfordness), saline lagoons and grazing marsh. The site supports nationally-scarce plants, British Red Data Book (BRDB) invertebrates, and notable assemblages of breeding and wintering wetland birds, including marsh harrier *Circus aeruginosus,* avocet *Recurvirostra avosetta*, little tern *Sterna albifrons* and sandwich tern *Sterna sandvicensis*. The site is primarily designated due to the important number of bird species it receives.

The main factors affecting the site currently are coastal squeeze and sea level rise, causing erosion of saltmarsh. Coastal processes have a much greater impact on the site than fluvial processes, although the upstream sections will be more influenced by fluvial processes.

<u>Alde, Ore and Butley Estuaries SAC.</u>

Areas of the estuary are also designated under the Habitats Directive. The estuary contains large areas of shallow water over subtidal sediments and extensive mudflats and saltmarshes which are exposed at low water. Its diverse and species-rich intertidal sand and mudflats grade into vegetated or dynamic shingle habitat, saltmarsh, grassland and reedbed. The main factors affecting the SAC are also coastal squeeze and sea level rise, having the same effect as on the SPA and Ramsar sites.

<u>Colne Estuary SPA.</u>

The Colne Estuary is a comparatively short, branching estuary, with five tidal arms that flow into the main channel. The estuary has a narrow intertidal zone predominantly composed of fine silt flats with mud-flat communities typical of south-eastern estuaries. The estuary is used by a range of wintering wildfowl and waders. Little terns also breed in the area, on shingle. There is a wide variety of coastal habitats including mud-flat, saltmarsh, grazing marsh, shingle spits and reedbeds which provide feeding and roosting opportunities. The Colne Estuary is primarily important for the number of wintering and breeding birds. The birds are dependent on abundant food source and any factors affecting this will have implications for the birds using the site. Boating activities and local shipyards have a large influence on the site, as do coastal processes.

<u>Deben Estuary SPA, Ramsar.</u>

The Deben Estuary extends south-eastwards for over 12 km from Woodbridge to just north of Felixstowe. It is relatively narrow and sheltered, and has limited levels of freshwater input. The estuary mouth is the narrowest section and is protected by shifting sandbanks, while the intertidal areas are constrained by sea-walls. The saltmarsh and intertidal mudflats that occupy majority of the site display the most complete range of saltmarsh community types in Suffolk. The site is primarily designated due to the important number of bird species it receives, particularly over-wintering bird species such as avocet and dark-bellied Brent goose *Branta bernicla bernicla.*

The main factors affecting the site currently are coastal squeeze and sea level rise, causing erosion of saltmarsh, indicating that coastal processes have a much greater impact on the site than fluvial processes.

Essex Estuaries SAC.

Essex Estuaries is a large, under-developed estuarine site, with associated mudflats and sandbanks. It comprises the major estuaries of the Colne, Blackwater, Crouch and Roach rivers, and is important as an extensive area of estuarine habitat. It contains a very wide range of characteristic marine and estuarine sediment communities and some diverse marine communities in the lower reaches.

The site also has large areas of saltmarsh and other important coastal habitats. The saltmarshes in this area are generally eroding with secondary pioneer communities, a precursor to erosion, on the seaward edge of degraded communities. The most extensive stand of small cord-grass *Spartina maritima* in the UK is found at Foulness Point. Smaller stands are found elsewhere in the estuary complex, most notably in the Colne Estuary, where it is a major component of the upper marshes. Vulnerabilities of this site are largely similar to those of the Colne Estuary.

Minsmere-Walberswick SPA, SAC, Ramsar.

Minsmere-Walberswick comprises two marshes and the Blyth estuary, containing a complex mosaic of habitats including areas of marsh with dykes, mudflats, lagoons, shingle and drift line. The site supports the largest continuous stand of reed in England and Wales, including nationally rare transition in grazing marsh ditch plant species. The combinations of habitats create an area of scientific interest, supporting nationally scarce plants, BRDB invertebrates and nationally important numbers of breeding and wintering birds. Bittern *Botaurus stellaris,* nightjar *Caprimulgus europaeus,* marsh harrier, hen harrier *Circus cyaneus*, avocet and little tern are all found on the site.

The site's vulnerability is mainly due to scrub encroachment of the heathland and also loss of reedbed, but minimising human disturbance is important to help protect drift line vegetation. Coastal processes have the largest influence on the site.

Stour and Orwell Estuaries SPA, Ramsar.

The Stour and Orwell estuaries straddle the eastern part of the Essex/Suffolk border. They are wetlands of international importance, comprising extensive mudflats, low cliffs, saltmarsh and areas of vegetated shingle. The estuaries provide habitat for an important assemblage of wetland birds in the non-breeding season and also support internationally important numbers of wintering and passage waterbirds. The Orwell is a relatively long, narrow estuary with extensive mudflats that support large areas of eelgrass *Zostera* spp. Saltmarsh tends to be sandy and fairly calcareous with a wide range of communities, while grazing marshes adjoin the estuary at Shotley.

The Stour Estuary is a relatively simple estuary with areas of higher saltmarsh, a sandy outer area and a muddier inner section, rich in invertebrates. The shoreline vegetation varies from wooded cliffs, to coarse grasses. The site also holds several nationally scarce plants and BRDB invertebrates. The site is primarily designated due to the large number of bird species it receives including important numbers of breeding avocet. Surrounding areas of agricultural land, outside the SPA, are also used by feeding geese and waders to roost.

The main factors affecting the site currently are coastal squeeze, port development, maintenance dredging and sea level rise, causing the erosion of saltmarsh. This indicates that coastal processes dominate the site. However the upstream sections of the site will be more influenced by fluvial processes and impacts.

<u>Outer Thames estuary potential SPA.</u>

The Outer Thames estuary has been identified as potentially qualifying as a SPA (pSPA). The site regularly supports a wintering population of red throated diver Gavia stellata in numbers of European importance – it is estimated that the area supports 48% of the Great Britain population. The red throated diver uses the area for feeding, eating fish species which use the sandbanks as nursery grounds and feeding areas. The pSPA boundary extends from just east of Southend to north of Clacton-on-Sea. A second area then extends from north of Felixstowe to north of Great Yarmouth on the coast of east Norfolk. There is a third offshore area which extends out from the Lowestoft area. The Outer Thames Estuary pSPA consists of areas of shallow water, deeper water offshore, high tidal current streams and sandbanks. There are also large areas of mud, silt and gravelly sediments which are continually being disturbed by shipping and maintenance dredging. There is limited fluvial influence on this site.

3.3 Wastewater Collection and Treatment

Wastewater collection and treatment as mentioned earlier is primarily the responsibility of Anglian Water Services for residential effluent and a range of parties (including AWS) for non residential. The Haven Gateway sub-region is divided into a large number of sewage treatment catchments which are serviced by at least one sewage treatment works. These catchments and works are considered in detail within the detailed sections developed for each of the local authorities.

In general the majority of the sewage treatment catchments fall within a single planning authority although there a few of the larger catchments which cross boundaries and receive inflow from more than one. Within this study the analysis of the sewage treatment works has considered development within the whole catchment rather than that just within the local planning area so as to reflect the true situation at the works.

For the vast majority of sites detailed information has not been available with regard to the capacity of the sewerage network. Area specific information has been obtained from Anglian Water Services, particularly in areas where there are known issues with the sewerage infrastructure. More detailed modelling of the sewage network with detailed development proposals will add benefit to future updates to this water cycle study.

One of the key aspects that could generally improve the network and the associated risks of flooding (and excessive flows into works) is the separation of surface water from sewage (i.e. combined systems) and the reduction in such systems is expected to help the long term flood risk and capacity issues in a number of locations. Increases in flow through these combined systems is unlikely to be acceptable due to the increase in pollutants that this would generate in the receiving watercourses.

3.4 Flood Risk

Flood risk has in general been considered at a local authority level as each planning authority has, or is, undertaking a Strategic Flood Risk Assessment (SFRA) to support the local planning process. These documents follow the requirements of "PPS25 - Development and Flood Risk" and are designed to assist in the planning process by providing information to enable the "sequential" and "exception" tests to be applied to ensure that only appropriate development takes place within the floodplain.

The Environment Agency publishes a suite of Flood Maps, which include Flood Zone 2 and Flood Zones 3a and 3b as defined in PPS25. These zones represent:

- Flood Zone 2 - Medium Probability of flooding. Annual probability of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%) for fluvial flooding and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) for tidal flooding.
- Flood Zone 3a - High Probability of flooding. Annual probability of flooding greater than 1 in 100 (1%) for fluvial and 1 in 200 (0.5%) for tidal flooding
- Flood Zone 3b - Functional floodplain. Land over which water has to flow or be stored in times of flood. Generally land which floods with an annual probability of greater than 1 in 20 (5%) or where the area is designed to flood in the extreme (0.1%) flood is considered as Zone 3b.

The Environment Agency Flood Zone maps are derived ignoring the presence of existing flood defence structures.

The Flood Zone maps currently do not cover surface water flooding, groundwater flooding or flooding from sewers. In addition watercourses where the upstream catchment is less than 3km^2 have not been mapped.

The identification of these other types of flooding is considered within the individual SFRAs, mainly through consideration of recorded flooding, and comments are made on individual sites/areas within the Local Authority areas. These have been picked up either in the local authority summaries, or within the detailed development area descriptions.

General Flood Risk Management Activities

There are a number of activities that should be undertaken during the planning phases of development which generally apply to all sites. These are:

- Flood Risk Assessments (FRA)
- Sustainable Drainage Systems (SuDS)

FRA's. PPS 25 - Development and Flood Risk (2006) sets down the requirements for the preparation of site specific FRA's and when FRA's may not be required. In general if developments are greater than 1Ha or fall within Flood Zone 2 or 3 then they require an FRA. There are also further conditions which may require smaller developments outside of Flood Zone 2 or 3 to prepare a FRA. The FRA needs to be prepared in consultation with the local planning authority and should be in line with any SFRA prepared by the local authority to support its development plans.

SuDS. Sustainable drainage systems aim to mitigate the adverse effects of urban storm water runoff on the environment. The objectives of SuDS are to minimise the impacts of development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities. The philosophy of SuDS is to replicate, as closely as possible, the natural drainage from a site before development.

The application of SuDS within a development can have a positive influence on the local water cycle and hence on the wider situation. The consideration of SuDS within development proposals is a requirement of the FRA process and should be positively encouraged by the local planning authorities within planning application and how SuDS can be incorporated at a larger scale should be considered at site allocation stage.

In addition even in areas where there is currently no identified flood risk the implementation of inadequate or poorly designed surface water drainage can lead in the future to the area becoming at risk of flooding.

Further information with regard to the application of SuDS to developments and planning can be found within section 5.2 and **Appendix B** of this report.

4 BABERGH DISTRICT SPECIFIC RESULTS

4.1 Introduction

The following section contains information which is specific within the Haven Gateway Water Cycle Study for Babergh District. The section has been divided up into a number of parts. The first few sections describe the Council's area, its development plans and District-wide issues relating to water supply, waste water disposal (including water quality) and flood risk management. Following that, further sections will consider specific development areas in more detail where appropriate. Finally, a timeline showing potential actions has been developed.

4.2 Babergh District and Development

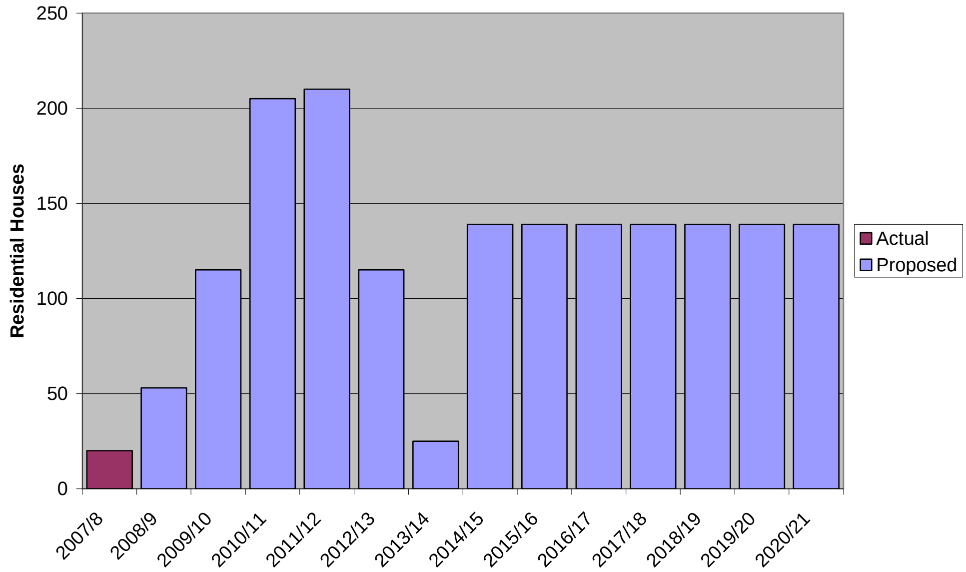
Babergh District is located within the central part of the Haven Gateway area, falling between Ipswich and Colchester, and between the Stour and Orwell Estuaries. The district of Babergh has a geographical area of 596km^2, 46% of that area falls within the Haven Gateway Sub-region. The district is predominantly rural, and has two main towns, Sudbury and Hadleigh. Only Hadleigh falls inside the Haven Gateway. The area of the District included within the Haven Gateway is shown in Figure 4.1 below:

Figure 4.1- Babergh District Location

The East of England Plan has identified that the Babergh district should grow by 5,600 dwellings in the 20 year period to 2021. The draft East of England Plan identifies 2,000 of these dwellings within the Haven gateway Area, however, from the Councils' trajectory only 1,700 dwellings are planned for development within the Haven Gateway.

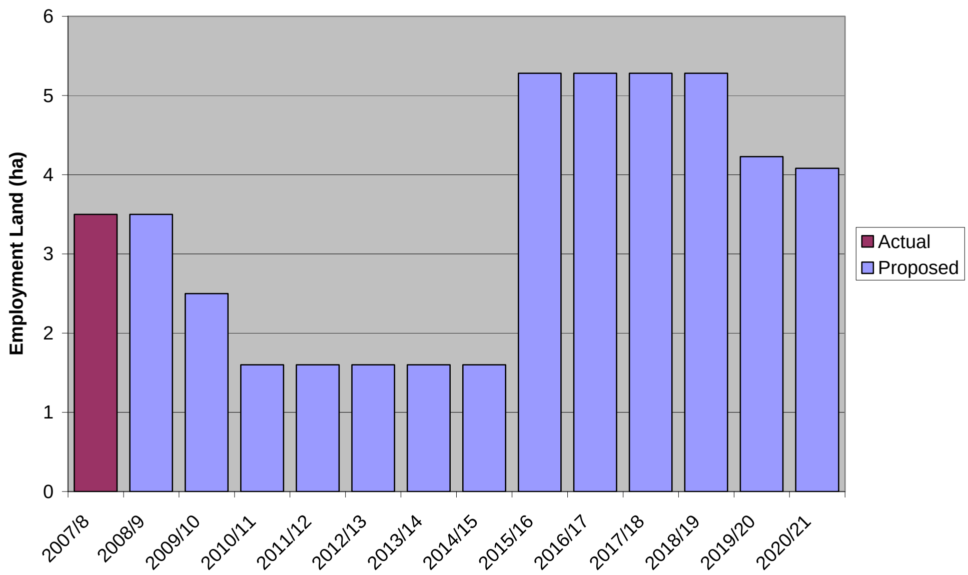
Figures 4.2 and 4.3 show the housing and employment development trajectories taken from the latest information provided by Babergh District Council, for the area included within the Haven Gateway.

Figure 4.2- Babergh Housing Development Trajectory 2007-2021.



In addition 97Ha of employment land are proposed for development over the study period. The trajectory for employment land development is shown in Figure 4.3 below.

Figure 4.3- Employment land development trajectory for Babergh (2007-2021).



The main development areas (Figure 4.4 - included at the end of Section 4) for consideration within Babergh District have been identified from the Council's trajectory data and are considered in more detail in later sections. Specifically;

- Hadleigh
- HMS Ganges site at Shotley
- Pinewood
- Sproughton

The development areas at Sproughton and Pinewood (south Ipswich) fall within the Ipswich Policy Area, although they are located in the Babergh District.

The current local plan for Babergh was adopted in June 2006. Babergh Council is in the process of developing their Local Development Framework (LDF) and, at present, the Core Strategy and Site Specific documents are in the early stages of production. These documents are expected to be adopted in 2011 for the Core Strategy and 2012 for the site specific document.

4.2.1 Ipswich Policy Area

Ipswich Borough has a tightly defined administrative area with few areas available for peripheral expansion. However parts of the 'greater' Ipswich urban area extend into the three adjoining districts - Mid Suffolk, Babergh and Suffolk Coastal. As a basis for planning the distribution of development in and around Ipswich, an 'Ipswich Policy Area' has been identified which has its own overall total of housing allocations.

The East of England Plan identifies that the Ipswich Policy Area should provide at least 20,000 new housing units between 2001 and 2021. Policy H1 of the Plan states that this should be at least 15,400 within Ipswich Borough, up to 600 in Babergh District, up to 3,200 in Suffolk Coastal District and up to 800 in Mid Suffolk District.

There are considerable outstanding Greenfield housing commitments within the Ipswich Policy Area. The effect of these proposals would be to achieve a higher degree of concentration of new Greenfield allocations within Ipswich itself.

4.3 Water Supply

The Babergh district area is supplied by Anglian Water Services (AWS). Babergh is part of the Water Resource Zone 10 (WRZ10) and lies within Planning Zone 60 (PZ60) - Ipswich. AWS is confident they have the supplies to accommodate the proposed development in Babergh.

The following feasible options for addressing water supply in the area have been based on the draft WRMP. This document is now being finalised and the final version should be referenced to ensure that these options are still those preferred by the water company.

AWS have assumed a decline in measured water consumption to 129/l/head/day by 2030 and intends to utilise quantities on existing licences through re-commissioning closed source-works and up-rating existing source-works. It is expected that domestic demand will increase from 82 to 90 ml/d. Commercial demand is expected to remain steady over the planning period at about 25ml/d.

PZ60 (Ipswich) forecast deficit by 2035-36 has an average of -16.68 Ml/d. This large deficit at the end of the planning stage is due to the planned growth within the area and the predicted impact of climate change on reservoir supplies. Anglian Water has outlined a number of Preferred Water Management Options for PZ60 to take place in AMP5 (2010-2015), with the option of 'Ipswich discharge re-use' occurring in AMP6 (2015-2020). The options for AMP5 include;

- Leakage Control
- Reducing usage
- Bucklesham Aquifer Storage Recovery scheme

In addition, within AMP6, the Ipswich discharge re-use scheme is proposed.

Table 4.1 - Timeline of Preferred Water Resource Activities for Babergh

	PZ	AMP 5	AMP6	AMP7	AMP8	AMP9	Activity
Ipswich WS Area	60						General demand management
							Bucklesham ASR Scheme
							Ipswich discharge re-use

The Bucklesham Aquifer Storage Recovery Scheme would utilise the current licence to abstract from the Mill River to the east of Ipswich. The scheme would treat the surface water resource of the Mill River for direct supply and store surplus surface water when available in the underlying confined Chalk aquifer for abstraction when the flows in the river were low. The Ipswich discharge re-use, which provides the bulk of the extra supply, is achieved by returning discharges, after additional treatment, to the River Gipping for abstraction to refill Alton Water reservoir rather than to the tidal River Orwell.

4.4 Wastewater Collection and Treatment

Babergh has 15 Sewage Treatment Works (STW) in the district. The catchment areas for each of these STWs are shown in Figure 4.5 (included at the end of Section 4) and Table 4.2 shows the current consented DWF discharges against the measured DWF in 2007/08.

Table 4.2 - STW in Babergh showing the Current Consented Dry Water Flow (DWF), measured DWF and the amount of headroom available in 2008

Site Name	STW	Current Consented DWF	Measured DWF 07/08	Headroom
Brantham	BRANST	910	n/a	n/a

Site Name	STW	Current Consented DWF	Measured DWF 07/08	Headroom
Hadleigh	HADLST	1700	1566	134
Chantry (Pinewood S.Ipswich)	CHANST	5200	3229	1971
Sproughton	SPRCST	238	242	-4.1
Boxford	BOXFST	420	305	115
Shotley	SHOTST	662	***358***	***304***
Cliff Quay	CLQYST	34213	24624	9589
Erwaton	ERWAST	n/a	n/a	-
Holbrook	HOLKST	n/a	n/a	-
Bentley	BENTST	n/a	n/a	-
East Bergholt	EBERST	n/a	n/a	-
Great Wenham	GWENST	n/a	n/a	-
Hintlesham	HINTST	n/a	n/a	-
Chelmondiston	CHEMST	n/a	n/a	-

Note: values in ***bold italics*** are based on calculated values from the JR07 results rather than measured. n/a represents where data has not been available for this study.

Of these 15 STW catchments only five have proposed development within them. The potential impact of the proposed development has been investigated for these catchments and the available headroom over time is presented in Table 4.3.

Table 4.3 - Headroom available at each STW considering both residential and employment land development.

STW Ref.	Catchment Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CHANST	Chantry (Pinewood)														
HADLST	Hadleigh														
CLQYST	Cliff Quay														
SHOTST	Shotley														
SPRCST	Sproughton														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Chantry STW results show that it will be able to cope with both the proposed housing and employment land development. There are two STWs within the Chantry (CHANSC) catchment: Chantry STW (CHANST) and Washbrook STW (WASBST). WASBST has not been referenced in any of the STW data sheets and it has been assumed that the combined capacities of the two STWs have been used for the catchment values.

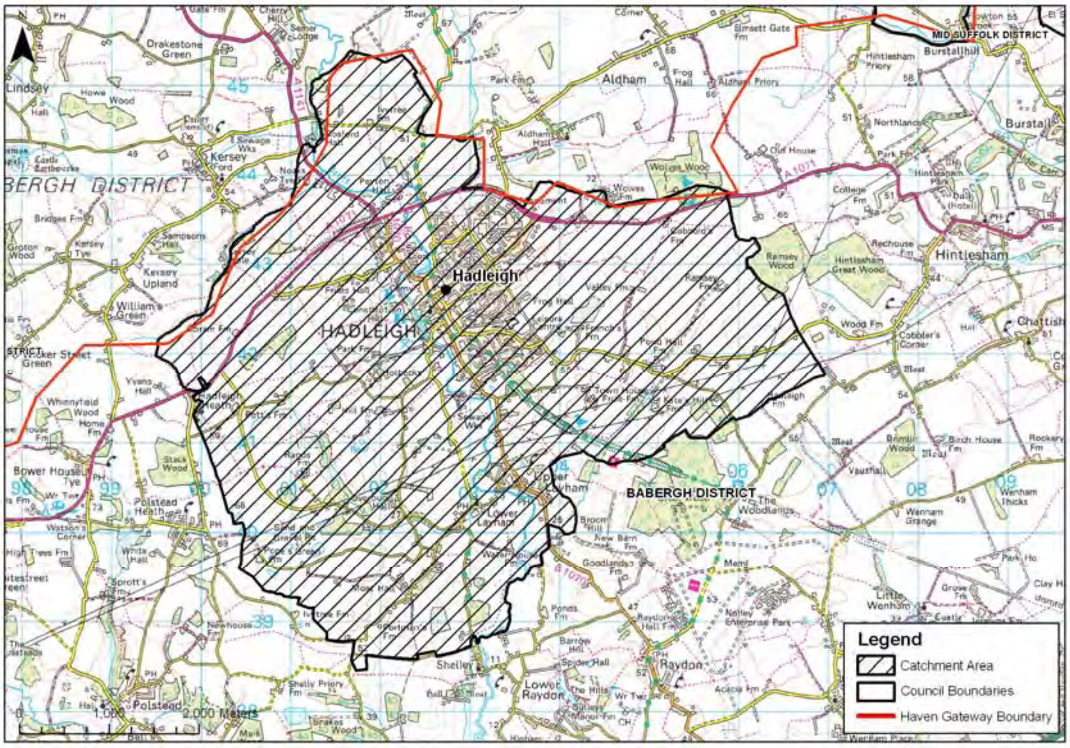
However, Sproughton, Hadleigh, Cliff Quay and Shotley are not able to cope with the development as proposed and exceed their CDWF at different stages up to 2021. These four STWs are considered further below.

Very limited information was available for this study with which to make an assessment of the capacity of the wastewater infrastructure (sewer pipes, pumping stations etc). However, brief comment was provided by AWS for each of the STW catchments in which a future potential for residential development has been identified. These are discussed within the analysis of individual STWs below and also within the discussion of individual development areas.

4.4.1 Hadleigh

The Hadleigh STW catchment is located to the west of Ipswich and is an area within the Babergh District for which development is proposed.

Figure 4.6 - Location of Hadleigh STW Catchment



The Council's trajectory proposes around 480 dwellings within the catchment, together with up to 7.6 Ha of employment development. The predictions of total discharge and therefore available headroom show that there will potentially be a deficit in available discharge around 2010/11, as illustrated in Figure 4.7 and Table 4.4 below:

Figure 4.7 - Hadleigh STW percentage headroom – residential and employment development

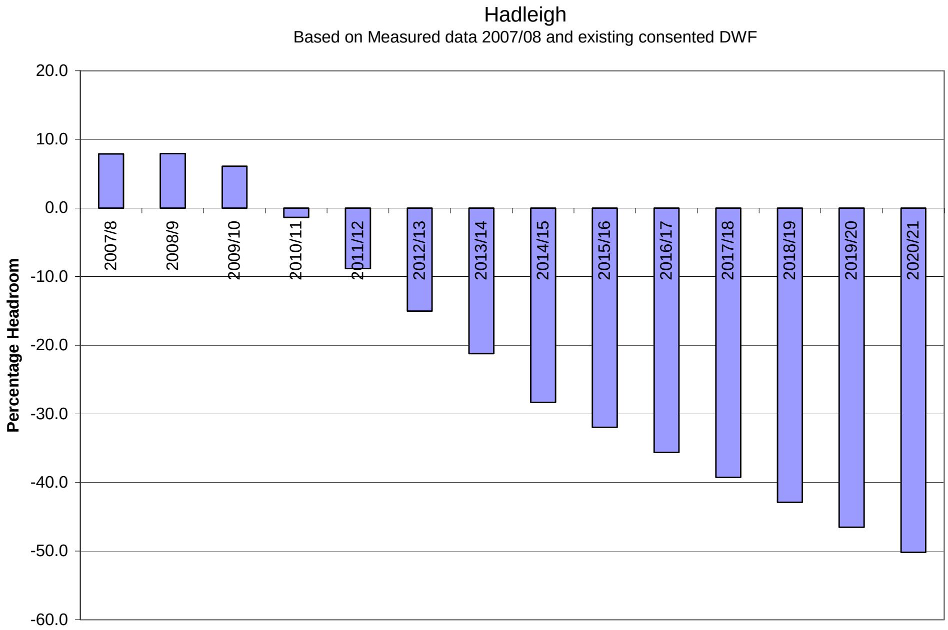


Table 4.4 - Headroom availability of the Hadleigh STW - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
HADLST	Hadleigh														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

This projection is based on combined residential and employment development. AWS however are only legally obliged to process sewage from residential development. When this is separated from the employment the STW remains below its CDWF throughout the planning period and is almost 7% below the CDWF at the end by 2020/21 (see Figure 4.8 below).

Figure 4.8 - Hadleigh percentage headroom - residential development only

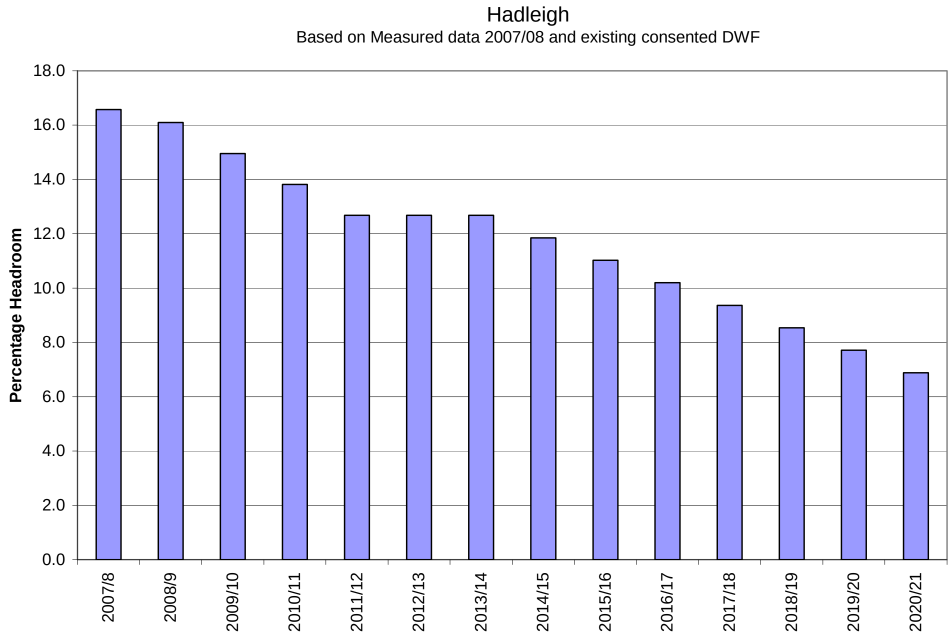


Table 4.5 - Headroom availability of the Hadleigh STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
HADLST	Hadleigh														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

AWS have commented that they do expect the proposed development to exceed the capacity of the STW. However, they have also stated that there is no spare capacity in the existing sewers. Their preferred location for new development is therefore in proximity to the STW or where the wastewater can be directly discharged to the STW.

Environmental Considerations

Hadleigh STW discharges into the River Brett (Grid Reference TM 0299 4150). The current maximum dry weather discharge flow volume is 1,700m^3 per day. It is understood that this consent is likely to be amended, and that current flows already exceed this level (Environment Agency pers. comm.); however the amendment has not been considered at this stage (see Section 2.5). The current consent (ASENF/1090B 01, modified April 2006) also states that the discharge shall not exceed:

- 10 milligrammes per litre of Biochemical (or Biological) Oxygen Demand (BOD)1;

[1] Biochemical (or Biological) Oxygen Demand is a procedure used to determine the rate at which biological organisms use up oxygen in water.

- 7 milligrammes per litre of ammoniacal nitrogen; or
- 20 milligrammes per litre of suspended solids.

It should be noted that current discharges are significantly more dilute than the consent allows for. Sampling at the discharge point by Anglian Water indicates that levels of BOD, ammoniacal nitrogen and suspended solids are consistently well under the consented limits, (40%, 43% and 35% of the consent limit, respectively). This may indicate that a higher standard of treatment is being applied.

The current state of the receiving environment

The recent General Quality Assessment (GQA) grades (2006) for the discharge area of the River Brett show it to have a biological grade B (good); prior to 2005 it was grade A (very good). The chemical quality is recorded as grade A (very good); this has improved as prior to 2005 it was grade B. The river has had a level 5 (very high) phosphate grade since 1995. This indicates that the river may be susceptible to eutrophication if concentrations increase.

The Hadleigh STW discharge is 11km upstream of the Stour Estuary, which forms part of the Stour and Orwell Estuaries SPA and Ramsar site. The relevant unit of the Cattawade Marshes SSSI is currently in ‘unfavourable, recovering’ condition. The poor condition was due to low water levels but this issue has now been resolved.

No sites downstream of the discharge point are designated as freshwater fisheries, shellfisheries or areas for bathing.

The impact of development

Modelled future flows (taking into account all development) show projected dry weather discharge in 2020/21 could be 2,553m^3 per day; this will exceed the current consent by 853m^3 or 67% per day. As discussed earlier, an increase in discharge consent would be necessary in order to accommodate the planned growth.

An increase in the consented discharge volume is required, but if the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 4.7kg of ammoniacal nitrogen and 13.5kg of suspended solids into the river system per day. The BOD of the receiving watercourse could also be affected.

Due to the distance from the discharge point to the internationally designated sites it is considered unlikely that the increase in discharge will have a negative impact. The Harwich and Dovercourt STW also discharges into the Stour Estuary, approximately 13km downstream from where the River Brett enters the Stour Estuary. The potential for these discharges to have a combined effect on the condition of the Stour Estuary is also considered unlikely due to the size and diluting action of the estuary.

However, under the Water Framework Directive there is an objective to ensure no deterioration of water courses. Where possible this is interpreted by the Environment

Agency as meaning that there is no increase in pollutant load within the receiving water course. Any increased future discharge volume would result in an increased total pollutant load unless it was treated to a higher standard.

Whilst current discharge concentrations are lower than the consented limits, the reported values suggest that treatment is not currently achieving Best Available Technology (BAT) or Best Available Technology Not Entailing Excessive Costs (BATNEEC) levels (see Section 2.5).

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Hadleigh met BATNEEC standards it would not be sufficient to prevent the BOD limits being exceeded from as early as 2010/11; given that flow levels are already thought to be higher than the modelled values, BATNEEC is not considered a viable option at this location. If the site were upgraded to BAT standard then the current consent limits (for total pollutant load) would not be exceeded within the plan period.

The draft Water Framework Directive (WFD) classifications for the area (Environment Agency, 2009) surrounding the Hadleigh STW is moderate, the category below good. The standards set for meeting this classification are 1.1mg/l ammonia and 6.5 mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Hadleigh in-combination with other discharges into the same watercourse.

If accompanied by technological upgrades to limit pollutant load it is unlikely that increased discharge would require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

Within the catchment of this STW, action is required, either by AWS (possibly funded by others), or by individual developers to cope with the discharges from the proposed employment development which, as identified above, could have a significant impact on the total flows within the catchment (potentially upwards of 800m^3/d by 2021). Although an increase in consent should not have a negative environmental impact, specific advice will be required from the Environment Agency.

In addition, the sewer network will require significant upgrade if development is to be placed away from the STW itself. Again this would require funding from either AWS and/or by individual developers.

Modelling of future flows has predicted that although there is currently a small headroom in the consented limit for Hadleigh STW, this will be exceeded in 2010/11. These results would indicate that actions will be required in the near future to prevent the consented limit from being exceeded.

The water quality analysis indicates that treatment is currently not meeting the level achievable by BATNEEC technology and if applied, BATNEEC technology would not allow standards to be met beyond 2010/11. Significant investment is therefore required in this catchment, even before development takes place, to introduce BAT technologies so as to meet standards for the remainder of the planning period.

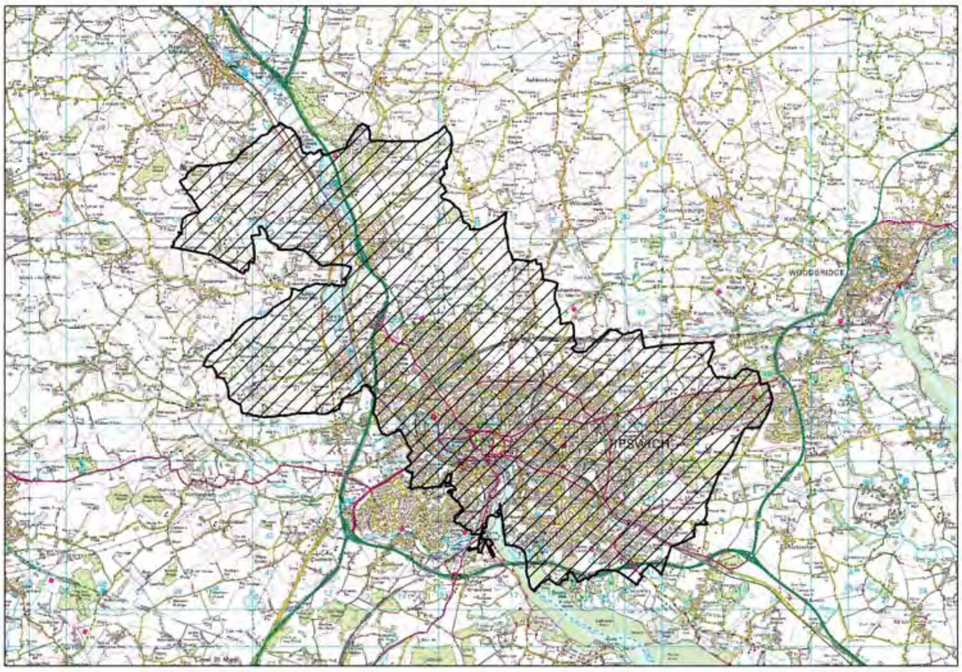
Table 4.6 - Hadleigh STW Summary

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Consent Increase			
Sanitary Treatment Improvements		Potentially to BAT Technologies	Potentially to BAT Technologies	Potentially to BAT Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

4.4.2 Cliff Quay

Cliff Quay STW (CLQYST) is located in Ipswich Borough. However, as illustrated in Figure 4.9, its catchment extends over 4,500ha covering most of Ipswich Borough but also parts of the Districts of Mid Suffolk, Babergh and Suffolk Coastal, a current total population of over 120,000.

Figure 4.9- Location of Cliff Quay STW Catchment



It therefore cannot be analysed independently within any one District and must consider the cumulative development in all four. Over the planning period (2001-2021) a total of 20,762 houses and just over 150ha of employment land are planned within the catchment of CLQYST, spread between Ipswich Borough, Mid Suffolk District, Babergh District (employment development only) and Suffolk Coastal District. CLQYST has a current consented DWF of 34,213m³/d, illustrated in Table 4.7.

Table 4.7- Discharge Capacity of the Cliff Quay STW, displaying current consented DWF, measured DWF and headroom availability

Site Name	STW	Current Consented DWF (m³/d)	Measured DWF (m³/d)	Headroom (m³/d)
Cliff Quay	CLQYST	34,213	24,624	9,589

As shown in Table 4.8 and Figure 4.10 below, the planned development, considering both employment and residential, will exceed this consent in 2014/15, reaching a maximum of almost 29% exceedance by 2020/21.

Figure 4.10: Cliff Quay STW percentage headroom – residential and employment development

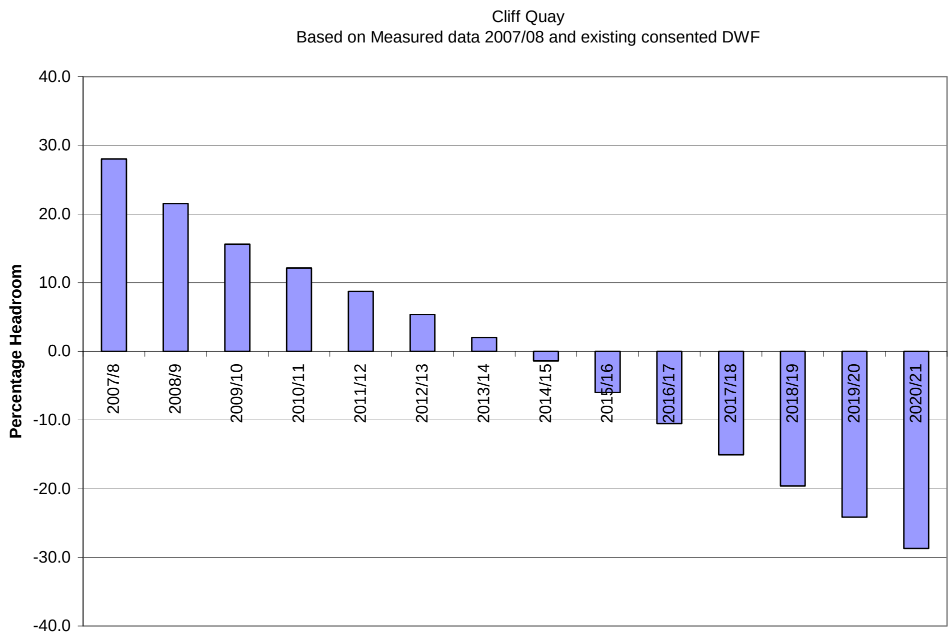


Table 4.8 - Headroom availability of the Cliff Quay STW.

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Ipswich Policy Area														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

AWS however are only legally obliged to process sewage from residential development. When this is separated from the employment then the STW remains below its CDWF throughout the planning period, and remains almost 13% below the CDWF at the end by 2020/21, as shown in Figure 4.11 and Table 4.9 below.

Figure 4.11: Cliff Quay STW percentage headroom – residential development only

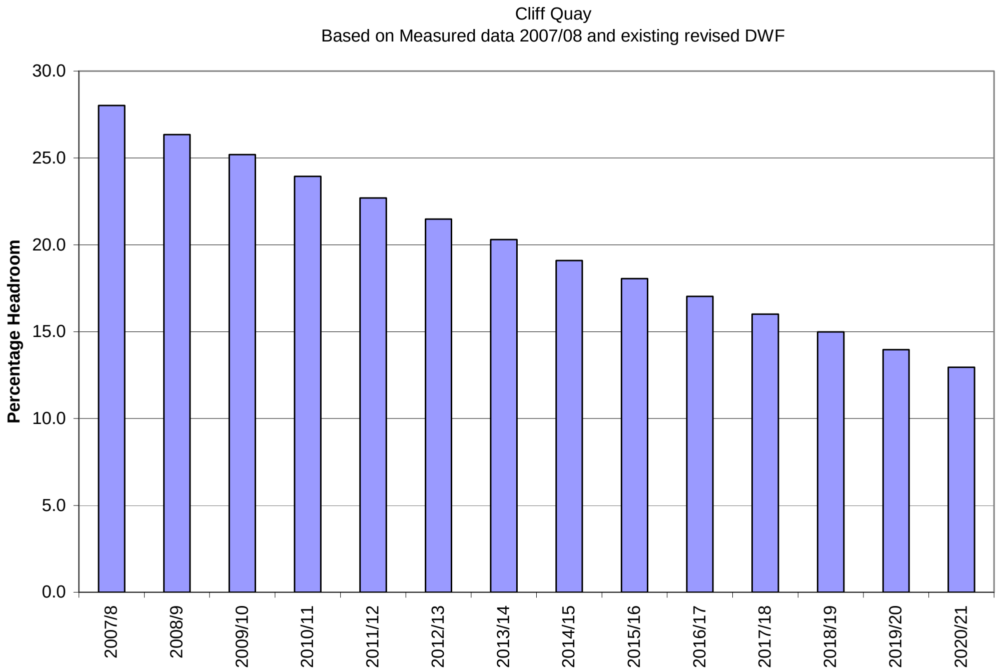


Table 4.9 - Headroom availability for the Cliff Quay STW, which concerns only residential development data

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Ipswich Policy Area														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

AWS have considered the potential impact of development on the Cliff Quay STW and have provided a summary of their findings for use within this WCS. Within their analysis they have considered 8,562 additional dwellings within the catchment between 2008 and 2016, which is roughly equivalent to the 8,789 dwellings considered within this study.

They have identified the main problems and restrictions in the system as being related to the volume of surface water discharge entering their combined sewer systems, resulting in flooding, and the underperformance of a Sludge Treatment Centre which impacts heavily on the STW. AWS consider the Sludge Treatment Centre to be the main limiting factor to the STW and therefore propose to replace it within AMP5, which they claim will enable the STW to continue within the existing flow and sanitary consent parameters until 2021 and beyond. They do not expect any changes in the DWF consents during the proposed growth period. In addition they suggest that tighter planning policies with regards to the surface water runoff would assist by limiting storm discharge and using site storage where the existing sewers are under capacity.

A long term potential strategy for the STW catchment announced by AWS is a potential diversion of flows to the neighbouring Sproughton STW. However, as identified within this report, that too is under pressure from proposed development indicating that, without expansion or improvement, it is unlikely to be able to accept an increase in flows.

Environmental Considerations

Cliff Quay STW (consent AEETS/12128B, modified 2005) discharges into the tidal River Orwell (Grid Reference TM 1714 4144). The current consented dry weather flow discharge is 34,213m^3 per day. The current discharge consents state that the discharge shall not exceed:

- 200 milligrammes per litre of suspended solids;
- 175 milligrammes per litre of BOD; or
- 50 milligrammes per litre of ammoniacal nitrogen.

As there is still headroom in the current consent, it can be assumed that these discharge limits will still be acceptable. It should further be noted that current discharges are currently significantly more dilute than the consent allows for.

Anglian Water monitoring of the discharge point takes place to ensure that these consent limits are maintained. Samples for Cliff Quay STW indicate the levels are sufficiently under the limits for suspended solids and BOD (25% of the consented limit for BOD and 15% of the limit for suspended solids). Ammoniacal nitrogen is frequently up to the consent limit. This indicates that future increases in discharges could have an impact on the levels of these pollutants.

The current state of the receiving environment

The Cliff Quay STW discharges directly into the Stour and Orwell Estuaries Ramsar, SPA and SAC designated site. The SSSI condition of the nearest Orwell Estuary units, which directly relate to the condition of the European designated areas, is a mix of ‘favourable’ and ‘unfavourable, no change’. The units are predominantly saltmarsh, indicating that saline influences are greater in the area and suggesting that variations in river quality will not directly jeopardise the integrity of the site. The unit which is unfavourable, no change condition is so due to coastal squeeze and the resulting erosion of saltmarsh.

Shotley STW also discharges directly into the River Orwell, approximately 11km downstream of the Cliff Quay STW outfall. Also the Sproughton STW discharges into a river which connects with the Orwell Estuary.

The impact of development

Modelled discharge accounting for all development types will exceed the consented limit in 2014/15 and this will continue to increase in the future. Projected dry weather discharge in 2020/21 is 39,666m^3 per day; this exceeds the consent limit by 14% or 5,453m^3 per day.

Shotley, Sproughton and Cliff Quay STWs are expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Orwell Estuary is considered unlikely due to the size and diluting action of the estuary.
Where possible the WFD objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Whilst current discharge concentrations are lower than the consented limits, the reported values suggest that treatment is not currently achieving Best Available Technology (BAT) or Best Available Technology Not Entailing Excessive Costs (BATNEEC) levels (see Section 2.5). Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Cliff Quay met BATNEEC standards then the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive (WFD) classifications for the area (Environment Agency, 2009) surrounding the Cliff Quay STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Cliff Quay in-combination with other discharges into the same watercourse. An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

With the exception of the replacement of the Sludge Treatment Centre and the reduction in surface water flows, AWS do not consider any further action is required for this STW within the planning period for residential development. However, as shown above, some degree of expansion/upgrade of the STW will be required in order to accommodate both residential and employment development.

Action will be needed, either by AWS (possibly funded by others), or by individual developers to cope with the discharges from the proposed employment development which, as identified above, could have a significant impact on the total flows within the catchment (potentially upwards of 10,000m^3/d by 2021) and for the required improvements to the sewer network.

Modelling of predicted flows indicates that the consent limit is not currently being exceeded and will not be exceeded until 2014/15. Current testing undertaken by Anglian Water indicates that the pollutant loads are sufficiently under the designated limits (75% under) and this should be taken into consideration when assessing the future impacts. There is the potential that future flows will not exceed the pollutant loads in the consent.

In addition, this STW has been identified as requiring an upgrade in its treatment procedures by the introduction of BATNEEC technologies in order to ensure that discharge standards are met. If this is implemented then the STW will remain below its target pollutant limit throughout the planning period.

These conclusions are summarised in Table 4.10 below:

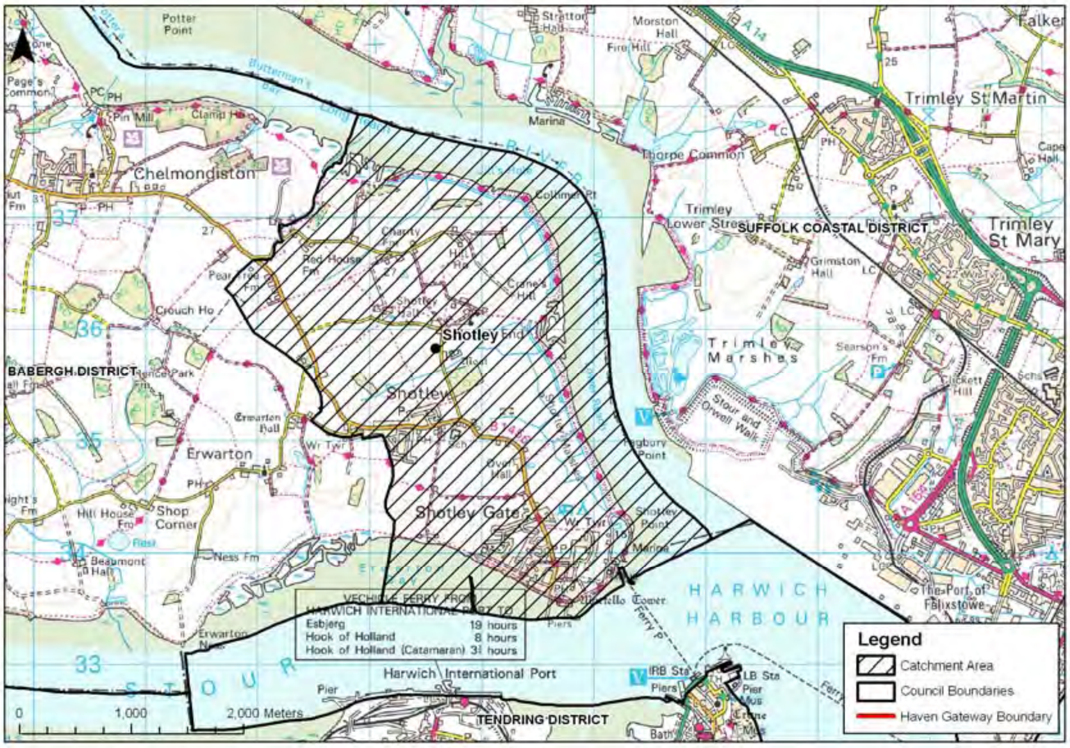
Table 4.10 - Cliff Quay STW Summary

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Reduce surface water inflow	Reduce surface water inflow	Reduce surface water inflow. Re-route to Sproughton or increase consent	Reduce surface water inflow. Re-route to Sproughton or increase consent
Sanitary Treatment Improvements	Replacement of STC		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

4.4.3 Shotley

Shotley , and in particular the old HMS Ganges site is an area identified for development and is located on the junction of the Orwell and Stour Estuaries. The STW takes wastewater from around 1100Ha of land. Figure 4.12 shows the extent of the catchment. There are 850 residential properties proposed for development in this area.

Figure 4.12 - Location of Shotley STW Catchment



Using the developed flows for Shotley compared with the current consented DWF discharge shows that there is sufficient headroom to cope with the development until 2019 when potentially the site would go into deficit, as shown in Figure 4.13 and Table 4.11.

Figure 4.13 - The headroom percentage for Shotley STW based on measured data 2007/8 and existing consented DWF

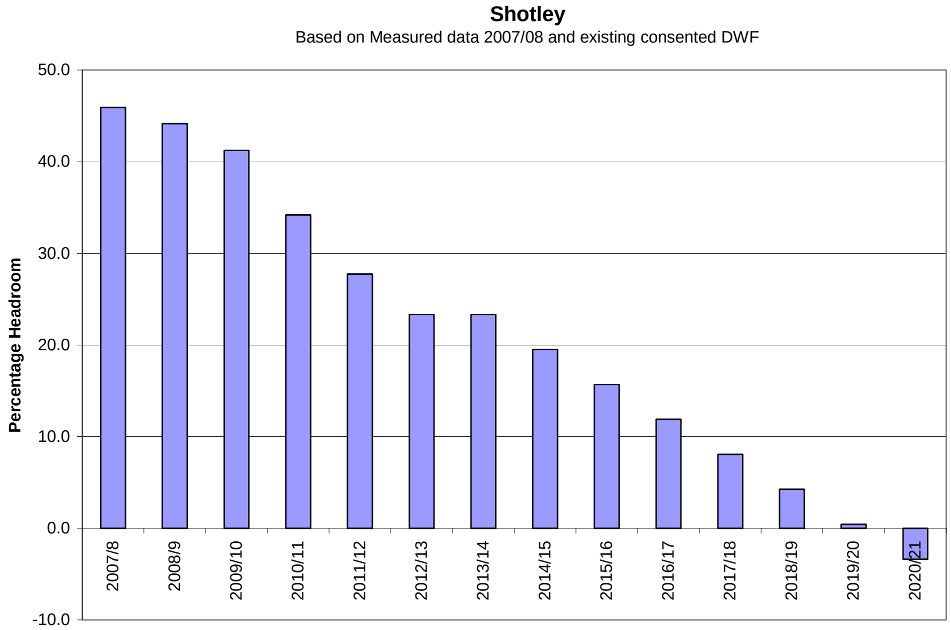


Table 4.11 - Headroom availability for the Shotley STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
SHOTST	Shotley/Shotley Gate														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

The potential deficit in 2020/21 is around 22m^3/d or 3.4%. This is not thought to be an issue at this stage as with potential improvements in water efficiency and the uncertainties of development this deficiency may not develop, however the situation needs to be monitored to ensure that these efficiencies do occur.

AWS have stated that most of the sewers within the Shotley STW catchment have a maximum diameter of 150mm or 225mm and are currently operating at capacity. Any new development will therefore need to be located around the STW, with flows discharging directly to the works.

<u>Environmental Considerations</u>

Shotley STW discharges into the River Orwell (Grid Reference TM 2498 3514). The maximum discharge volume is 1,728m^3 per day, with a dry weather discharge flow of 662m^3 per day. The consent (consented in March 2005 through modification ASETS/1532) states that the discharge shall not exceed:

- 100 milligrammes per litre BOD with an upper limit of 250 milligrammes per litre; or

- 250 milligrammes per litre of suspended solids.

Sampling at the discharge point by Anglian Water indicates that levels of BOD and suspended solids are consistently well under the consented limits, and are clearly being successfully controlled (10% and 8% of the consent limit, respectively).

The current state of the receiving environment

The Shotley STW discharges into Orwell Estuary, which forms part of the Stour and Orwell Estuaries SPA and Ramsar site. Since the stretch of river associated with the discharge point is dominated more by estuarine/tidal influences than fluvial, no GQA values are available for this discharge. The SSSI unit conditions for this section of the estuary shows it to be in ‘unfavourable declining’ and ‘favourable’ condition. The nearest unit to the discharge is in a declining condition due to coastal squeeze. Cliff Quay STW also discharges into the River Orwell, approximately 11km upstream of the Shotley STW outfall.

No sites downstream of the discharge point are designated as freshwater fisheries, shellfisheries or areas for bathing.

The impact of development

Modelled discharge of future flows taking into account all development indicates that flows are not currently exceeding the consented limit and that there is 41% headroom. Projected dry weather discharge in 2020/21 is 689m^3 per day, which will slightly exceed the current consent by 27m^3 or 4% per day). This modelled discharge accounts for all proposed development within the current development horizon.

An increase in the consented discharge volume is required, and if the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 6.75kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

The relatively small increase in discharge required by 2020/21 combined with the current absence of significant pressure resulting from the STW discharge, mean that negative impacts on the condition of the designated area may not be significant. However mechanisms, including monitoring, should be employed to ensure this and to limit any effect on the receiving water course.

Although both Cliff Quay and Shotley STW are expected to exceed their consented limits, the potential for these discharges to have a combined effect on the condition of the Orwell Estuary is considered unlikely due to the size and diluting action of the estuary.

An objective of the Water Framework Directive is to ensure no deterioration of water courses, and this is interpreted where possible by the Environment Agency as no increase in pollutant load within the receiving water course. For the purposes of the Water Cycle Study modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Shotley met the current BATNEEC standard before 2019/20 then the current maximum pollutant loads would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Shotley STW is moderate, the category below good. The River Orwell has not been assessed yet and therefore has no classification. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Shotley in-combination with other discharges into the same watercourse.

If accompanied by technological upgrades to limit pollutant load it is likely to require assessment under the Habitats Regulations due to the distance from the internally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

Capacity issues are not envisaged within this STW catchment until late in the planning period and, by that time, may be overcome through the implementation of water efficiency measures. The consented flows are unlikely to be exceeded until 2019 and as such it can be concluded that pollutant loads are sufficiently under the consent limits currently and in the future. If the STW uses BATNEEC technologies then it is not envisaged that the pollutant consent will be exceeded within the planning period.

The sewer network, however, does require upgrade in the immediate future if it is to take additional flows and action will be needed, either by AWS (possibly funded by others), or by individual developers.

The actions required for this STW catchment within the planning period are as follows:

Table 4.12 - Shotley STW Summary

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent				Potential increase consent
Sanitary Treatment Improvements				Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

4.4.4 Sproughton

Sproughton is located within Babergh District and lies immediately west of Ipswich, as illustrated in Figure 4.14. Sproughton is an area in which development is proposed and is part of the Ipswich Policy Area.

The current measured discharge at Sproughton STW is already above the consented DWF by some 4m^3/day and, with the projected development in the area of around 100 houses and 17Ha of employment land, results in continued exceedence of the consented DWF to 2021, as shown below.

Figure 4.14 - Location of Sproughton STW Catchment

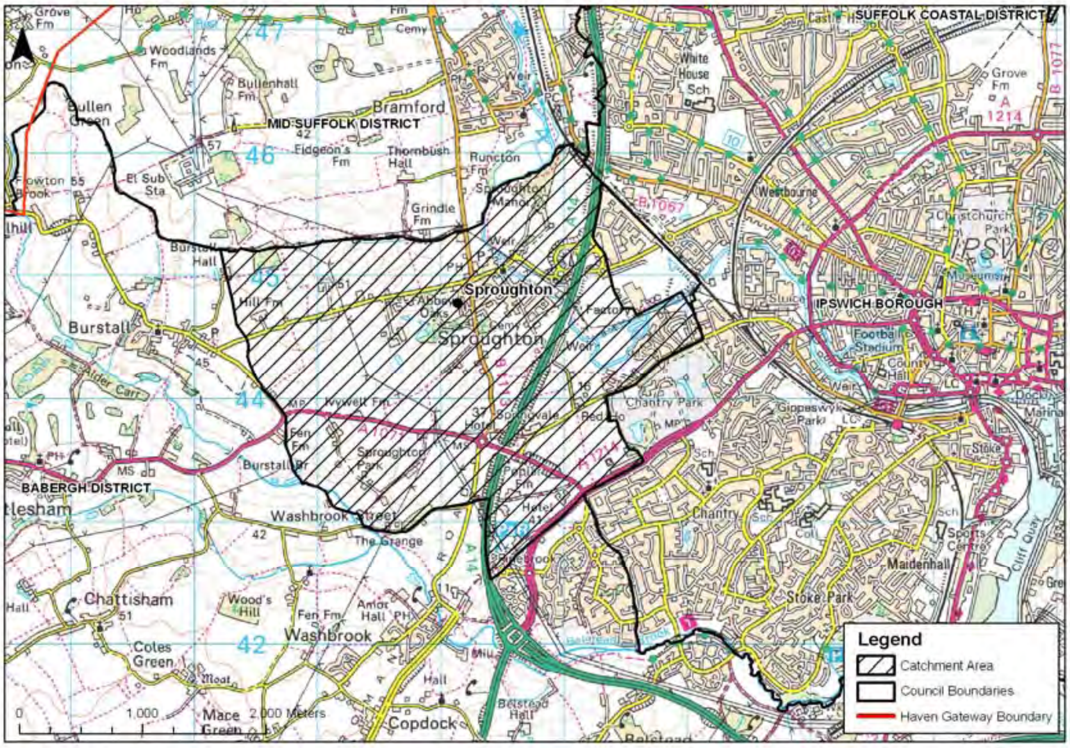


Figure 4.15 - The headroom percentage for Sproughton STW based on measured data 2007/8 and existing consented DWF for both residential and employment development.

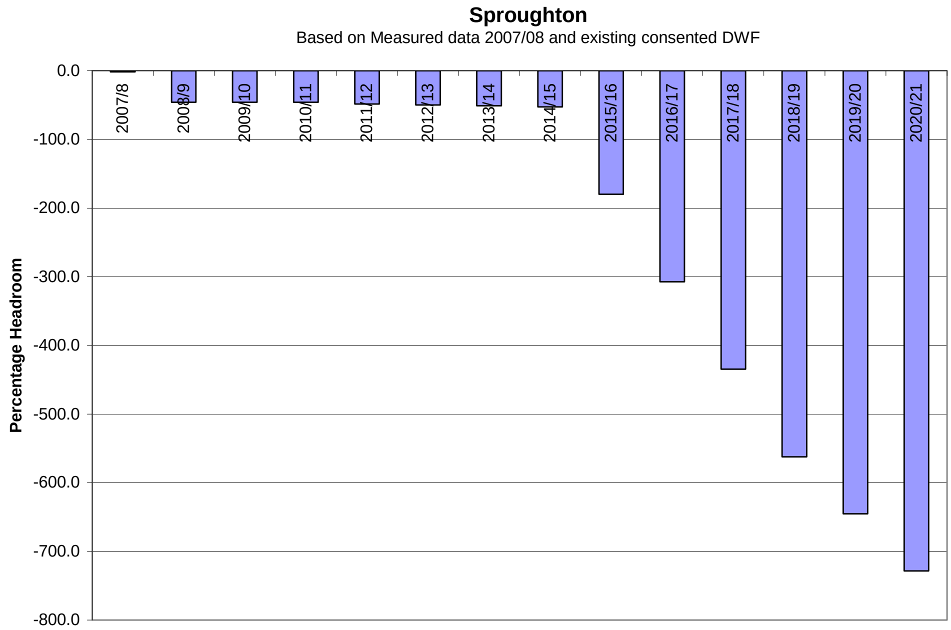


Table 4.13 - Sproughton STW headroom availability - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
SPRCST	Sproughton														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

If only residential development is considered then the potential lack of headroom is much less with only around 40m^3/d (20%) rather than the 1700m^3/d (700+%), as shown in Figure 4.16 and Table 4.14. This lack of headroom could be more readily accommodated with a small increase in consented DWF.

Figure 4.16 - The headroom percentage for Sproughton STW based on measured data 2007/8 and existing consented DWF for both residential and employment development.

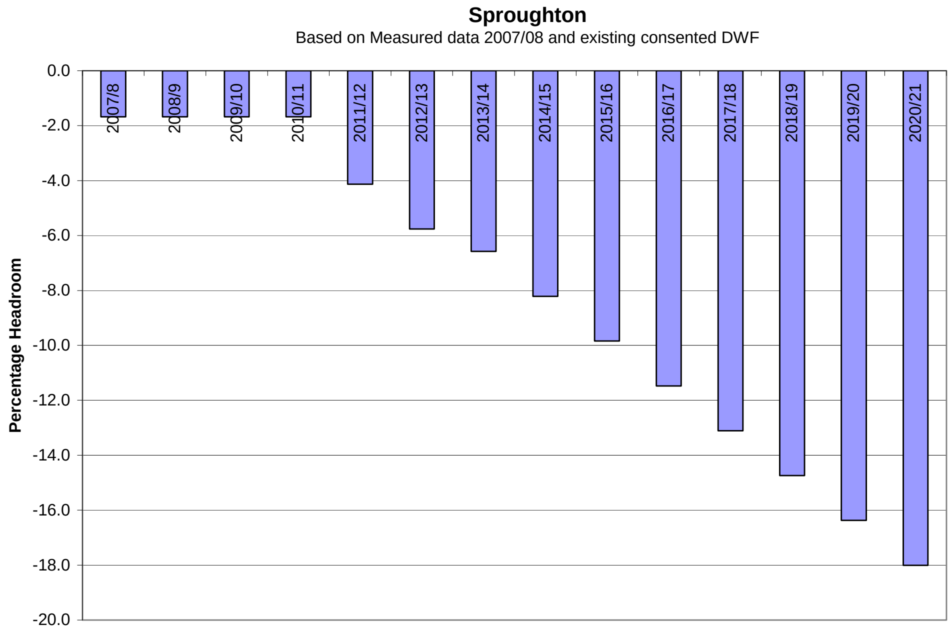


Table 4.14 - Sproughton headroom availability - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
SPRCST	Sproughton														

The 15 Ha of employment development is related to redevelopment of the Sproughton Sugar Beet factory site. This site crosses the boundaries of the Sproughton STW and Cliff Quay STW catchments and it may be possible to route flows from the site into Cliff Quay rather than Sproughton, therefore moving the issue onto Cliff Quay which is a much larger treatment works with more potential to accept the increased flows. However it should be noted that Cliff Quay will be oversubscribed by the end of the study period, without additional flows routed from Sproughton, if no action is taken to moderate employment discharges from within its current catchment. The impact of diverting this water may have an adverse impact on the water resource of the Gipping and will need further investigation before implementation. As treatment of employment discharges do not necessarily have to be combined with residential discharge and treated at the same works, the flows from employment land could be treated independently and then routed directly into the watercourses with separate discharge consents and treatment requirements.

AWS have stated that a long term action plan from the area is currently under consideration where flows from some of the Ipswich development sites (namely the Northern Fringe, Great Blakenham and Sn Oasis) are to be re-directed to Sproughton. Before any action is taken to this effect this scenario would require detailed modelling.

In addition the impacts of applying BAT to this site to offset any increased pollutant load would also need to be addressed.

There is currently limited capacity within the existing sewerage network so AWS would prefer development to take place as close to the STW as possible.

Environmental Considerations

Sproughton STW discharges into the River Gipping (at Grid Reference TM 1309 4456). The dry weather discharge flow is 238m^3 per day. The conditions of the consent limit the composition of the discharge, stating that it shall not exceed:

- 40 milligrammes per litre of BOD;
- 25 milligrammes per litre of ammoniacal nitrogen; or
- 60 milligrammes per litre of suspended solids.

Sampling at the discharge point indicates that the amounts BOD and ammoniacal nitrogen in the water are consistently significantly within the limits in the consent (12.5% and 12%, respectively, of the consent limit). There is some variation in the sampled suspended solid quantities, but whilst these occasionally exceed 50% of the consented limit the majority of the samples taken since 2007 are significantly below it.

The current state of the receiving environment

The River Gipping is currently un-graded for biological GQA but has a C (fairly good) for chemical GQA (2006). The Sproughton section of the river has been graded a C since 1999, but it has never been graded for biological GQA. The phosphate GQA is classified as level 5 or very high and has been consistently this level since 2000. This high grade of phosphate GQA suggest that measures should be taken to limit further phosphate entering the system in order to prevent eutrophication.

The Stour and Orwell Estuaries SPA and Ramsar site and the Orwell Estuary SSSI are 5km from the discharge point. The SSSI units closest to the discharge point are in 'unfavourable', 'no change' and 'favourable' condition. The unfavourable unit is saltmarsh showing clear signs of erosion due to coastal squeeze, indicating that coastal influences are the main processes determining the status of the site. There is an identified water pollution problem being caused by agricultural run off. The rest of the site is predominantly in favourable condition and noted problems are due to coastal squeeze.

Cliff Quay STW (downstream) and Ipswich Docks, have the potential to have an 'in-combination' effect, depending on the future flows. Cliff Quay STW discharges into the River Orwell, approximately 6km downstream of the Sproughton STW outfall.

The River Gipping around the Sproughton STW is classified as salmonid water under the Freshwater Fish Directive. This classification means that there are specific physical and water quality objectives which the waters must meet, for example the concentrations of total ammonium should not exceed 1 mg/l. Regular sampling and monitoring is also undertaken to ensure that these objectives are met. No sites downstream of the discharge point are designated as shellfisheries or areas for bathing.

The impact of development

Currently the discharge limit is being exceeded and will continue to increase into the future if development is allowed. Projected dry weather discharge in 2020/21, accounting for all future development, is 1,972m^3 per day. This would exceed the current consent by 1,734m^3 per day (829%).

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented concentrations this could allow the additional release of up to 200kg of ammoniacal nitrogen, and 480kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Both Cliff Quay and Sproughton STW are expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Orwell Estuary is considered unlikely due to the size and diluting action of the estuary.

However, under the Water Framework Directive there is an objective to ensure no deterioration of water courses. Where possible this is interpreted by the Environment Agency as meaning that there is no increase in pollutant load within the receiving water course. An increased future discharge volume would result in an increased total pollutant load when it was treated to a higher standard.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that neither BAT nor BATNEEC is sufficient to prevent the BOD limits being exceeded from as early as 2010/11.

Further modelling, undertaken of discharges associated with housing only, shows that if Sproughton met the BATNEEC standard then the current consent limits would not be exceeded within the plan period. However, all non residential flows would require separate treatment.

The draft Water Framework Directive (WFD) classifications (Environment Agency, 2009) for the area surrounding the Sproughton STW is moderate, the category below good. The River Orwell has not been assessed yet and therefore has no WFD classification. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Sproughton in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required. If accompanied by technological upgrades to limit pollutant load, and additional treatment of non-residential flows, it is still likely to require assessment under the Habitats Regulations due to the distance from the internally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

Currently Sproughton is potentially discharging in excess of its consented discharge and therefore may require an increase in the discharge consent to accommodate this and the projected growth within the catchment. The environmental review, although not identifying any direct issues with the current discharges suggests care be undertaken if consents are to be significantly increased. Improvements to the existing sewer pipes, or the implementation of new pipes will be required to accommodate the increase in discharge and transmit it to the STW and therefore action is needed from AWS and/or individual developers.

Modelling of predicted flows indicates that's in the near future the consent limits will be significantly exceeded and as such it can also be assumed that the current performance of the STW is exceeding or close to exceeding the pollutant limits laid out in the consent.

The environmental analysis also indicates that BAT technologies would need to be implemented in order to keep the pollutant levels below the consent within the short term. Beyond 2016/17 no current technology appears to be able to reduce the levels of pollutant levels if both residential and employment discharges are combined. However the use of BATNEEC technologies would be adequate to process flows for residential alone. Some level of investment will be required to keep the pollutant levels satisfactory.

The actions required within this STW catchment within the planning period are summarised below:

Table 4.15 - Sproughton STW Summary

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Potential increase consent	Potential increase consent	Potential increase consent	Potential increase consent
Sanitary Treatment Improvements		Potentially implement BATNEEC Technologies	Potentially implement BAT Technologies	Potentially implement BAT Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

4.5 Flood Risk

The current status of the Strategic Flood Risk Assessment for Babergh is that an initial scoping report has been prepared, and currently work has commenced on producing the Level 1 SFRA. As with all areas in England and Wales the Environment Agency have produced Flood Zone maps in line with PPS 25 and these have been compared with the proposed development sites to identify key areas of concern. A map showing Flood Zones 2 and 3 within Babergh District is shown in Figure 4.17 (end of Section 4).

Initial inspection of the flood zone information with the supplied development areas has identified four potential areas where proposed development may lie within the Flood Zones. The area at Sproughton is discussed further below. However there is an area of Ipswich Docks and in Brantham which are potentially subject to tidal flooding which will need due consideration during planning phases to ensure that appropriate development is sited in these areas. Ipswich Docks falls within the IPA and are adjacent to areas within Ipswich which will also be subject to the same levels of risk. Brantham appears to be redevelopment of existing employment areas, and may be within an area benefiting from tidal flood defences, but these areas were not available for use at this time from the Environment Agency.

There has been no information regarding sewer flooding supplied by Anglian Water or the District Council. Historical flooding information concerning surface water is currently limited.

With reference to ground water flooding there is limited information overall however areas of groundwater emergence are noted to be present within the vicinity of the main watercourses.

The selection of new development sites and the evaluation of existing sites should follow the guidance in PPS25 - Development and Flood Risk and use the Sequential and Exception tests where required. The Level 1 SFRA and possible Level 2 SFRA will assist in the selection of sites in line with these tests.

4.5.1 Source Protection and Groundwater Vulnerability Areas

As part of controlling surface water flooding, options may be considered that use retention or infiltration techniques. Therefore, before development can take place source protection and groundwater vulnerability issues must be appreciated and reviewed.

There are a number of water resource Source Protection Zones (SPZs) identified by the Environment Agency in the part of Babergh which is within the Haven Gateway Sub Region and these are shown in Figure 4.18 (end of Section 4) There are a number of 'Inner' and 'Outer' Zone areas which need careful consideration in planning flood alleviation measures. Of these the Inner Zone adjacent to Sproughton is affected by the proposed development. The Environment Agency will not support the use of SUDS which use infiltration techniques on any development sites which overlap the Inner Zone. There are a number of other sites within the Outer Zone, both on the outskirts of Ipswich and Hadleigh, which will need consideration, albeit to a lesser extent.

Areas of Ground Water Vulnerability (GWV) can be seen from Figure 4.19 (end of Section 4). Major GWV areas occur to the north-east of Sproughton (Hu, H1, I1) where development is to take place and in a swathe through Hadleigh (I1). All other development areas in Babergh lie within minor GWV (I1) zones. Table 4.16 below identifies the soil classification for both major and minor vulnerability areas which relate directly to the areas undergoing development in Babergh. H refers to a high vulnerability, I to an intermediate vulnerability and L to a low vulnerability

Table 4.16- Soil Classification Table

Soil Class	Description
I1	Soils of intermediate leaching potential (I). Soils which can possibly transmit a wide range of pollutants
L	Soils of low leaching potential in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal or they have the ability to attenuate diffuse pollutants.
H1	Soils which readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.
Hu	Designates a restored mineral working and/or urban areas where soil information is based on fewer observations and therefore classified a worst case vulnerability classification.

National Rivers Authority Map 1995

4.6 Development Areas

The following Development Areas have been determined based upon their classification within the Sewage Treatment Works (STW) catchments, as provided by AWS. They have been classified in this way as the wastewater treatment has been shown to be the most limiting factor to growth within this study. As highlighted in Section 2.4 it was not possible to assess the capacity of the wastewater infrastructure in great detail, which may prove to be a greater limitation than the treatment works. The brief comments received from AWS have however been incorporated within the analysis of the development areas, but are shown as semi-shaded in the concluding tables to indicate a requirement for additional modelling/analysis at a later date. However, all elements of the Water Cycle will be reviewed for each Development Area in the following sections. The AMR figures for individual development sites have been updated by the Council following their review of the Stage 1 report.

4.6.1 Hadleigh

Hadleigh is an area located to the west of Ipswich which is undergoing development. Hadleigh has proposed 478 residential properties to be developed in the area from 2008-2021 together with the development or redevelopment of 7.6Ha of employment land.

Water supply, wastewater collection and water quality have been discussed in sections 4.3 and 4.4 above. Hadleigh is in Water Resources Zone 10, Planning Zone 60 and therefore will require the range of water resource activities described to maintain adequate water supply.

Although AWS have requested to increase the consented DWF discharge from Hadleigh STW the projections including residential and employment still show that the consented value will be exceeded by 2010/11. The key issue relates to employment development as there is sufficient headroom to accommodate the proposed residential development. Therefore, to accommodate the employment development additional capacity will need to be sought. However, the network has no spare capacity, placing restrictions on the possible location of development within the catchment without an upgrade/extension to the system.

The review of Flood Risk has not identified any major flooding within the areas of Hadleigh proposed for development. The residential and employment land development planned lies outside of Flood Zone 2. No other recorded flooding has been identified in this area and there is no Level 1 SFRA to use for reference at this stage.

The Hadleigh development area lies partially on top of an major GWV unit and partially over the catchment of a SPZ, some of it defined as the Outer Zone. Although this should not pose a problem to development, SUDS will need to be applied with care and only with permission from the Environment Agency.

This development area is mostly underlain by a minor aquifer, although a swathe through the middle is classified as major. Most of the area is also underlain by the Outer Zone of an SPZ. The Inner Zone lies to the south of the development area and if any development takes place here then the Environment Agency will not allow the installation of SUDS which use infiltration techniques.

To summarise the situation in Hadleigh if no action is taken then the following situation would occur.

Table 4.17 - Situation in Hadleigh Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 4.18 - Activities required in Hadleigh development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Bucklesham ASR Ipswich discharge reuse	Demand management Ipswich discharge reuse
Wastewater Treatment		Increase consented DWF Additional Capacity for Employment	Additional Capacity for Employment	Additional Capacity for Employment
Flooding	SuDS FRA development	SuDS FRA development	SuDS FRA development	SuDS FRA development
Environment – Water Quality	Currently not meeting BAT or BATNEEC. BAT required.	BAT required	BAT required	BAT required
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.
Water Supply Infrastructure				

4.6.2 Pinewood

Pinewood is located to the South West of Ipswich and falls within the Ipswich Policy Area. It is proposed to build 288 residential properties within Pinewood from 2008-2021. In addition some 14Ha of employment land is expected to be developed at Pinewood and in the vicinity.

Water supply, wastewater collection and water quality been discussed in earlier sections above. Pinewood is in WRZ 10, PZ 60 and therefore will require the range of water resource activities described to maintain adequate water supply.

The Chantry STW which receives flow from Pinewood has sufficient capacity to cope with the additional residential and employment land development that is proposed. The wastewater infrastructure has been identified as having no spare capacity. In the current situation any additional development will therefore need to be located as close to the STW as possible.

Belstead Brook flows through the Pinewood area, and the Flood Zones (2 and 3) have been developed by the Environment Agency for this Brook. The proposed development areas do not appear to fall within the Flood Zones, however the housing developments areas do not appear to be available with spatial locations. If they do fall within the Flood Zones then appropriate action according to PPS25 must be applied.

This development area is underlain by a minor aquifer and the Outer Zone of a SPZ. Depending upon the proximity of the development to the Inner Zone SUDS which use infiltration techniques may be restricted within this area.

To summarise the situation in Pinewood if no action is taken then the following situation would occur.

Table 4.19 - Situation in Pinewood Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:
Green - OK for development
Amber - Some issues now or in the near future
Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 4.20 - Activities required in Pinewood Development Area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Bucklesham ASR Ipswich discharge reuse	Demand management Ipswich discharge reuse
Wastewater Treatment				
Flooding	SuDS FRA development	SuDS FRA development	SuDS FRA development	SuDS FRA development
Environment – Water Quality				
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.
Water Supply Infrastructure				

4.6.3 Sproughton

Sproughton is an area of development in Babergh situated close to the western border of Ipswich Borough and falls within the Ipswich Policy Area. It is proposed to build around 100 residential properties in the area from 2008-2021 together with the development/re-development of around 65Ha of land (although some 9Ha of this is being set aside as a natural area).

Water supply, wastewater collection and water quality been discussed in earlier sections above. Sproughton is in WRZ 10, PZ 60 and therefore will require the range of water resource activities described to maintain adequate water supply.

The area is serviced by two STWs, Cliff Quay and Sproughton. Neither of these STW's can cope with both the residential and employment development without some action within the study period. Sproughton potentially requires an increase in discharge consent to cope with the residential development, and Cliff Quay, although having adequate headroom to accommodate the residential development throughout Ipswich will need intervention in some manner to accommodate the potential flows from the planned employment development. Both of these STWs have sewer networks which are currently operating at capacity and will therefore require extensions/upgrades to avoid limitations being placed on the feasible locations where the proposed development can be built.

Inspection of the Flood Zone mapping shows that the development in Sproughton straddles the River Gipping and a high proportion of the employment development areas, and a small part of the residential area falling within the Flood Zone 2 outline and with a similar amount of the employment falling within Flood Zone 3. Careful consideration is going to be required to ensure that appropriate development takes place in these areas.

The north of this development area is overlapped with both a major GWV unit and the Inner Zone of an SPZ. Restrictions will therefore be placed upon the use of SUDS which use infiltration techniques within this area.

There is also limited information regarding sewage flooding and surface water flooding.

To summarise the situation in Sproughton if no action is taken then the following situation would occur.

Table 4.21 - Situation in Sproughton Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	A	A	A	A
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 4.20 - Activities required in Sproughton Development Area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Bucklesham ASR Ipswich discharge reuse	Demand management Ipswich discharge reuse
Wastewater Treatment	Increase consented DWF Additional Capacity for Residential and Employment	Additional Capacity for Residential and Employment	Additional Capacity for Residential and Employment	Additional Capacity for Residential and Employment
Flooding	SuDS (restricted) FRA development - sequential and exception tests	SuDS (restricted) FRA development - sequential and exception tests	SuDS (restricted) FRA development - sequential and exception tests	SuDS (restricted) FRA development - sequential and exception tests
Environment – Water Quality	Currently not meeting BAT or BATNEEC. BATNEEC required.	BATNEEC required	BAT required	Neither BAT nor BATNEEC sufficient to prevent BOD limits being exceeded.
Wastewater Infrastructure	Restrictions on location of development.	Restrictions on location of development.	Restrictions on location of development.	Restrictions on location of development.
Water Supply Infrastructure				

4.6.4 Shotley

Shotley is located to the south of Ipswich, at the mouth of the Orwell and Stour Estuaries. It has been planned to build around 850 residential properties on the old HMS Ganges site.

Water supply, wastewater collection and water quality been discussed in earlier sections above. Shotley is in WRZ 10, PZ 60 and therefore will require the range of water resource activities described to maintain adequate water supply.

The STW at Shotley is able to cope with the residential land development taking place up to 2019/20, although it the capacity falls within 20% of the limit from 2014. After this date the consented DWF is exceeded, forcing additional measures to be taken in order to manage the excess discharge. The major problem with regards to wastewater is the lack of capacity in the current sewer network, which will require upgrade or extension to accommodate the additional flows.

There is no evidence of significant flooding events within this area of development. The majority of the old HMS Ganges site is not within the Flood Zone 2 or 3. There is an area alongside the marina and to the north along the Orwell estuary that falls within the Flood Zones, but it is expected that the development will be directed away from these areas.

This area is only underlain by a minor GWV unit and is not located in proximity to any SPZs.

To summarise the situation in Shotley if no action is taken then the following situation would occur.

Table 4.23- Situation in Shotley Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Water Supply Infrastructure	R	R	R	R
Wastewater Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 4.24 - Activities required in Shotley Development Area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Bucklesham ASR Ipswich discharge reuse	Demand management Ipswich discharge reuse
Wastewater Treatment				Increase consented DWF
Flooding	SuDS FRA development	SuDS FRA development	SuDS FRA development	SuDS FRA development
Environment – Water Quality				BATNEEC required
Water Supply Infrastructure	Increase capacity/ implementation of new sewers.	Increase capacity/ implementation of new sewers.	Increase capacity/ implementation of new sewers.	Increase capacity/ implementation of new sewers.
Wastewater Infrastructure				

4.7 Summary Timeline

The following table shows a summary of the current state of each of the development areas in terms of issues with the areas considered, water supply, wastewater, environment and flooding.

Table 25 - Summary timeline for each development area in Babergh District

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Hadleigh	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Pinewood	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Sproughton	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	A	A	A	A
	Water Supply Infrastructure				
Shotley	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				

The key activities required to resolve the "red" time periods above are:

Water Supply - Implementation of the proposed Bucklesham Aquifer Storage Recovery Scheme in PZ 60 in AMP5
Implementation of the proposed Ipswich Discharge Reuse Scheme (PZ60) in AMP6

Wastewater - Detailed review of development and discharges to establish the required increase in the consented DWF for Sproughton STW, and apply if necessary.
Careful monitoring of development at Shotley to ensure that consented discharge is not exceeded towards the end of the study period and discharge consent increases considered if necessary.
Extension and upgrade/capacity increase of current sewer network.

Flooding - Ongoing care with the development of FRA's, and planning constraints for development in Sproughton adjacent to the River Gipping where appropriate.

Water Quality - Further investigation into the treatment processes and potential implementation of improvements to sanitary treatment at Hadleigh and Sproughton to keep pollution levels constant with increasing flows.

4.8 Constraints to Development

The previous sections detail the issues and in many cases the worse case scenarios with regard to development within the area. This precautionary practice has been adopted to try and ensure that discussion and consultation is undertaken with the relevant authorities and responsible organisations before development takes place.

The main constraints to development and activities required are indicated below.

Water Supply - AWS are confident of maintaining supply provided activities put forward within their WRMP and Business Plans are implemented as programmed.

Wastewater treatment capacity at Sproughton - discharge consent increases required if development continues as proposed.

Flooding - ensure appropriate development within potential flood areas. Use PPS25 - Development and Flood Risk sequential and exception tests in these areas such as Sproughton where development sites are close or in existing Flood Zones 2 and 3..

Sanitary treatment capacity at Hadleigh and Sproughton - investigate available treatment headroom to accept discharge increases. AWS consider levels of investment in improving sanitary treatment processes if required.

Wastewater Infrastructure - undertake additional investigation and modelling with detailed site allocations to establish infrastructure limits. Consider locating development closer to sewage treatment works in Hadleigh, Shotleigh and Sproughton in the short term to allow infrastructure improvements to be developed in the future if required.

5. COLCHESTER BOROUGH SPECIFIC RESULTS

5.1 Introduction

The following section contains information which is specific within the Haven Gateway Water Cycle Study for Colchester Borough. The section has been divided up into a number of parts. The first few sections describe the Borough area, its development plans and Council wide issues relating to water supply, waste water disposal (including water quality) and flood risk management. Following that further sections will consider specific development areas in more detail where appropriate. Finally, a timeline showing potential actions has been developed.

5.2 Colchester Borough and Development

Colchester Borough sits in the south western part of the Haven Gateway area, and falls within Essex County. The location of the Borough in relation to Haven Gateway, its adjacent Local Authorities and key features is given in Figure 5.1.

Figure 5.1 - Colchester Borough Location

Of the six Local Authorities within the Haven Gateway, Colchester has the largest planned level of growth, as identified in both the Annual Monitoring Reports (AMR) and the East of England Plan. The AMR, adopted Core Strategy (December 2008) and East of England plan identify a minimum target of 17,100 dwellings in the period 2001 to 2021 and at least 19,000 dwellings by 2023. This target is being comfortably achieved by the current trajectory.

The Core Strategy of the Local Development Framework was adopted in December 2008 and the Regulation 25 Site Allocations document was issued for consultation in January 2009.

The residential development trajectory has been supplied in sufficient detail so that the majority of developments can be allocated within specific sewage treatment catchment areas, and also to sub-divide the catchments to look in more detail where required.

The following development areas have been identified from the Council's trajectory data and are considered in some detail in later sections.

- Town Centre and Fringe
- North Growth Area
- East Growth Area
- South Growth Area
- Stanway Growth Area
- Colchester Town – Other Areas
- Tiptree
- West Mersea
- Wivenhoe and Rowhedge
- Marks Tey
- West Bergholt
- Great Horkesley
- Other Villages

Development in these areas accounts for 97% of the total planned/constructed residential development in Colchester Borough between 2001/2 and 2020/21. The remaining 3% consists of a small site allowance of 100 houses per year, scheduled between 2015/16 and 2020/21, the exact location of which has not yet been decided.

Employment development has also been considered within the WCS. The adopted Colchester Core Strategy identifies the need for the Borough to accommodate the following development within the plan period:

- 67,000m² (6.7ha) net of retail floor space between 2006 and 2021;
- 106,000m² (10.6ha) gross of office floor pace between 2004 and 2021;
- 45,000m² (4.5ha) gross of other business floor space between 2004 and 2021; and
- 270-390 hotel bedrooms between 2006 and 2015.

The Core Strategy has identified an ample supply of land to meet these demands and the Council has provided us with trajectories, updated from the Stage 1 WCS study, for the delivery of the known employment sites, totalling just over 84ha. These include the three sites providing just over 35ha of industry and warehouse development land identified in the adopted Core Strategy – Cuckoo Farm in North Colchester (19.8ha), Tollgate, Stanway (11.37ha) and London Road, Stanway (4.75ha). In total 92% of the identified development between 2007 and 2021 is located within Colchester Town and Stanway. However detail on employment development is less well provided than residential development.

Housing trajectory data has been taken from the latest information provided by Colchester Borough Council. This shows the following total development for the Borough from 2001/2 to 2020/21.

Figure 5.2 - Housing Trajectory for Colchester BC

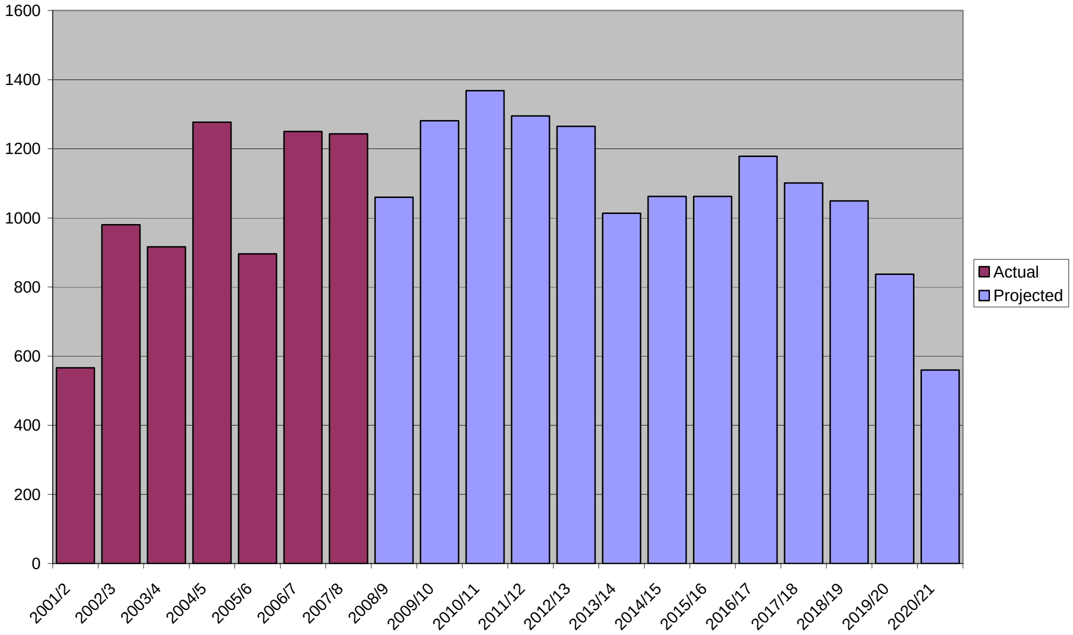
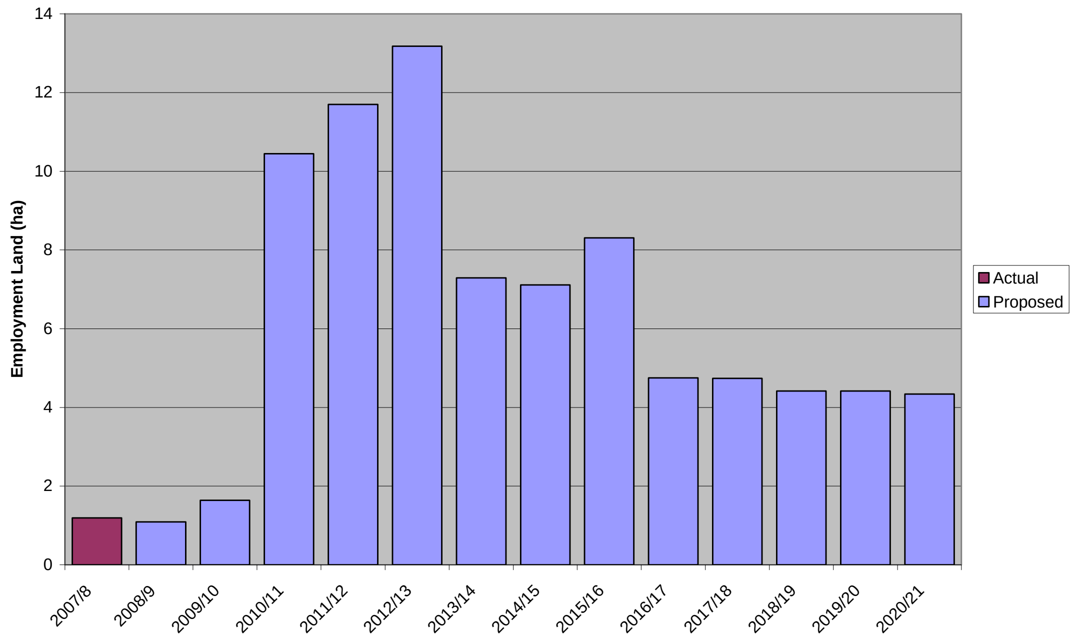


Figure 5.3 - Employment Trajectory for Colchester BC



The East of England Plan has annualised development in Colchester BC as 830 dwellings per annum, and the trajectory above will exceed this by around 5000 dwellings. Figure 5.4 (end of Section 5) indicates the development areas in Colchester.

5.3 Water Supply

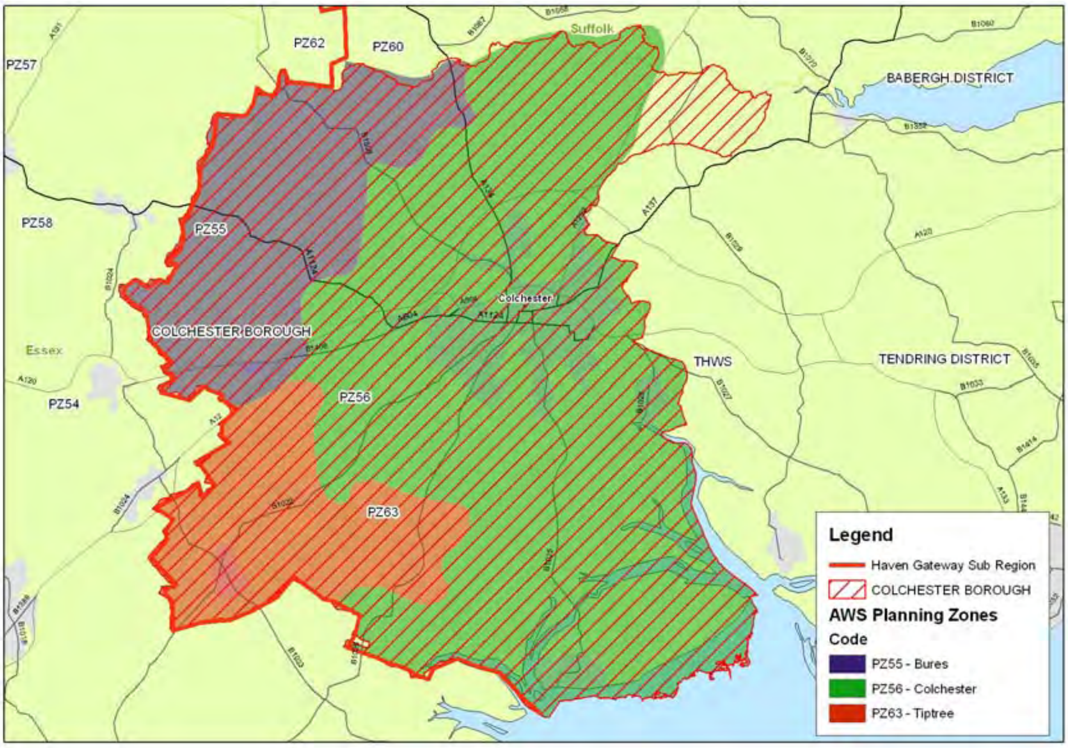
Colchester Borough is primarily served by Anglian Water Services, although a small area around Dedham and one around Wivenhoe fall within the area supplied by Tendring Hundred Water.

Both Anglian Water and Tendring Hundred Water are confident that they can supply demand within the Region to at least 2035 (the end of their draft Water Resource Management Plans).

However, AWS recognise that there are potential supply deficits either against dry year averages or critical peak period forecasts and have proposed a range of activities to address these deficits over the next 27 years.

Colchester Borough falls within Water Resources Zone (WRZ) 10 as identified in AWS dWRMP. WRZ 10 covers East Suffolk and Essex and is further sub-divided into planning zones (PZs). Colchester Borough covers three of these PZs, PZ55 - Bures, PZ 56 - Colchester and PZ 63 - Tiptree, and these are shown in Figure 5.5 (the names used for these Planning Zones have been provided by AWS and do not necessarily reflect the settlements located within them).

Figure 5.5 - Water Resource Planning Zones for Colchester



In the dWRMP AWS state that without implementing water management options within the zone, they forecast a deficit between the available supply and the predicted water requirements (including headroom allowances) by the end of the AMP5 (2010-2015) period, and in particular Colchester shows higher deficits because of the higher growth rates in this area, and the likely impacts of climate change on reservoirs.

AWS have proposed activities for addressing these deficiencies across the zone. These include both measures to increase the available supply, to reduce usage and to reduce losses due to leakage. For the three PZs within Colchester Borough the following activities have been proposed for implementation within the study period (i.e. AMP5 or AMP6).

However, please note: The following feasible options for addressing water supply in the area have been based on the draft WRMP. This document is now being finalised and the final version should be referenced to ensure that these options are still those preferred by the water company

Table 5.1 - Timeline of Preferred Water Resource Activities for Colchester Borough

PZ	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035	Activity
55						General demand management
						Transfer from PZ56 - Colchester
56						General demand management
						Ardleigh Reservoir Extension
						Transfer from PZ60 - Ipswich
63						Transfer from PZ56 - Colchester

5.4 Wastewater Collection and Treatment

Colchester Borough is serviced by fifteen sewage treatment works of which two (Dedham and Tiptree) also receive discharges from adjacent Local Authority areas.

Based on the measured DWF values for 2007(JR08), together with the current Consented DWF values, the present day available headroom for all STWs are shown in Table 5.2 below.

Table 5.2 - Discharge Capacities of STWs in Colchester BC

STW Code	Site Name	Consented DWF (m^3/d)	Measured DWF 2007/JR08 (m^3/d)	Headroom (m^3/d)
BIRCST	BIRCH STW	300	238	62
COLCST	COLCHESTER STW	29284	30256	-972
COPFST	COPFORD STW	1300	1474	-174
DEDHST	DEDHAM STW	610	755	-145
EIGHST	EIGHT ASH GREEN STW	650	517	133
FINGST	FINGRINGHOE STW	367	336	31
GTEYST	GREAT TEY STW	150	97	53
GWIGST	GREAT WIGBOROUGH STW	not available	-	
LANMST	LANGHAM STW (ESSEX)	400	768	-368
LAYEST	LAYER DE LA HAYE STW	380	289	91
SALCST	SALCOTT STW	not available	-	
TIPTST	TIPTREE STW	2400	1940	460

WBERST	WEST BERGHOLT STW	1430	***825***	***605***
WMERST	WEST MERSEA STW	2900	***1510***	***1390***
WORMST	WORMINGFORD STW	65	48	17

Note: values in ***bold italics*** are based on calculated values from the older JR07 results rather than those measured and presented in the JR08 data.

This shows that four of the STWs are currently at or above their consented DWFs. These are:

- Colchester
- Copford (Marks Tey)
- Dedham
- Langham

Future development within these STW catchments will require careful consideration. Those catchments in which development is already planned are discussed further in the following sections.

Of the fifteen, only six receive any significant increase in discharge for the projected development. The location of the STW catchments is shown in Figure 5.6 (end of Section 5). The six potentially affected STWs are:

- Colchester
- Copford
- Tiptree
- West Bergholt
- West Mersea
- Fingringhoe

The results of the projected wastewater analysis for the STWs affected by the current planned development (both residential and employment) are presented in Table 5.3 below. This shows whether the headroom at each STW in each year is more than 20% of the consented DWF (Green), between 20% and 0% (Amber) or negative (Red).

Table 5.3 - Summary of STW Headroom for affected STWs in Colchester BC considering both residential and employment land development

STW Ref.	Catchment Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COLCST	Colchester														
COPFST	MarksTey/Copford														
TIPTST	Tiptree														
WBERST	West Bergholt														
WMERST	West Mersea														
FINGST	Other Villages (PYE)														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

This shows three works with a lack of headroom to cope with the projected growth of both housing and employment over the study period. These three works are discussed further below.

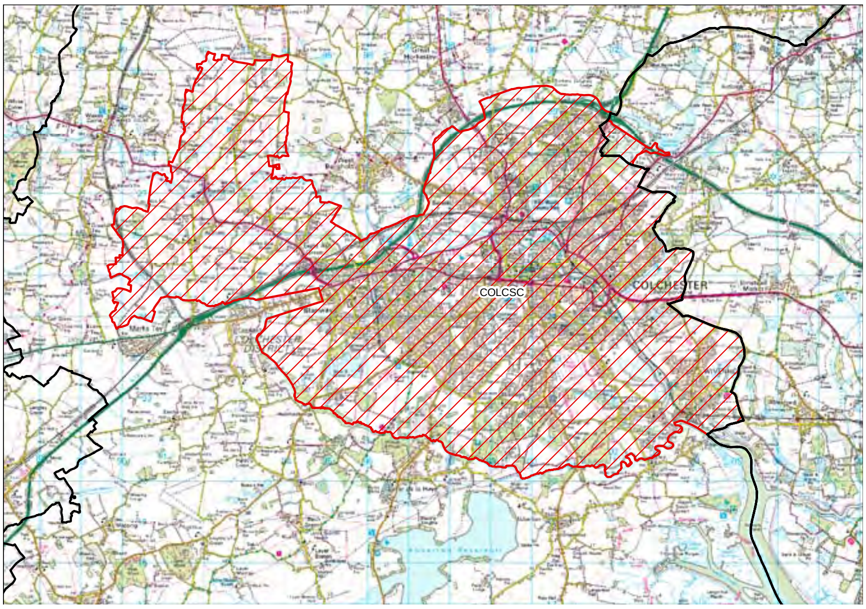
Very limited information was available for this study with which to make an assessment of the capacity of the wastewater infrastructure (sewer pipes, pumping stations etc). However, brief comment was provided by AWS for each of the STW catchments in which a future potential for residential development has been identified. These are discussed within the analysis of individual STWs below and within the discussion of individual development areas.

5.4.1 Colchester STW

Colchester STW receives wastewater from the majority of the Colchester town together with land to the north east of the A12. The area is shown below in Figure 5.7 and includes the following development Growth Areas:

- Town Centre and Fringe;
- North Growth Area;
- East Growth Area;
- South Growth Area;
- Stanway Growth Area (with the exception of the Westside Centre and Wyvern Farm employment development sites, which are located in the catchment of the neighbouring Copford STW);
- Colchester Town Growth Area; and
- Other Villages (land adjacent to All Saints Church, Halsted Road).

Figure 5.7 - Location of Colchester STW Catchment



This STW catchment contains 94% of the residential development planned/completed within the planning period 2001/2 – 2021/21 and 88% of the proposed employment development for Colchester Borough. The development Growth Area of Stanway falls on the borders of the catchment of this STW, but the development sites have been assigned within the current STW catchments as accurately as possible. The current consented DWF for the works is 29,284 m^3/d.

Using the measured value in 2007/8 as a starting point for the projected capacity of the works, and the development trajectories outlined in Section 5.1 then the percentage headroom to 2020/21 is shown in the Figure 5.8 and Table 5.4 below.

Figure 5.8 – Colchester STW percentage headroom - residential and employment development

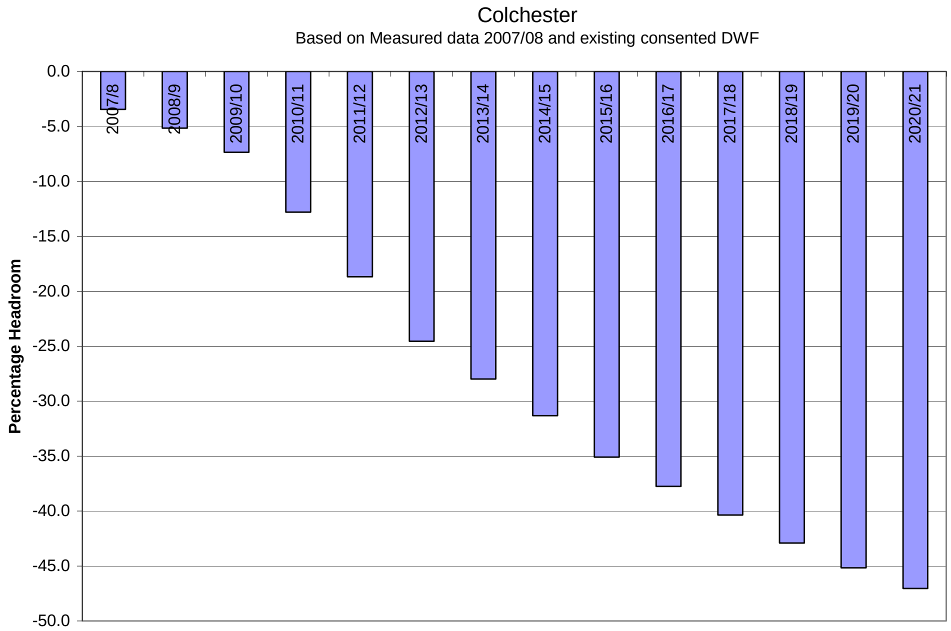


Table 5.4 - Headroom availability of the Colchester STW - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COLCST	Colchester,/Stanway /rural villages														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

This projected headroom trajectory considers both residential (housing) development and employment. However, if employment wastewater is removed from the evaluation then the STW still exceeds its consented discharge throughout the planning period, with a percentage headroom of more than -20% in 2020/21, as shown in Figure 5.9 and Table 5.5 below:

Figure 5.9- Colchester percentage headroom - residential development only

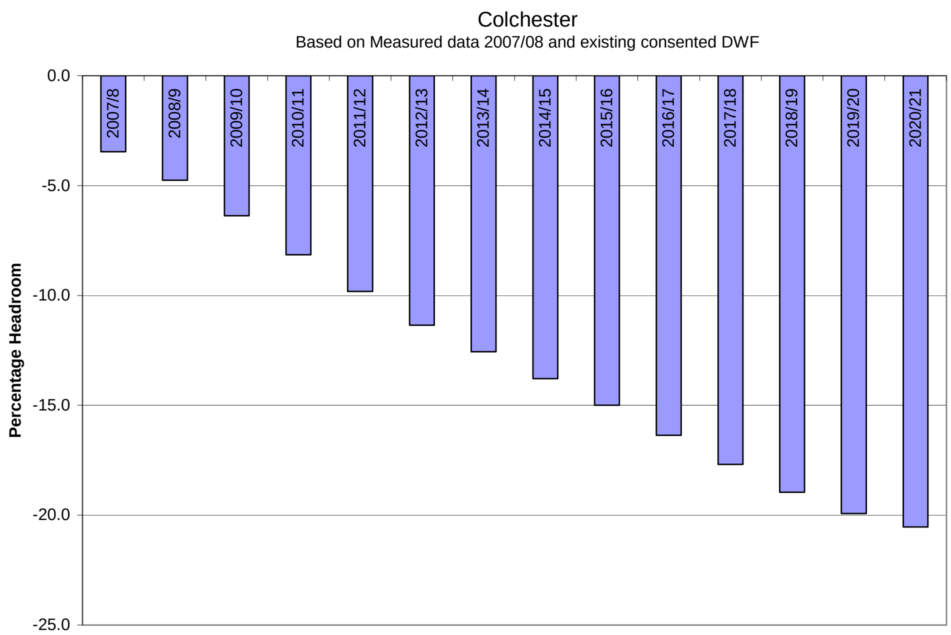


Table 5.5 - Headroom availability of the Colchester STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COLCST	Colchester,/Stanway /rural villages														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

AWS have commented that the Colchester STW has no spare capacity. In most of the catchment, AWS has also identified the sewer network as currently operating close to, or at, capacity. The individual requirements for each area are identified in the individual development are sections below.

Environmental Considerations

Colchester STW (ASETS/1046E consented 2006) discharges secondary treated sewage effluent into the Colne estuary (Grid Reference TM 0225 2361). The current consented dry weather flow is 29,284m^3 per day with a total daily volume limited to 76,400m^3. Currently, the discharge shall not exceed:

- 35 milligrammes per litre of BOD;
- 15 milligrammes per litre of ammoniacal nitrogen; or
- 60 milligrammes per litre of suspended solids.

Sampling at the discharge point is frequently carried out by Anglian Water to assess that the discharge is keeping to the consent limits. The sampling shows that suspended solids are well below the consent level at around 20% of the consented limit. Ammoniacal nitrogen levels are currently 50% of the consent limit, and are frequently reaching or exceeding 50% of the consent limit; this may indicates that future management of nitrogen could be an issue for Colchester STW.

The current state of the receiving environment

The discharge point at Colchester is approximately 3km from the Colne Estuary Ramsar and SPA site and Essex Estuaries SAC site. The Colne Estuary SSSI units which are nearest to the discharge point are in 'unfavourable, declining' condition and in 'favourable' condition. All the units in 'unfavourable, declining' condition are suffering from coastal squeeze and the resulting erosion. The European designated sites also include a small area of the Upper Colne Marshes SSSI. The relevant unit is in favourable condition. Tidal processes clearly have the biggest influence on the designated sites.

Brightlingsea STW and Copford STW (via the Roman River) also discharge into the Colne Estuary, approximately 7km and 3km downstream respectively of the Colchester STW outfall.

No sites downstream of the discharge point are designated as freshwater fisheries or areas for bathing. Areas of the Colne Estuary are designated as shellfisheries and discharges from Colchester STW may have an impact on these fisheries that should be considered in the future.

The impact of development

Modelled flows accounting for all developments suggest the discharge limit is being exceeded and will continue to into the future. Projected dry weather discharge in 2020/21 is 43,060m^3 per day; this exceeds the current consent by 13,776m^3 per day (68%). Therefore in order to accommodate planned growth an increase in consented discharge would be necessary.

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 192kg of ammoniacal nitrogen, and 767kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Brightlingsea, Copford and Colchester STWs are also expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Colne Estuary is considered unlikely due to the size and diluting action of the estuary. It is also unlikely that the combined discharges will have an impact on the Colne Estuary designated shellfish waters further downstream from Colchester.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if BATNEEC standards were met this would provide a sufficient level of treatment to maintain pollutant loads under the current consent limits.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Colchester STW is moderate, the category below good. The standards set for meeting this classification are 1.1mg/l ammonia and 6.5 mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Colchester in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required. If accompanied by technological upgrades to limit pollutant load it may still require assessment under the Habitats Regulations due to the proximity of the Colne Estuary designated sites; however this position would need to be confirmed by seeking specific advice from Natural England.

<u>Conclusions</u>

Based upon both scenarios of development (including employment development and without), the Colchester STW is already operating beyond capacity with the discharge continuing to increase beyond consent throughout the planning period. In addition, many areas of the catchment will require improvement of the sewer network to accommodate the additional development with actions required from either AWS and/or individual developers.

As both the current performance of the STW and predicted future modelling are exceeding the current consented dry weather flow and it can therefore also be concluded that the consented pollutant loads could be close to being exceeded. Current testing by Anglian Water indicates that suspended solids are below the limits but that ammoniacal nitrogen is exceeding 50% of the limit which indicates that there may be an issue in the near future.

The water quality analysis indicates that treatment is currently not meeting the levels achievable by either BATNEEC or BAT technologies. A shortfall in sanitary treatment could be overcome by applying BATNEEC technology throughout the planning period. Investment is therefore required in this catchment, even before development takes place, to introduce BATNEEC technologies so as to meet standards for the remainder of the planning period.

These conclusions are summarised in Table 5.6 below:

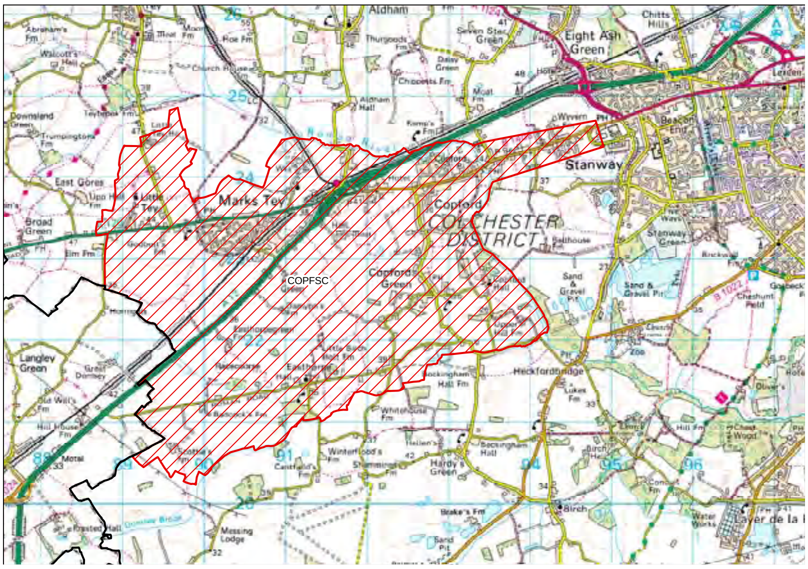
Table 5.6 - Colchester STW Summary

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Potential increase consent	Potential increase consent	Potential increase consent	Potential increase consent
Sanitary Treatment Improvements	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

5.4.2 Copford STW

Copford STW receives discharge from Marks Tey, Copford and parts of Stanway (on the western side of Colchester). The area is shown below in Figure 5.10

Figure 5.10 - Location of Copford STW Catchment



There is limited development within this catchment, consisting of the Stanway Westside Centre and Wyvern Farm employment sites and limited residential development at Marks Tey, but the works have been flagged as they appear to be at their consented capacity at present. Based on the measured DWF of 1474 m^3/d in 2007/8 this is about 13% above the consented discharge of 1300 m^3/d. Development projections raise the discharge to 1,779 m^3/d in 2020/21 (37% above the current consented limit). The two scenarios are shown in Figures 5.11 and 5.12 and Tables 5.7 and 5.8 below:

Figure 5.11 - Copford STW headroom - residential and employment development

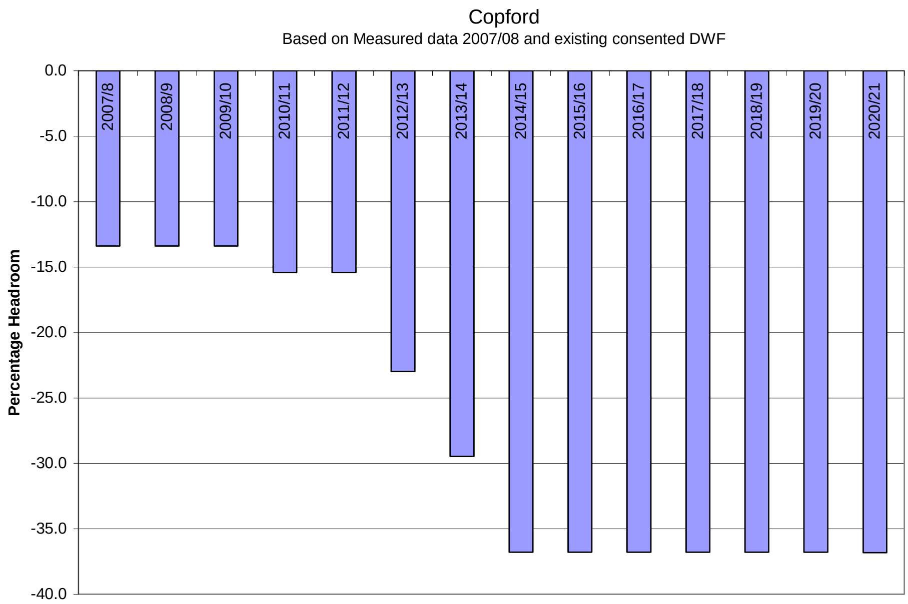


Table 5.7 - Headroom availability for the Copford STW - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COPFST	Marks Tey														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Figure 5.12 - Copford STW headroom - residential development only

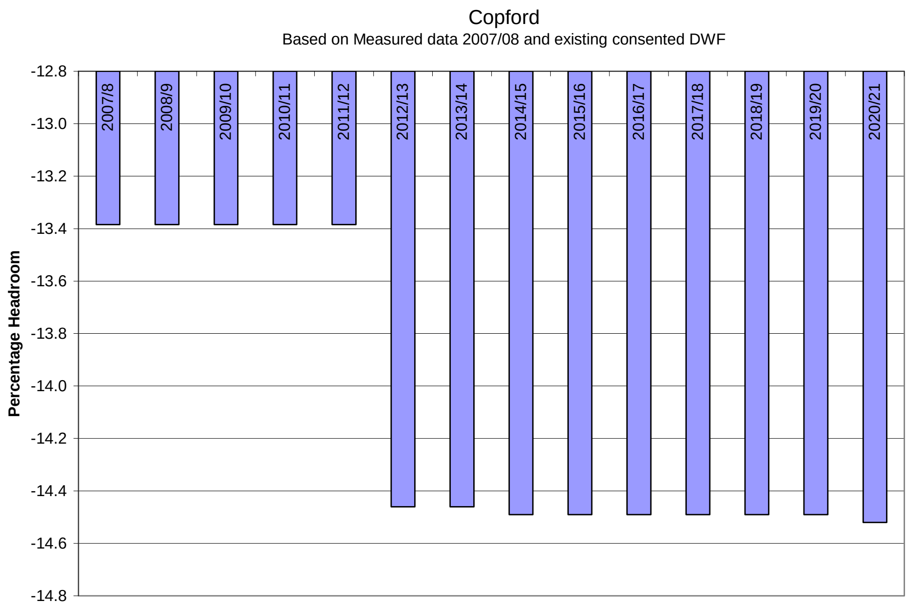


Table 5.8 - Headroom availability for the Copford STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COPFST	Marks Tey														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

AWS have not identified any wastewater network issues within this catchment.

Environmental Considerations

Copford STW discharges secondary treated sewage effluent into the Roman River (at Grid Reference TL 9330 2340). The current consented discharge (ASENF/1050C) is 3,380m^3 per day, with a consented dry weather flow of 1,300m^3 per day. According to the conditions of the current consent the discharge shall not exceed:

- 10 milligrammes per litre of BOD with an upper limit of 40 milligrammes per litre;
- 3 milligrammes per litre of ammoniacal nitrogen;
- 20 milligrammes per litre of suspended solids.

Anglian Water carry out regular sampling at the discharge points to ensure that current consent limits are being met. Trends in the sampling indicate that the quantity of suspended solids and ammoniacal nitrogen in the water is being sufficiently maintained and is in fact well under the consent limit (at around 45% and 20%, respectively, of the consented concentration).

The current state of the receiving environment

The Roman River currently has a GQA grade (2006) of B (good) for chemical and B grade (good) for biological standards. Previously in 2004-2005 the chemical and biological grades were C (fairly good). The phosphate GQA grade for the river is 5, indicating a very high level of phosphate. This high grade of phosphate GQA suggest that measures may need to be taken to limit further phosphate entering the system in order to prevent eutrophication.

The STW discharges into Roman River which flows into the Colne Estuary. The discharge point is approximately 13km from the Colne Estuary Ramsar and SPA site and Essex Estuaries SAC site. The Colne Estuary SSSI units which are nearest to the discharge point are in ‘unfavourable, declining’ condition and in ‘favourable’ condition. All the units in ‘unfavourable, declining’ condition are in this condition due primarily to coastal squeeze and the resulting erosion. The European designated sites also include a small area of the Upper Colne Marshes SSSI. The relevant unit is in favourable condition. Tidal processes have the biggest influence on the designated site.

Brightlingsea STW and Colchester STW also discharge into the Colne Estuary, approximately 5km and 3km from where the Roman River enters the estuary.

No sites downstream of the discharge point are designated as freshwater fisheries or areas for bathing. Areas of the Colne Estuary are designated as shellfisheries.

Impact of development

Modelled discharge flows accounting for all developments suggest the discharge limit is being exceeded and will continue to into the future. Projected dry weather discharge in 2020/21 is 1,779m^3 per day; this exceeds the current consent by 479m^3 or 27% per day. Therefore in order to accommodate planned growth an increase in consented discharge will be necessary.

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 1.4kg of ammoniacal nitrogen, and 9.6kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Brightlingsea, Colchester and Copford STW are also expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Colne Estuary and its designated shellfish waters is considered unlikely due to the size and diluting action of the estuary.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Copford met BATNEEC standards it would not be sufficient to prevent the BOD limits being exceeded from as early as 2010/11; given that flow levels are already thought to be higher than the modelled values, BATNEEC is not considered a viable option at this location. If BAT was installed then the current consent limits would not be exceeded within the plan period.

The Roman River has not yet been assessed as part of the draft Water Framework Directive classifications for the area (Environment Agency, 2009). More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Copford in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, but if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site;

however this position would need to be confirmed by seeking specific advice from Natural England

Conclusions

Despite the limited development within this catchment, the STW still exceeds its cDWF both with and without residential development. Action is therefore required from AWS and/or individual developers in order to enable the proposed development to proceed. No sewer network issues have been identified although it is recommended that these are investigated in greater detail with AWS once the development sites have been finalised.

The current consent limits for pollutant loads (as tested by Anglian Water) are not being exceeded although the consented dry weather flow is. The small but steady increase in predicted future dry weather flows would indicate that there potentially will be some headroom in the consent regarding pollutants in the near future. However monitoring will be required to keep track of changes. If the worst case scenario is adopted where the current consented discharge is at the consented sanitary levels then further treatment will be needed in the future, and that this may require implementing BAT technologies to maintain a no net increase in pollutants.

These conclusions are summarised in Table 5.9 below:

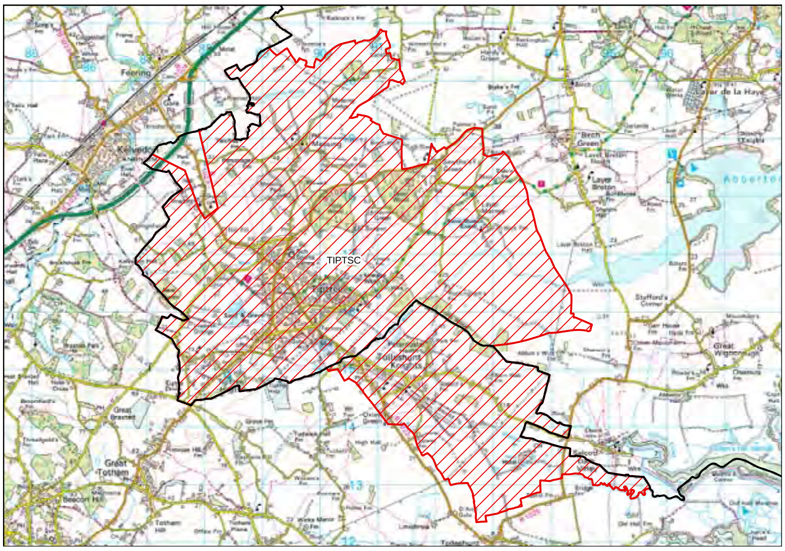
Table 5.9 - Copford STW Summary

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Potential increase consent	Potential increase consent	Potential increase consent	Potential increase consent
Sanitary Treatment Improvements		Potentially implement BAT Technologies	Potentially implement BAT Technologies	Potentially implement BAT Technologies

5.4.3 Tiptree STW

Tiptree STW is in the south west of the Borough, abutting Maldon and Braintree, and is on the borders of the Haven Gateway. The catchment area is shown below in Figure 5.13.

Figure 5.13 - Location of Tiptree STW Catchment



Tiptree has headroom at the current time, but with the projections of growth exceeds capacity around 2016/17. Development in the Tiptree catchment is a range of small developments in the immediate future, with a larger allocation from the Core Strategy from 2013 through to 2017. In addition there is a small allocation of employment land development from 2012 through to 2021. The lack of headroom in 2021 is projected to be around 414m^3/d or just over 17% of the current consented DWF.

The scenarios, one including both residential and employment development and one representing just the proposed residential development are summarised in Figures 5.14 and 5.15, and Tables 5.10 and 5.11 below:

Figure 5.14 - Tiptree STW headroom - residential and employment development

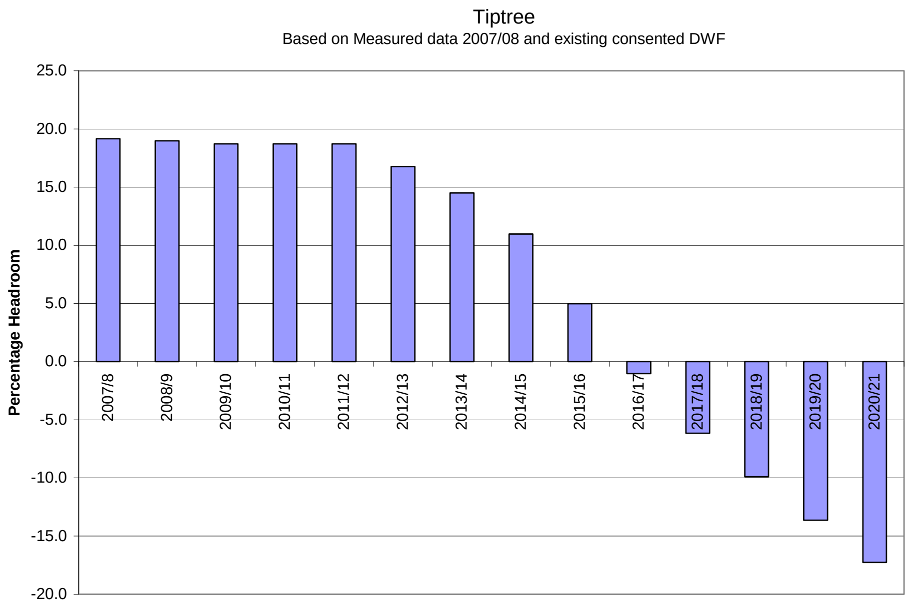


Table 5.10 - Headroom availability for the Tiptree STW - employment and residential development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
TIPTST	Tiptree														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Figure 5.15 - Tiptree STW headroom - residential development only

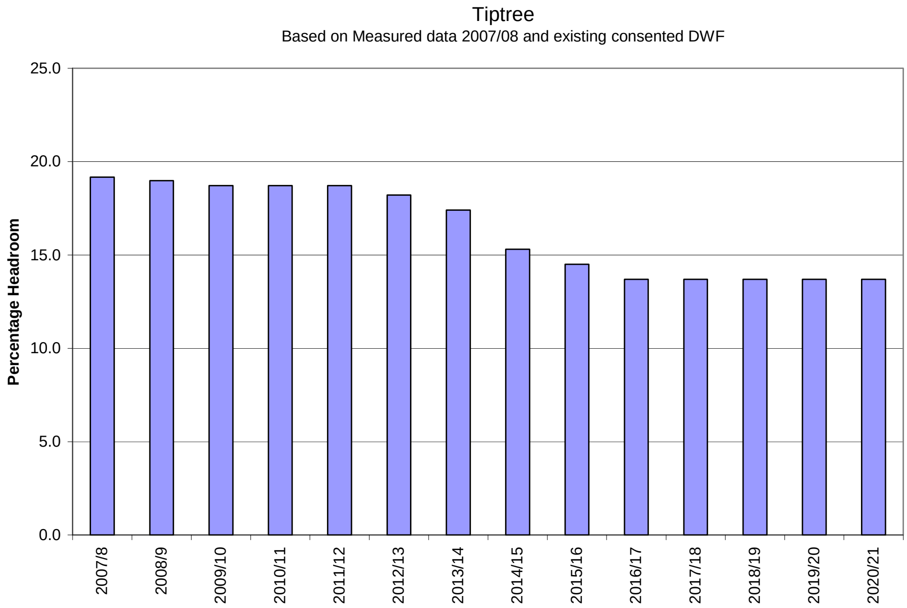


Table 5.11 - Headroom availability for the Tiptree STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
TIPTST	Tiptree														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

AWS have agreed that, when only residential development is considered, the Tiptree STW has the capacity to receive the flows from the proposed development. This catchment has also been identified by AWS as currently operating at the capacity of its sewerage network. Upgrade or expansion will therefore be required before development takes place, or development needs to take place close to the works with direct connections.

Environmental Considerations

Tiptree STW discharges secondary treated sewage effluent into the Virley Brook, a tributary of Salcott Creek (at Grid Reference TL 9389 1572). The current consented discharge (ASENF/4001) is 6,254m^3 per day, with a consented dry weather flow of 2,400m^3 per day. According to the conditions of the current consent the discharge shall not exceed:

- 10 milligrammes per litre of BOD with an upper limit of 40 milligrammes per litre;
- 4 milligrammes per litre of ammoniacal nitrogen with an upper limit of 18 milligrammes per litre;
- 20 milligrammes per litre of suspended solids.

Anglian Water carry out regular sampling at the discharge points to ensure that current consent limits are being met. Trends in the sampling indicate that the quantity of suspended solids and ammoniacal nitrogen in the water is being sufficiently maintained and is in fact well under the consent limit (at around 40% and 25%, respectively, of the consented concentration).

The current state of the receiving environment

The STW discharges into Virley Brook which enters Salcott Creek, part of the Blackwater Estuary SPA and Ramsar designated site and the Essex Estuaries SAC designated site. The units of the Blackwater Estuary SSSI which corresponds to the point where the brook enters the site are currently in unfavourable declining condition. These units are areas of saltmarsh which are being affected by coastal squeeze.

The Blackwater Estuary is designated as a shellfish water under the Shellfish Waters Directive. The aim of the EC Shellfish Waters Directive is to protect or improve shellfish waters in order to support shellfish life and growth, therefore contributing to the high quality of shellfish products directly edible by man. It sets physical, chemical and microbiological water quality requirements that designated shellfish waters must either comply with ('mandatory' standards) or endeavour to meet ('guideline' standards). One of the standards is the level of suspended solids; it states that "a discharge affecting shellfish waters must not cause the suspended solid content of the waters to exceed by more than 30% the content of waters not so affected".

Impact of development

Modelled discharge flows accounting for all developments suggest the discharge limit is currently not being exceeded and there is 19% headroom. By 2016/17 the consent limits will be exceeded. Projected dry weather discharge in 2020/21 is 2,814m^3 per day; this exceeds the current consent by 414m^3 or 15% per day. Therefore in order to accommodate planned growth an increase in consented discharge will be necessary.

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 1.7kg of ammoniacal nitrogen, and 8.3kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads and that at the current consented discharge the works were discharging at their consented sanitary limits. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Tiptree met BATNEEC standards it would not be sufficient to prevent the BOD limits being exceeded from as early as 2016/17; given that flow levels are already thought to be higher than the modelled values, BATNEEC is not considered a viable option at this location. If BAT was installed then the current consent limits would not be exceeded within the plan period. Since the Blackwater Estuary shellfishery could potentially be affected by increased discharge of suspended solids, additional action to limit these concentrations may also be required.

Virley Brook and Salcott Creek have not been assessed as part of the draft Water Framework Directive classifications for the area (Environment Agency, 2009). More detailed future assessment by the Environment Agency could able to provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Tiptree in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

For both employment and residential development to take place action will be required from AWS and/or individual developers to upgrade or expand the current STW. Funding will be required for both residential and mixed scenarios to extend/upgrade the sewer network from the start of the planning period.

Both the current consent limits for pollutant loads (as tested by Anglian Water) and the dry weather flow are not currently being exceeded and there is also a substantial headroom until 2016. As current pollutant loads are significantly under the consent limits it can be concluded that there will be some headroom in the consent in the near future.

Improvements to the sanitary treatment may require BAT technologies to allow standards to be met and will need to be applied towards the end of the planning period to enable the STW to continue to operate within these consents. This will require significant investment.

These conclusions are summarised in Table 5.12 below:

Table 5.12 - Tiptree STW Summary

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent				Potential increase consent
Sanitary Treatment Improvements				Potentially implement BAT Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

5.5 Flood Risk

As part of the Mid Essex SFRA, Colchester Borough had both a Level 1 and Level 2 SFRA available. As with all areas in England and Wales the Environment Agency have produced Flood Zone maps in line with PPS 25 and these have been compared with the proposed development sites to identify key areas of concern. The locations of Flood Zones 2 and 3 within the Borough are shown in Figure 5.16 (end of Section 5). Much of the future development land identified in Colchester is located within Flood Zones 1 and 2. However, some development has been located within Flood Zone 3.

Colchester's development is extensively located on Previously Developed Land within Regeneration areas, in accordance with the guidelines within PPS 3. Colchester is also subject to tidal and fluvial flooding, although the tidal flooding has been greatly reduced by extensive flood defences. The SFRA suggests that pluvial flooding is insignificant.

The effect of additional surface water flows from development sites is of more concern, and has been highlighted within the SFRA as a potential issue.

Development within Flood Zones 2 and 3 is only proposed in the East Colchester development area (including the University of Essex and Colne Harbour), the Town Centre and Fringe development area (North Station and Colchester Institute area) and also Rowhedge Port development, outside of the town. The SFRA also places the sites in East Colchester and at Rowhedge as being at risk of flooding due to modelled breaching of the flood defences.

Increase in surface water flows is also identified as potentially being a problem in those areas of predominantly greenfield development. These are primarily at the sites on the edge of Colchester (Rowhedge, Stanway and North Colchester) and will be discussed further in the relevant sections.

The selection of new development sites and the evaluation of existing sites should follow the guidance in PPS25 - Development and Flood Risk and use the Sequential and Exception tests where required. The Level 1 and Level 2 SFRAs will assist in the selection of sites in line with these tests.

5.5.1 Source Protection and Groundwater Vulnerability

As part of controlling surface water flooding, options may be considered that use retention or infiltration techniques. Therefore, before development can take place source protection and groundwater vulnerability issues must be appreciated and reviewed.

Source Protection Zones (SPZ) have been identified by the Environment Agency as requiring protection as water sources. Figure 5.17 shows the source protection zones within Colchester. For Colchester Borough these are primarily along the Stour River valley along the northern boundary of the Borough and away from any of the main development areas. One very small SPZ exists within the Town Centre and Fringe Development Area but this is barely noticeable. The only other area is a site to the south of Colchester between Blackheath and Abberton, again out of any potential development areas. If any development areas do overlap with the Inner Zone of an SPZ then the Environment Agency will not support the use of SUDS which use infiltration techniques for that area.

An assessment of the vulnerability of groundwater to diffuse sources of pollution has also been supplied by the Environment Agency. This shows that Colchester Borough is either within a non-aquifer area or within a minor aquifer. Minor aquifers are geological areas with some permeability but are not designated as producing large quantities of water for extraction. They are important, however, in feeding local supplies and feeding rivers. Of these minor aquifers the areas under Colchester and Tiptree have been highlighted as areas of high leaching potential, but mainly because of the lack of information in urban areas rather than from the underlying soil types. The groundwater vulnerability map for Colchester can be seen in Figure 5.18.

Table 5.13 below identifies the soil classification for both major and minor vulnerability areas which relate directly to the areas undergoing development in Colchester. None of the sites are underlain by Major aquifers. H refers to a high vulnerability, I to an intermediate vulnerability and L to a low vulnerability

Table 5.13- Soil Classification Table

Soil Class	Description
I1	Soils of intermediate leaching potential (I). Soils which can possibly transmit a wide range of pollutants
Hu	Designates a restored mineral working and/or urban areas where soil information is based on fewer observations and therefore classified a worst case vulnerability classification.
H1	Soils which readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.
L	Soils of low leaching potential in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal or they have the ability to attenuate diffuse pollutants.

National Rivers Authority Map 1995

5.6 Development Areas

The following sections outline specific issues relating to specific development areas within the Borough area. They do not repeat issues already discussed above.

5.6.1 North Colchester

North Colchester is an area of growth to the north of the town centre, extending roughly from the A12 south towards the railway, and to the west of High Woods Country park. It includes Mile End, Colchester General Hospital and Myland Hospital areas and some green fields to the west of Mile End Road. It is proposed that up to 4000 residential properties could be built in this area from 2008 to 2021 together with up to 32 hectares of employment related development. Just under 1,700 homes and approximately 1ha of employment land have already been developed in this area between 2001 and 2008, which is sufficient to meet the Core Strategy target of 2000 dwellings between 2001 and 2021.

Water supply, wastewater collection and water quality have been discussed in sections above. Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period. Wastewater from the area is treated at Colchester STW which has the constraints as listed in the section above. The detail issues with this area will relate to network capacity - both in terms of water supply and wastewater disposal. These have not been considered in depth as part of this study to date. AWS have stated that a new trunk sewer is required to take all flows from the future development within this area and SOS restrictions need to be removed. Their preferred start date for development in this area is after 2013, although measures are in place for growth accommodation within AMP5.

The SFRA for Colchester indicates that there are a few small streams and brooks within or adjacent to the area that have not been mapped by the Environment Agency as part of their mapping programme. It did not initially indicate drainage issues for the area or any historic flooding, however it did indicate that the potential surface water discharges would need to be carefully managed, particularly as many of the development areas in North Colchester are not Brownfield and therefore may not have existing infrastructure to manage additional surface water flow. Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise the situation in Colchester North, if no action is taken then the following situation would occur.

Table 5.14 - Situation in North Colchester Development Area if no action is taken:

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.15- Activities required in North Colchester development area to enable development to continue as planned

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment	Discharge Consent Increase required for both residential and employment development	Discharge Consent Increase required for both residential and employment development	Discharge Consent Increase required for both residential and employment development	Discharge Consent Increase required for both residential and employment development
Flooding	FRAs required	FRAs required	FRAs required	FRAs required
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Wastewater Infrastructure	New trunk sewer and removal of SOS restrictions.	Network Improvements	Network Improvements	Network Improvements
Water Supply Infrastructure				

5.6.2 Town Centre and Fringe

The growth area of Central Colchester and the Central Fringe extends from north of the railway station across the River Colne and down to the A134 and from Colchester Institute in the west to the railway bridge to the east. The trajectories provided by the Council indicate that just over 1,500 residential properties and 0.76ha of employment land are planned for construction between 2008 and 2021. Approximately 1,600 properties have already been built in this development area between 2001 and 2008, which is sufficient to meet the Core Strategy target of 2,000 houses.

Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period

Wastewater is treated at Colchester STW and water supply and water quality issues have been discussed in earlier sections. There may be issues relating to infrastructure for both water supply and wastewater disposal. Although measures are in place for growth accommodation within AMP5, AWS have stated that there is no capacity within the existing sewers for this development area. As the town centre is served by a combined sewer network, surface water will need to be separated from the foul for all new developments as a main planning consideration.

The River Colne flows through the middle of this development area and therefore there is the potential for both fluvial and tidal flood risk, although tidal risk is expected to stop at the lower edges of the area (and is more of an issue for the East Colchester Growth Area).

Currently functional floodplain (Flood Zone 3b), High Risk floodplain (Flood Zone 3a) and Flood Zone 2 dissects the development area. Existing development falls within the Flood Zone 3a and Zone 2 outlines with the current flood zone mapping. The SFRA indicates that with climate change slightly more land will be at risk, particularly upstream of North Bridge. A few of the detailed sites fall within the Flood Zone 3a outline and these will need careful consideration at the planning stage, together with detailed FRAs to address the risks.

Parts of this area are underlain by a minor aquifer and a tiny SPZ, classified as an Inner Zone is also located within the area. Unless a development site is located directly above this SPZ it is unlikely any restrictions will be placed on the use of SUDS. As mentioned above, the Environment Agency will not support the use of SUDS which use infiltration techniques on any development located above the Inner Zone.

The SFRA has identified possible problems with surface water drainage in the region of the Colchester Institute.

To summarise the situation in the Colchester Town Centre and Fringe Growth Area, if no action is taken then the following situation would occur.

Table 5.16 - Situation in Colchester Town Centre and Fringe Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:
Green - OK for development
Amber - Some issues now or in the near future
Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.17 - Activities required in Colchester Town Centre and Fringe development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment	Discharge Consent Increase for both residential and employment development			
Flooding	SuDS FRAs required - Exception test in some areas	SuDS FRAs required - Exception test in some areas	SuDS FRAs required - Exception test in some areas	FRAs required - Exception test in some areas
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure	Separation of foul and surface water for all development. Additional sewer infrastructure required	Separation of foul and surface water for all development. Additional sewer infrastructure required	Separation of foul and surface water for all development. Additional sewer infrastructure required	Separation of foul and surface water for all development. Additional sewer infrastructure required
Water Supply Infrastructure				

5.6.3 South Colchester (Garrison)

The growth area of South Colchester, also known as the Garrison area, is a well established regeneration area which sits to the south of the Town Centre and Fringe Growth Area, extending to the boundaries of the town. The housing and employment trajectories show around 2,500 dwellings and 3.6ha of new employment being developed in this area. Approximately 560 houses have already been development since 2001, which meets the Core Strategy target of 3,000 dwellings by 2021.

Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period

The whole area is served by the Colchester STW and the issues with the collection and supply are discussed above. It is likely that issues may occur with the capacity of the existing infrastructure to both supply and carry away water from new developments. Again AWS state that measures are in place for growth accommodation within AMP5, but this area requires SOS restrictions to be removed, with the preferred start date for development being after 2013.

The SFRA for Colchester does not identify any significant flooding within the area from rivers, streams or brooks. However it has identified historic problems with flooding from the arterial drainage network and this needs to be considered within the future planning processes in this area. Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise the situation in South Colchester, if no action is taken then the following situation would occur.

Table 5.18 - Situation in South Colchester (Garrison) Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.19 - Activities required in South Colchester (Garrison) development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment	Discharge Consent Increase for both residential and employment development	Process Increase		
Flooding	SuDS Drain flooding considerations	SuDS Drain flooding considerations	SuDS Drain flooding considerations	SuDS Drain flooding considerations
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure	Removal SOS restrictions			
Water Supply Infrastructure				

5.6.4 East Colchester

The East Colchester Growth Area extends along the River Colne corridor from the railway bridge to the east of the town centre to just downstream of the University site. The area covers both sides of the river including The Hythe and King Edward Quay. Within this area the trajectories show that an additional 2,560 dwellings and 13.8ha of new employment are planned for development between 2008 and 2021, with the employment land consisting of 7.19ha of land at Whitehall Road and 6.57ha of land at the University Research Park. Just under 850 dwellings have already been constructed since 2001, giving a total that exceeds the Core Strategy target of 2,600 dwellings between 2001 and 2021. The area contains the Colne Harbour Masterplan area.

Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period

Both sides of the river are served by the Colchester STW and are subject to the same water supply and water quality comments as the remainder of Colchester town. Again there is no capacity within the existing sewer network and AWS state the preferred location for any development is around the STW, or where flows from the new development can discharge directly to the STW, preferably after 2015. AWS do, however, state that appropriate measures are in place for development with the AMP5 period.

As this area again straddles the River Colne it falls within the Flood Zone 2 and 3 outlines. The area is at risk from both fluvial and tidal flooding, albeit that the tidal flood risk is significantly reduced by the presence of the Colne Barrier downstream of Wivenhoe. The SFRA has considered the failure of the Colne Barrier to try and establish the residual flood hazard if the barrier was to both fail open and be overtopped. This shows, as expected, a smaller flood risk area than the flood zones which are based on the barrier and raised defences not being in place.

There are significant areas within the Colne Harbour Masterplan area that fall within the current EA Flood Zone 3 area and even within the revised Zones developed as part of the SFRA. The SFRA gives recommendations as to which areas could be considered for which development types and which areas are at a level of risk that precludes all but water compatible development.

Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

In addition there is recorded arterial drainage flooding in the vicinity of the development area, particularly to the north of the river. This needs to be considered carefully within any planning decisions within the area to ensure suitable measures are put in place to prevent added pressure on the existing systems.

To summarise the situation in East Colchester, if no action is taken then the following situation would occur.

Table 5.20 - Situation in East Colchester Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Green	Green	Green	Amber
Wastewater Treatment	Red	Red	Red	Red
Flooding	Amber	Amber	Amber	Amber
Environment – Water Quality	Amber	Amber	Amber	Amber
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure	Grey	Grey	Grey	Grey

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.21 - Activities required in East Colchester development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment	Discharge Consent Increase for both residential and employment development	Process Increase		
Flooding	SuDS FRAs required - Exception test in some areas	SuDS FRAs required - Exception test in some areas	SuDS FRAs required - Exception test in some areas	SuDS FRAs required - Exception test in some areas
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure	Sewer network upgrade	Sewer network upgrade.		
Water Supply Infrastructure				

5.6.5 Stanway

Stanway is located to the west of Colchester town and has become adjoined to the town. The development is planned to the west and south of the existing development. Much of the development in the Stanway area is proposed to be on green field sites. The present trajectories propose the development of just under 1,200 dwellings and an additional 25.5ha of new employment use. The employment land includes the Tollgate and London Road development sites identified in the adopted Core Strategy. The Core Strategy also identifies a target of 1,000 houses to be built in the area between 2001 and 2021, which is surpassed by the planned development and 300 houses which have already been built.

Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period

As discussed in section 5.4 regarding wastewater, Stanway falls on the border of the catchments of the Copford STW and the Colchester STW. However the majority of both the residential and employment development is planned within the catchment of the Colchester STW and will therefore contribute to the discharge from that site. Water supply and water quality issues follow the same requirements as other locations within Colchester and it is expected that the infrastructure for both water supply and wastewater collection will require further consideration before extensive development takes place. AWS have commented that a new sewer is required to take all future development and SOS restrictions require removal, with the preferred start date for development in this area being beyond 2013. As the Copford STW is already exceeding its consented discharge, additional consent would need to be sought before any development could proceed which routes water to this works.

The SFRA rates flood risk in Stanway as being reasonably low with the only consideration being to local streams or brooks flowing through the area which may contribute to flood risk. However as the development is likely to consist of a high percentage of green field development the impact of potentially increasing surface water run off rates needs to be considered within planning applications for this area. Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise the situation in Stanway, if no action is taken then the following situation would occur.

Table 5.22 - Situation in Stanway Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.23 - Activities required in Stanway development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment	Discharge Consent Increase for both residential and employment development	Process Increase		
Flooding	SuDS FRAs required	SuDS FRAs required	SuDS FRAs required	SuDS FRAs required
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Wastewater Infrastructure	New sewer Removal SOS restrictions	New sewer Removal SOS restrictions		
Water Supply Infrastructure				

5.6.6 Colchester – Other Areas and Other Villages

Rather than being located within the main Growth Areas listed above, some development is planned for other areas of Colchester Town. This consists of approximately 400 dwellings between 2008 and 2021, the exact location of which has not been identified. Just under 1,300 houses have already been constructed in other areas of Colchester, which is more than sufficient to meet the 1,100 adopted Core Strategy target.

Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period

The whole area is served by the Colchester STW and the issues with the collection, supply and quality of water are discussed above. It is likely that issues may occur with the capacity of the existing infrastructure to both supply and carry away water from new developments. AWS have not provided comment in this area as there is insufficient detail on the location of the sites to make meaningful comment.

As mentioned in discussion of the other Growth Areas in Colchester, the town is at risk from both tidal and fluvial flooding and the SFRA has noted problems with surface water drainage and historic problems with flooding from the arterial drainage network. This will need to be considered within the future planning processes within this area, most probably through site specific flood risk assessments. Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise, if no action is taken in Colchester then the following situation would occur:

Table 5.24 - Situation in Colchester- Other Areas and Villages Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Green	Green	Green	Amber
Wastewater Treatment	Red	Red	Red	Red
Flooding	Amber	Amber	Amber	Amber
Environment – Water Quality	Amber	Amber	Amber	Amber
Wastewater Infrastructure				
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.25 - Activities required in Colchester Other Areas and Villages development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment	Discharge Consent Increase for both residential and employment development	Process Increase		
Flooding	SuDS FRAs required - Exception test in some areas	SuDS FRAs required - Exception test in some areas	SuDS FRAs required - Exception test in some areas	FRAs required - Exception test in some areas
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure				
Water Supply Infrastructure				

5.6.7 Wivenhoe/Rowhedge

Wivenhoe and Rowhedge sit on the east and west banks of the River Colne downstream of Colchester. Both of the settlements are upstream of the tidal barrier which prevents extreme tidal flooding within the River Colne. The trajectory for Colchester proposes around 600 dwellings within the two settlements, between 2008 and 2021. A further 300 dwellings have already been constructed in the area since 2001, which indicates the development is on track to exceed the target of 635 houses in the Core Strategy between 2001 and 2021.

Water supply is split in this area with Rowhedge being supplied by AWS and following the comments above for Planning Zone 56. Wivenhoe however falls within Veolia Water East (VWE) supply area. The dWRMP has been reviewed as part of the Tendring District analysis and has shown that provided that customer water efficiency is continued, leakage managed correctly and that the longer term projects to increase the size of Ardliegh Reservoir and the Ely-Ouse-Essex Transfer scheme are implemented towards the end of the study period then supply can be maintained to 2035.

Wastewater collection on both sides of the River Colne is handled by the Colchester STW and the issues regarding treatment and water quality are listed above. AWS have commented that measures are place for growth within AMP5 and that, with all flows pumping directly to the SOS, there is capacity for development to take place from 2010.

Both Rowhedge and Wivenhoe abut the River Colne and Rowhedge also sits on the confluence of the Colne and the Roman River. Although they are upstream of the Colne Barrier there is the potential for tidal flooding in addition to fluvial flooding. There are parts of Wivenhoe which may be a flood risk from fluvial flooding in the event that the barrier is closed and a 0.1% Annual Probability fluvial event comes down the River Colne. Parts of Wivenhoe are already shown falling within Flood Zones 2 and 3 and so future development will need to be carefully sited so that inappropriate development does not take place within these zones.

The development site within Rowhedge falls mainly outside the Flood Zone 2 and 3 although around 14% (from the SFRA) may fall within Flood Zones 2 or 3 and future development needs to be carefully sited to ensure that inappropriate development does not take place here.

The SFRA did not identify any drainage issues with either side of the river. Although all of the currently identified development sites in Rowhedge are Brownfield, the inclusion of surface water run off control must be considered to ensure that the current situation with surface water is not adversely affected. This is of particular importance if any Greenfield land is subsequently identified for development. Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise the situation in Rowhedge and Wivenhoe if no action is taken then the following would occur.

Table 5.26 - Situation in Rowhedge and Wivenhoe Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Water Supply Infrastructure	R	R	R	R
Wastewater Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.27 - Activities required in Wivenhoe/Rowheadge development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment	Discharge Consent Increase for both residential and employment development	Process Increase		
Flooding	SuDS FRAs required - exception tests in some areas	SuDS FRAs required - exception tests in some areas	SuDS FRAs required - exception tests in some areas	SuDS FRAs required - exception tests in some areas
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure	All flows to pump directly to SOS.			
Water Supply Infrastructure				

5.6.8 Tiptree

Tiptree is the largest settlement within the Borough outside of Colchester Town and it is planned to build just over 300 dwellings and 7Ha of new employment land between 2008 and 2021. The Core Strategy identifies a target of 620 houses within the planning period, of which 318 have already been constructed.

Tiptree is served by Tiptree STW which currently has sufficient headroom to cope with projected development to 2015/2016 after which time the projected DWF will exceed consented levels. If the employment land allowance is removed from the wastewater predictions then Tiptree STW has sufficient headroom to accommodate all the projected residential development. However, there is no spare capacity within the existing sewer network and, as such, AWS would prefer the new development to be situated around the STW or be connected so the wastewater flows directly to the STW.

Tiptree falls within Water Resource Planning Zone 63 which has been identified as requiring a transfer of water from the Colchester Planning Zone within AMP 5(2010-2015) to maintain adequate supply headroom.

The SFRA identifies that there are some small streams or drains running through or close to the development areas which could give rise to flooding, but that there are no major Flood Zones identified by the Environment Agency. The majority (80%) of development (included both the proposed and developed sites) is proposed on Brownfield sites so the potential impact of development on surface water run off will be reduced although surface water will need to be considered within any planning applications. Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise the situation in Tiptree if no action is taken then the following situation would occur.

Table 5.28 - Situation in Tiptree Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:
Green - OK for development
Amber - Some issues now or in the near future
Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.29 - Activities required in Tiptree development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management Transfer from Colchester	Demand management Transfer from Colchester	Demand management Transfer from Colchester	Demand management Transfer from Colchester
Wastewater Treatment	Within 20% of DWF consent.	Within 20% of DWF consent.	Within 20% of DWF consent.	Within 20% of DWF consent. Additional consent required for employment development.
Flooding	SuDS FRAs required	SuDS FRAs required	SuDS FRAs required	SuDS FRAs required
Environment – Water Quality			BAT required	BAT required
Wastewater Infrastructure	Direct connection to STW or upgrade/expansion of existing sewers.			
Water Supply Infrastructure				

5.6.9 West Mersea

West Mersea is on Mersea Island, located on the southern side of Colchester Borough. The island is bounded by the mouth of the River Blackwater estuary to the south, the Strood and Pyefleet channels to the north and the River Colne to the east. West Mersea is in the south western corner of the island.

The projected development in this area is for 122 residential properties between 2008 and 2021, together with a small amount of employment land development. Approximately 158 houses have already been constructed since 2001, indicating a sufficiently allocation to meet the adopted Core Strategy target of 280 dwellings.

Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period

West Mersea is served by its own sewage treatment works which has apparently sufficient headroom at the current time to absorb the projected development in the area. However AWS have raised concern regarding the capacity of this STW. They have also identified that there is no capacity within the existing sewers and, as such, their preferred location for new development is around the STW or with direct connections to the STW. As a consent exceedance has not been identified for this STW, no environmental analysis has been carried out for this catchment. However, as the waters of the Blackwater Estuary have both bathing and Shellfish Waters then any increase in flows from West Mersea should not have any adverse impact on these areas.

The SFRA does not specifically consider the development area in West Mersea. Breaching of the tidal defences to the north and east of West Mersea has been considered as part of the SFRA but these areas do not encroach on the main area of development. The Flood Zones show some tidal flooding around the edges of the conurbation; however the identified development area is well outside of these areas. If development was to be proposed closer to the shoreline then additional consideration of either tidal flooding or residual flood risk due to breaching would be required.

Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise, if no action is taken in West Mersea then the following situation would occur.

Table 5.30 - Situation in West Mersea Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.31 - Activities required in West Mersea development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment				
Flooding	SuDS FRAs required	SuDS FRAs required	SuDS FRAs required	SuDS FRAs required
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	Direct connection to STW or upgrade/expansion of existing sewers.			
Water Supply Infrastructure				

5.6.10 Marks Tey

Marks Tey is located to the west of Colchester, just north of the A12. No employment development is planned within this area and just 36 houses are forecast between 2008 and 2021 to meet the adopted Core Strategy target of 70 dwellings within the planning period. The exact location of these houses has not yet been confirmed.

Marks Tey is served by the Copford STW, which has been identified as already exceeding its consented discharge. Additional consent would need to be sought before any development could proceed. AWS have not identified any restrictions within the sewer network.

Water in this area is supplied by AWS, with Marks Tey falling within the Planning Zone 55. No actions have been identified for this area within the planning period, although beyond 2025 AWS have identified the need for general demand management and a transfer from Planning Zone 56 to maintain adequate supply headroom.

Marks Tey is not specifically mentioned within the SFRA. The Roman River runs to the north east of the village, but the village itself is not intersected by the Flood Zones or significant watercourses. However, if the new development is to be located on Greenfield land sufficient consideration should be given to treatment of surface water.

Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise, if no action is taken in Marks Tey then the following situation would occur:

Table 5.32 - Situation in Marks Tey Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	G	G	G	G
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.33 - Activities required in Marks Tey development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management
Wastewater Treatment	Discharge Consent Increase required or both residential and employment development.			
Flooding	SUDS	SUDS	SUDS	SUDS
Environment – Water Quality	BAT required	BAT required	BAT required	BAT required
Water Supply Infrastructure	Nothing identified by AWS			
Wastewater Infrastructure				

5.6.11 West Bergholt and Great Horkesley

West Bergholt and Great Horkesley are two of the larger villages located to the northeast of Colchester, beyond the A12. Great Horkesley is identified to receive the majority of the rural development, with 130 dwellings planned between 2008 and 2021, whereas West Bergholt has an allocation of just 20 dwellings. The adopted Core Strategy targets for West Bergholt and Great Horkesley are 50 and 160 dwellings respectively and both are on target to meet these allocations. At present no employment sites have been identified in either location.

Water is supplied from AWS' Planning Zone 56, which poses little constraint to development within the planning period other than demand management. An increase in water yield is planned from an extension to Ardleigh reservoir towards the end of the planning period

Both villages are located in the catchment area of the West Bergholt STW. This is currently, and predicted to continue, operating below its consented discharge throughout the planning period. As such no environmental analysis has been carried out for this area. Although AWS have identified West Bergholt as having capacity within its sewer network for the development to go ahead, they have identified that there is no spare capacity within the network for Great Horkesley. As such, they would prefer the development for Great Horkesley to be located nearer the north of the Colchester development area and pump directly to the Colchester sewers.

The River Colne flows to the southwest of West Bergholt, although currently none of the main development of the village falls within the Flood Zones. St Botolph's Brook flows to the south west of both Great Horkesley and West Bergholt, just downstream of which it joins the River Colne. Numerous tributaries of these watercourses dissect the general area and in some locations lie in proximity to the villages. Although the area around the

Tile House Farm, the main development area in Great Horkesley, appears to be situated away from these watercourses, it is recommended that any development in these Growth Areas is undertaken in line with the recommendations of site specific FRAs. It is also recommended that sufficient consideration of surface water discharge is given to any Greenfield development, such as Tile House Farm.

Parts of this area are underlain by a minor aquifer. It is unlikely that any restrictions will be placed on the use of SUDS.

To summarise, if no action is taken in Great Horkesley and West Bergholt then the following situation would occur:

Table 5.34 - Situation in West Bergholt and Great Horkesley Development Area if no action is taken:

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure (Horkesley)	A	A	A	A
Wastewater Infrastructure (West Bergholt)	G	G	G	G
Water Supply Infrastructure				

Note:
Green - OK for development
Amber - Some issues now or in the near future
Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.35- Activities required in West Bergholt and Great Horkesley development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment				
Flooding	SUDS FRAs required	SUDS FRAs required	SUDS FRAs required	SUDS FRAs required
Environment – Water Quality	-	-	-	-
Water Supply Infrastructure	Great Horkesley to pump to Colchester sewers	Great Horkesley to pump to Colchester sewers	Great Horkesley to pump to Colchester sewers	Great Horkesley to pump to Colchester sewers
Wastewater Infrastructure				

5.6.12 Other Villages

Some development has been identified as being required in other rural areas of the Borough. This development is very limited, consisting of just 15 dwellings close to Eight Ash Green (Halstead Road) and 10 dwellings at Langenhoe. Additional minor developments may come forward through windfalls or as part of the small site allowance.

The Halstead Road development is located within the Colchester STW catchment. As mentioned above, some capacity and water quality issues have been identified with this STW and it is likely that additional consent will need to be sought. This development is too small, however, to have much of an impact on the works. No comment has been provided by AWS for the rural areas of the Borough.

The Langenhoe development is located within the catchment of the Fingringhoe STW. This STW is currently operating within its consented flow and the proposed development is so small in scale that it would not have a significant effect on the discharge. No environmental analysis has therefore been undertaken for this STW.

Both areas are supplied with water from PZ56 and supply issues are discussed above. It is likely that issues may occur with the capacity of the existing infrastructure to both supply and carry away water from new developments.

Neither area is identified within the SFRA as being in an area of flood risk, although a small brook does flow through the village of Eight Ash Green, which if in proximity to the development site, may warrant the need for a site specific FRA. Langenhoe is located in proximity to the Abberton Reservoir, but appears to be at an elevation not at risk from a breach in the dam.

Many areas of the Borough are underlain by minor aquifers, which should not pose a constraint upon the use of SUDS. However, a couple of areas are underlain by the Inner Zones of SPZs, the largest of which is located just north of Langenhoe. If a development site falls on top of one of these Inner Zones, the Environment Agency will not support the use of SUDS which use infiltration techniques.

To summarise, if no action is taken the areas of Eight Ash Green and/or Langenhoe then the following situation would occur:

Table 5.36 - Situation in Colchester Borough Other Villages Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Green	Green	Green	Amber
Wastewater Treatment – Eight Ash Green	Red	Red	Red	Red
Wastewater Treatment – Langenhoe	Green	Green	Green	Green
Flooding	Green	Green	Green	Green
Environment – Water Quality (Eight Ash Green only)	Amber	Amber	Amber	Amber
Wastewater Infrastructure	Grey	Grey	Grey	Grey
Water Supply Infrastructure	Grey	Grey	Grey	Grey

Note:
Green - OK for development
Amber - Some issues now or in the near future
Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 5.37 - Activities required in Colchester Borough and Other Villages development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management Ardleigh Reservoir Extension
Wastewater Treatment – Eight Ash Green	Discharge Consent Increase for both residential and employment development.	Process Increase		
Wastewater Treatment – Langenhoe				
Flooding	SUDS Potential FRAs	SUDS Potential FRAs	SUDS Potential FRAs	SUDS Potential FRAs
Environment – Water Quality	Eight Ash Green requires BATNEEC	Eight Ash Green requires BATNEEC	Eight Ash Green requires BATNEEC	Eight Ash Green requires BATNEEC

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Infrastructure				
Wastewater Infrastructure				

5.7 Summary Timeline

The following table shows a summary of the current state of each of the development areas in terms of issues with the three areas considered, water supply, wastewater, environment and flooding.

Table 5.38 - Summary Timeline

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
North Colchester	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Colchester Town Centre and Fringe	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
South Colchester (Garrison)	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
East Colchester	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Stanway	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Colchester – Other Areas	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure				
	Water Supply Infrastructure				
Wivenhoe/ Rowhedge	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Tiptree	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
West Mersea	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Marks Tey	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	G	G	G	G
	Water Supply Infrastructure				
West Bergholt and Great Horkesley	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure (Horkesley)	A	A	A	A
	Wastewater Infrastructure (West Bergholt)	G	G	G	G
	Water Supply Infrastructure				

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Other Villages – Eight Ash Green and Langenhoe	Water Supply Resources				
	Wastewater Treatment - EAG				
	Wastewater Treatment - Lan				
	Flooding				
	Environment – Water Quality (Eight Ash Green only)				
	Wastewater Infrastructure				
	Water Supply Infrastructure				

The key activities required to resolve the "red" time periods above are:

Water Supply - Implementation of proposed transfer of water from Planning Zone 56 - Colchester to Planning Zone 63 - Tiptree
Wastewater - Implement proposed discharge consent increases and process improvements at Colchester STW and Copford STW.
Upgrade/extension of existing sewers or implementation of new sewer
Water Quality - Implementation of BAT technologies, and therefore significant investment, to keep pollution levels within consent.

5.8 Constraints to Development

The previous sections detail the issues and in many cases the worse case scenarios with regard to development within the area. This precautionary practice has been adopted to try and ensure that discussion and consultation is undertaken with the relevant authorities and responsible organisations before development takes place.

The main constraints to development and activities required are indicated below.

Water Supply - both AWS and VWE are confident of maintaining supply provided activities put forward within their WRMP and Business Plans are implemented as programmed.

Wastewater treatment capacity Colchester, Marks Tey and Tiptree - discharge consent increases required if development continues as proposed.

Flooding - ensure appropriate development within potential flood areas. Use PPS25 - Development and Flood Risk sequential and exception tests in these areas such as Sproughton where development sites are close or in existing Flood Zones 2 and 3.

Sanitary treatment capacity at Tiptree, Copford and Colchester - investigate available treatment headroom to accept discharge increases. AWS consider levels of investment in improving sanitary treatment processes if required.

Wastewater Infrastructure - undertake additional investigation and modelling with detailed site allocations to establish infrastructure limits. Consider locating development closer to sewage treatment works in West Mersea, Tiptree, Wivenhoe/Rowhedge and Great Horkesley in the short term to allow infrastructure improvements to be developed in the future if required.

6 SITE SPECIFIC RESULTS - IPSWICH BOROUGH

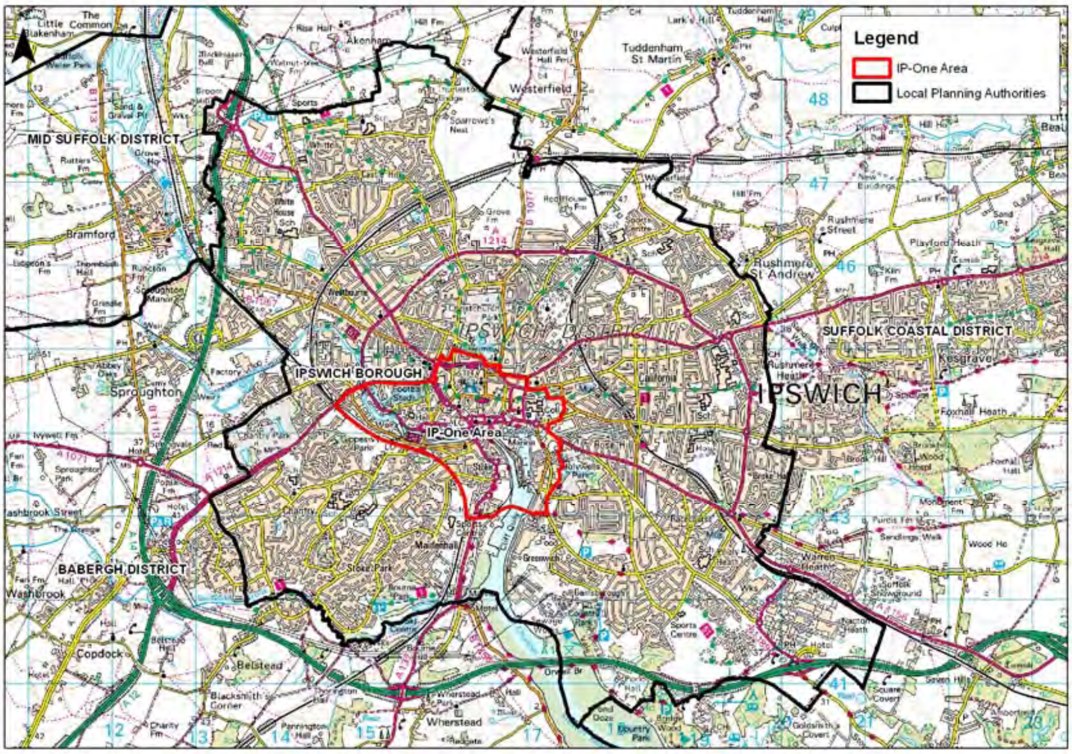
6.1 Introduction

The following section contains information which is specific within the Haven Gateway Water Cycle Study for Ipswich Borough. The section has been divided up into a number of parts. The first few sections describe the Borough area, its development plans and Council wide issues relating to water supply, waste water disposal (including water quality) and flood risk management. Following that, the further sections will consider specific development areas in more detail where appropriate. Finally, a timeline showing potential actions has been developed.

6.2 Ipswich Borough and Development

Ipswich Borough covers the major conurbation of Ipswich which is in the centre of the Haven Gateway Sub Region and is the larger of the two major towns in the region. The location of the Borough with regard to the adjacent Local Authorities is shown in Figure 6.1.

Figure 6.1: Haven Gateway Ipswich Borough Location



Because of the desire to grow the town of Ipswich and the surrounding area, and the general lack of readily available development land within the Ipswich Borough area a specific policy area, the Ipswich Policy Area, has been developed by Suffolk County Council and the local planning authorities. This area contains all of Ipswich Borough and parts of Mid Suffolk, Suffolk Coastal and Babergh Districts.

Ipswich Borough Council is well advanced with their Local Development Scheme. Both the Core Strategy and Site Specific documents have been submitted and are in the process of examination with adoption expected in December 2009 for the Core Strategy and early 2011 for the Site Specific documents. The current Local Development Framework covers the period 1998-2006 and was adopted in November 1997.

The residential and employment development trajectories for the study period are shown in Figures 6.2 and 6.3 below.

Figure 6.2 - Ipswich Housing Trajectory 2006/7 to 2020/21

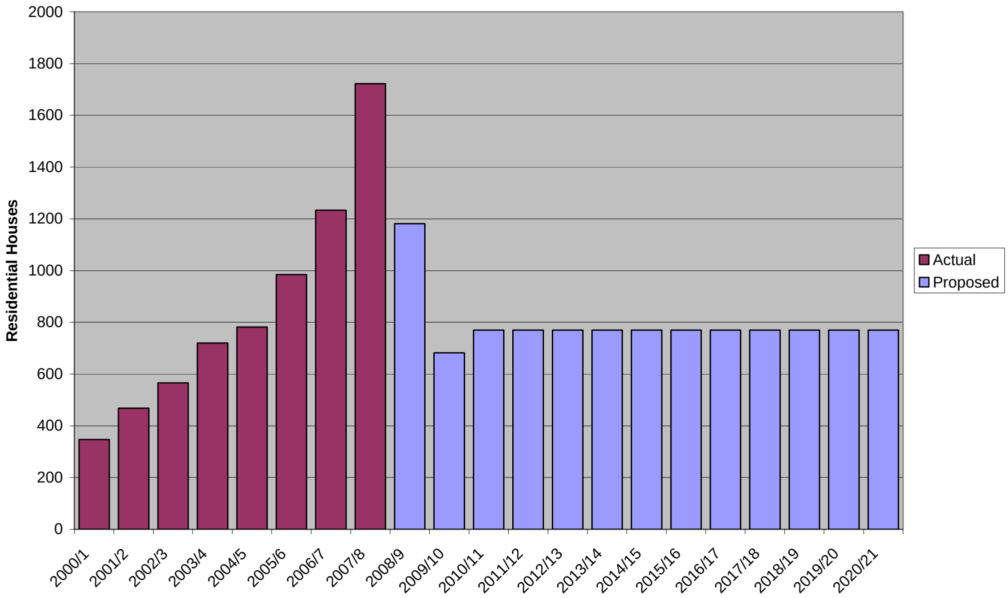
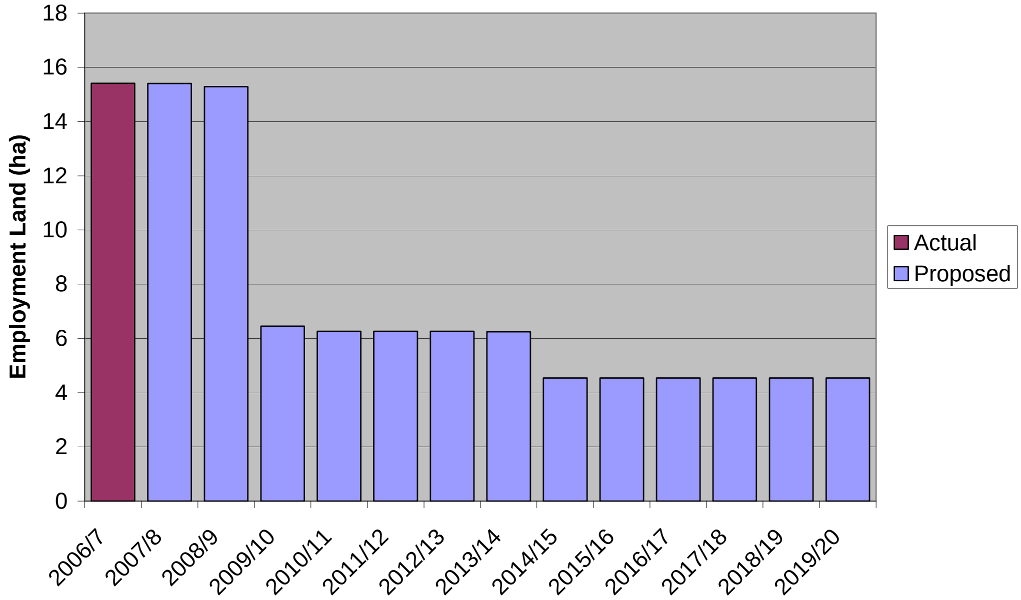


Figure 6.3 - Ipswich Employment Trajectory 2006/7 to 2020/21



This trajectory shows some 17,000 houses being built from 2001 to 2021 and around 12,000 from 2007/8 to 2020/21. This is in excess of the 15,400 residential houses proposed within the Secretary of States Proposed Changes to the East of England Plan: December 2006 which covers the period 2001 to 2021. Of the 12,000 units a number are already under construction or in areas where planning permission has already been granted or where a resolution to grant planning permission has been made. Ipswich Borough have therefore identified a need for sites to be allocated for a further 6,800 units.

The development is spread across Ipswich, but with a large proportion within the IP-One development area. The IP-One area is a major area of development centred on the existing centre of Ipswich and the docks/marina. The area is shown in Figure 6.1 above. The IP-One Area Action Plan - Preferred Options document suggests allocated sites for around 3,500 residential properties within the area.

The Water Cycle Study will consider the consequences of the full allocation of development (both built, with planning and to be allocated) so as to reflect the impact on the water cycle.

The trajectory for employment land within Ipswich Borough gives around 105 Ha to be developed from 2007/8 to 2020/21. This excludes re-development of existing employment land within the IP-One area of Ipswich as it has been taken that the existing discharges in these areas will be similar following any re-development.

Ipswich has been divided into three specific development areas which cover the majority of the proposed allocated sites. These are:

- IP-One Area
- Ipswich North
- Ipswich East

These areas are shown in Figure 6.4 (end Section 6)

There are also a few other sites scattered across the other parts of Ipswich which are not considered as separate areas.

6.2.1 Ipswich Policy Area

Ipswich Borough has a tightly defined administrative area with few areas available for peripheral expansion. However parts of the ‘greater’ Ipswich urban area extend into the three adjoining districts - Mid Suffolk, Babergh and Suffolk Coastal. As a basis for planning the distribution of development in and around Ipswich, an ‘Ipswich Policy Area’ has been identified which has its own overall total of housing allocations.

The East of England Plan identifies that the Ipswich Policy Area should provide at least 20,000 new housing units between 2001 and 2021. Policy H1 of the Plan states that this should be at least 15,400 within Ipswich and up to 600 in Babergh, up to 3,200 in Suffolk Coastal and up to 800 in Mid Suffolk.

There are considerable outstanding Greenfield housing commitments within the Ipswich Policy Area. The effect of these proposals would be to achieve a higher degree of concentration of new Greenfield allocations within Ipswich itself.

6.3 Water Supply

Ipswich Borough is supplied by one water company, Anglian Water Services and is located within AWS's East Suffolk and Essex WRZ10 and within Planning Zone – PZ60 Ipswich. AWS have identified a potential deficit in supply in 2035 of -16.68Ml/d with the deficit identified as a result of planned growth and predicted impact of climate change on reservoir supplies.

This WRZ is predominantly supplied by groundwater from the Chalk aquifer, although surface water stores are also located at Alton and Ardleigh (the latter of which is jointly operated with THWS). Within the PZ located within Ipswich Borough, water management options have been proposed to maintain the supply-demand balance, including an allowance for target headroom. These are detailed within Section 3, with a number of options scheduled within AMP5 and AMP6, as detailed in Table 6.1.

However, please note: The following feasible options for addressing water supply in the area have been based on the draft WRMP. This document is now being finalised and the final version should be referenced to ensure that these options are still those preferred by the water company

Table 6.1: Timeline of Preferred Water Resource Activities for Ipswich PZ

	PZ	AMP 5	AMP6	AMP7	AMP8	AMP9	Activity
Ipswich WS Area	60						General demand management
							Bucklesham ASR Scheme
							Ipswich discharge re-use

The Ipswich discharge re-use, which provides the bulk of the extra supply, is achieved by returning discharges to the tidal River Orwell after additional treatment to the River Gipping for abstraction to refill Alton Water reservoir. The Bucklesham Aquifer Storage Recovery Scheme would utilise the current licence to abstract from the Mill River to the east of Ipswich. The scheme would treat the surface water resource of the Mill River for direct supply and store surplus surface water when available in the underlying confined Chalk aquifer for abstraction when the flows in the river were low.

Through these activities AWS are satisfied that they have sufficient options to maintain the supply-demand balance, although the number of assumptions and reliance upon the options must be appreciated and may cause barriers to development. In addition it must be borne in mind that the capacity and extent of the water supply network has not been reviewed here and may prove a limit or additional cost with regards to the location of the proposed development.

6.4 Wastewater Collection and Treatment

The area of Ipswich Borough is serviced by only two sewage treatment works, of which one – Cliff Quay STW – covers the vast majority of the areas. Figure 6.5 (end of Section 6) shows the catchment areas of both these STWs, both of which are affected by the proposed development. In addition both STW receive water from outside of the Ipswich Borough Area, Chantry STW from Babergh and Cliff Quay from Babergh, Mid Suffolk and Suffolk Coastal.

Based on the measured DWF values for 2007(JR08), together with the current Consented DWF values, the present day available headroom for both STWs are shown in Table 6.2 below.

Table 6.2 : Discharge capacities of STWs in Ipswich Borough

STW Code	Site Name	Consented DWF (m^3/d)	Measured DWF 2007/JR08 (m^3/d)	Headroom (m^3/d)
CLQYST	IPSWICH-CLIFF QUAY RAEBURN STW	34213	24624	9589
CHANST	CHANTRY STW	5200	3229	1971

The results of the projected wastewater analysis for the two STWs affected by the current planned development are presented in **Table 6.3** below. This shows whether the headroom at each STW in each year is more than 20% of the consented DWF (Green), between 20% and 0% (Amber) and negative headroom (Red).

Table 6.3: Summary of STW Headroom for affected STWs in Suffolk Coastal District – Employment and Residential Development

STW Ref.	Catchment Settlement(s) / Development Area	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Cliff Quay*														
CHANST	Chantry (Pinewood)														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Note: * *Cliff Quay contains the development projections across its entire catchment, including development in Suffolk Coastal District, Ipswich Borough and Mid Suffolk District.*

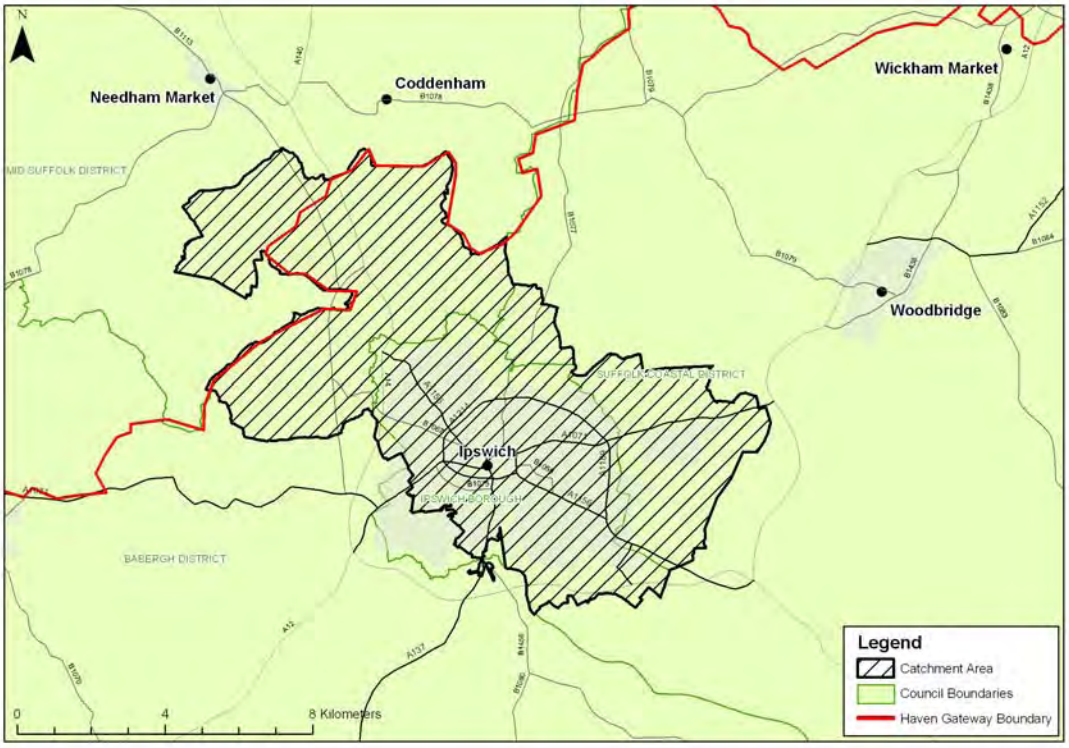
This shows Cliff Quay with a lack of headroom to cope with the projected growth of both housing and employment over the study period and Chantry coming within 20% of the limit of its headroom. As Cliff Quay is potentially an issue within the study period it is considered further in the following section.

Very limited information was available for this study with which to make an assessment of the capacity of the wastewater infrastructure (sewer pipes, pumping stations etc). However, brief comment was provided by AWS for each of the STW catchments in which a future potential for residential development has been identified. These are discussed within the analysis of STWs and development areas below.

6.4.1 Cliff Quay

Cliff Quay STW (CLQYST) is located in Ipswich Borough. However, as illustrated in Figure 6.6, its catchment extends over 4,500ha covering most of Ipswich Borough but also parts of the Districts of Mid Suffolk, Babergh and Suffolk Coastal, a current total population of over 120,000.

Figure 6.6- Location of Cliff Quay STW Catchment



It therefore cannot be analysed independently within any one District and must consider the cumulative development in all four. Over the planning period (2001-2021) a total of 20,762 houses and just over 150ha of employment land are planned within the catchment of CLQYST, spread between Ipswich Borough, Mid Suffolk District, Babergh District (employment development only) and Suffolk Coastal District. CLQYST has a current consented DWF (cDWF) of 34,213m³/d, illustrated in Table 6.4.

Table 6.4- Discharge Capacity of the Cliff Quay STW, displaying current consented DWF, measured DWF and headroom availability

Site Name	STW	Current Consented DWF (m^3/d)	Measured DWF (m^3/d)	Headroom (m^3/d)
Ipswich Policy Area	CLQYST	34,213	24,624	9,589

As shown in Figure 6.7 and Table 6.5 below, the planned development, considering both employment and residential, will exceed this consent in 2014/15, reaching a maximum of almost 29% exceedance by 2020/21.

Figure 6.7: Cliff Quay STW percentage headroom – residential and employment development

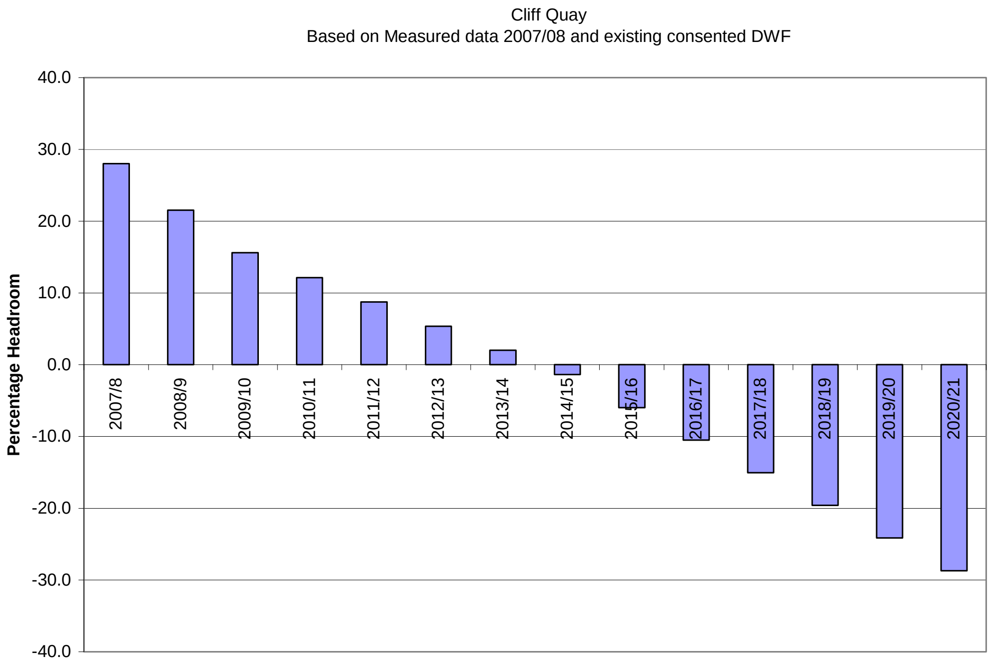


Table 6.5 - Headroom availability of the Cliff Quay STW - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Ipswich Policy Area*														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Note: * *Cliff Quay contains the development projections across its entire catchment, including development in Suffolk Coastal District, Ipswich Borough and Mid Suffolk District.*

AWS however are only legally obliged to process sewage from residential development. When this is separated from the employment then the STW remains below its cDWF throughout the planning period, and remains almost 13% below the cDWF at the end by 2020/21, as shown in Figure 6.8 and Table 6.6 below.

Figure 6.8: Cliff Quay STW percentage headroom – residential development only

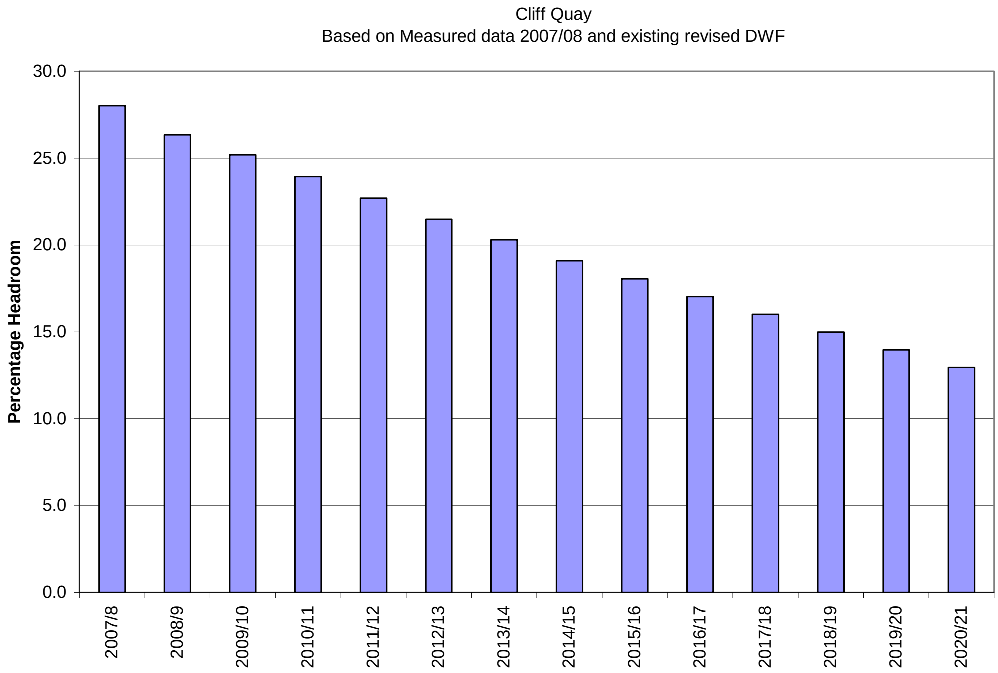


Table 6.6 - Headroom availability for the Cliff Quay STW, which concerns only residential development data

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Ipswich Policy Area*														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Note: * *Cliff Quay contains the development projections across its entire catchment, including development in Suffolk Coastal District, Ipswich Borough and Mid Suffolk District.*

AWS have considered the potential impact of development on the Cliff Quay STW and have provided a summary of their findings for use within this WCS. Within their analysis they have considered 8,562 additional dwellings within the catchment between 2008 and 2016, which is roughly equivalent to the 8,789 dwellings considered within this study.

They have identified the main problems and restrictions in the system as being related to the volume of surface water discharge entering their combined sewer systems, resulting in flooding, and the underperformance of a Sludge Treatment Centre which impacts heavily on the STW. AWS consider the Sludge Treatment Centre to be the main limiting factor to the STW and therefore propose to replace it within AMP5, which they claim will enable the STW to continue within the existing flow and sanitary consent parameters until 2021 and beyond. They do not expect any changes in the DWF consents during the proposed growth period. In addition they suggest that tighter planning policies with regards to the surface water runoff would assist by limiting storm discharge and using site storage where the existing sewers are under capacity.

A long term potential strategy for the STW catchment announced by AWS is a potential diversion of flows to the neighbouring Sproughton STW. However, as identified within this report, that too is under pressure from the proposed development indicating that, without expansion or improvement, it is unlikely to be able to accept an increase in flows.

Environmental Considerations

Cliff Quay STW (consent AEETS/12128B, modified 2005) discharges into the tidal River Orwell (Grid Reference TM 1714 4144). The current consented dry weather flow discharge is 34,213m^3 per day. The current discharge consents state that the discharge shall not exceed:

- 200 milligrammes per litre of suspended solids;
- 175 milligrammes per litre of BOD; or
- 50 milligrammes per litre of ammoniacal nitrogen.

As there is still headroom in the current consent, it can be assumed that these discharge limits will still be acceptable. It should further be noted that current discharges are currently significantly more dilute than the consent allows for.

Anglian Water monitoring of the discharge point takes place to ensure that these consent limits are maintained. Samples for Cliff Quay STW indicate the levels are sufficiently under the limits for suspended solids and BOD (25% of the consented limit for BOD and 15% of the limit for suspended solids). Levels of ammoniacal nitrogen are frequently up to the consent limit. This indicates that future increases in discharges could have an impact to the levels of these pollutants.

The current state of the receiving environment

The Cliff Quay STW discharges directly into the Stour and Orwell Estuaries Ramsar, SPA and SAC designated site. The SSSI condition of the nearest Orwell Estuary units, which directly relate to the condition of the European designated areas, is a mix of 'favourable' and 'unfavourable, no change'. The units are predominantly saltmarsh, indicating that saline influences are greater in the area and suggesting that variations in river quality will not directly jeopardise the integrity of the site. The unit which is unfavourable, no change condition is so due to coastal squeeze and the resulting erosion of saltmarsh.

Shotley STW also discharges directly into the River Orwell, approximately 11km downstream of the Cliff Quay STW outfall. Also the Sproughton STW discharges into a river which connects with the Orwell Estuary.

The impact of development

Modelled discharge accounting for all development types will exceed the consented limit in 2014/15 and this will continue to increase in the future. Projected dry weather discharge in 2020/21 is 39,666m^3 per day; this exceeds the consent limit by 14% or 5,453m^3 per day.

Shotley, Sproughton and Cliff Quay STWs are expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Orwell Estuary is considered unlikely due to the size and diluting action of the estuary.
Where possible the WFD objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Whilst current discharge concentrations are lower than the consented limits, the reported values suggest that treatment is not currently achieving Best Available Technology (BAT) or Best Available Technology Not Entailing Excessive Costs (BATNEEC) levels (see Section 2.5). Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Cliff Quay met BATNEEC standards then the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Cliff Quay STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Cliff Quay in-combination with other discharges into the same watercourse. An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

With the exception of the replacement of the Sludge Treatment Centre and the reduction in surface water flows, AWS do not consider any further action is required for this STW within the planning period for residential development. However, as shown above, some degree of expansion/upgrade of the STW will be required in order to accommodate both residential and employment development.

Action will be needed, either by AWS (possibly funded by others), or by individual developers to cope with the discharges from the proposed employment development which, as identified above, could have a significant impact on the total flows within the catchment (potentially upwards of 10,000m3/d by 2021) and for the required improvements to the sewer network.

Modelling of predicted flows indicates that the consent limit is not currently being exceeded and will not be exceeded until 2014/15. Current testing undertaken by Anglian Water indicates that the pollutant loads are sufficiently under the designated limits (75% under) and this should be taken into consideration when assessing the future impacts. There is the potential that future flows will not exceed the pollutant loads in the consent.

In addition, the water quality analysis indicates that this STW requires an upgrade to its treatment procedures through the application of BATNEEC technologies in order to remain below its target pollutant limit throughout the planning period from 2014.

Table 6.7 - Cliff Quay STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Reduce surface water inflow	Reduce surface water inflow	Reduce surface water inflow. Re-route to Sproughton or increase consent	Reduce surface water inflow. Re-route to Sproughton or increase consent
Sanitary Treatment Improvements	Replacement of STC		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

6.5 Flood Risk Management

Ipswich Borough Council has prepared a Level 1 Strategic Flood Risk Assessment as part of the supporting documentation to their Local Development Scheme. This was issued as Draft in November 2007. The assessment considers flooding within the borough from a range of sources - tidal flooding, Main River fluvial flooding, localised flooding and groundwater. As with all areas in England and Wales the Environment Agency have produced Flood Zone maps in line with PPS 25 and these have been compared with the proposed development sites to identify key areas of concern. Figure 6.9 (end of Section 6) shows the locations of Flood Zones 2 and 3 within the Borough.

The SFRA acknowledges that there are significant flood risk issues within the Borough, primarily relating to tidal flood risk adjacent to the Orwell and River Gipping, together with surface water and drainage issues.

The SFRA recognises that the tidal flood risk will increase with projected climate change and that although flood defences will be able to reduce the risk of flooding, that they will not remove this risk. It also comments on the current standard of the tidal flood defences and the need for improvements to maintain the current levels of protection.

The Environment Agency are proposing improvements to the tidal flood defences in Ipswich which include a flood defence barrier across the Orwell together with flood defence raising downstream. This is proposed to provide flood defence standards of 1 in 300 years (0.33% Annual Probability) upstream of the barrier at New Cut after 100 years of climate change. Downstream of the barrier defence standards will be restored to the 1% Annual Probability (1 in 100 years) level of protection by primarily improving the defences on the west bank of the estuary.

Works are currently proposed to commence on tying in the barrier location to high ground in 2009/2010 with the barrier being constructed between 2010 and 2012. The dates for construction of the barrier are dependant on obtaining funding for the scheme and therefore these dates are not final.

Further details on flood risk within the development areas are given in Section 6.6 below, whilst additional information on general flood risk within the Borough can be obtained from the SFRA.

The selection of new development sites and the evaluation of existing sites should follow the guidance in PPS25 - Development and Flood Risk and use the Sequential and Exception tests where required. The Level 1 SFRA and, if completed, any Level 2 SFRA will assist in the selection of sites in line with these tests.

6.5.1 Source Protection and Groundwater Vulnerability

As part of controlling surface water flooding, options may be considered that use retention or infiltration techniques. Therefore, before development can take place source protection and groundwater vulnerability issues must be appreciated and reviewed.

Source Protection Zones (SPZ) have been identified by the Environment Agency as requiring protection as water sources. As shown in Figure 6.10, a number of Source Protection Zones (SPZs) are located within the study area of Ipswich Borough. The key Inner Zone areas are located within the centre of Ipswich close to the River Gipping and to the south west in the area of Stoke Park.

These two areas contain proposed development areas which will need careful consideration during the planning process, and because of the wider areas of the identified Outer Zone (which covers all the land to the west of the River Gipping together with the centre of Ipswich) consideration will need to be given to infiltration schemes and potential pollutants. The Environment Agency will not support the use of SUDS which use infiltration techniques on any development sites which overlap the Inner Zone.

An assessment of the vulnerability of groundwater to diffuse sources of pollution has also been supplied by the Environment Agency. Figure 6.11 shows the groundwater vulnerability classifications present within Ipswich Borough. Aquifers extend underneath almost all of the study area of Ipswich Borough, although most of these are classified as

‘Minor’. The majority of the area is “U” classified - i.e. urban, where because of limited soils information a worse case scenario has been adopted. In the region of the river Gipping this has been defined as a ‘Major’ aquifer, because of its proximity to the river and the potential permeability of the adjacent soils.

Three main soil types are present, which are classified in terms of their vulnerability as described in the following table. H refers to a high vulnerability, I to an intermediate vulnerability and L to a low vulnerability. The numbers refer to the soil type.

Table 6.8: Aquifer Soil Types Present within Ipswich Borough as shown on Figure 6.10

Soil Classification	Description
H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.
HU	Designates a restored mineral working and/or urban areas where soil information is based on fewer observations and therefore classified a worst case vulnerability classification.
I1	Soils which can possibly transmit a wide range of pollutants.

National Rivers Authority - Groundwater Vulnerability 1:100,000 Map Series 1995

The proximity of the soil types to the Development Areas is discussed in more detail in Section 6.6.

6.6 Development Areas

The following Development Areas have been determined based upon the development pressures and their physical location within the Borough. There are some areas of planned development that fall outside these areas which will need to be considered against the more global criteria described above. However, all elements of the Water Cycle will be reviewed for each Development Area in the following sections.

6.6.1 IP-One

The main area of proposed development within Ipswich is the area known as IP-One. This includes the centre of Ipswich, the areas known as Ipswich Village, the Waterfront and the wet dock area. Its extent is shown in Figure 6.1 (Section 6.1) and 6.4 (end of Section 6).

From the development plans a minimum of 3,500 dwellings are to be allocated within this area, with potentially more already allocated planning consent. In addition there is extensive employment development planned within this area. The development area is brown-field and has been subject to extensive development in the past.

Water supply falls within the Ipswich Water Resource Planning Zone, PZ60 and so ongoing supply is dependant on the activities detailed in Section 6.3 above.

Wastewater treatment will be provided by the Cliff Quay STW, which again has been discussed in Section 6.4. However wastewater collection and transport of wastewater to the works is seen as a potential issue within the IP-One area. There is a history of sewer flooding (mainly as a result of surface water overloading the combined foul/surface water system) and the trunk sewers that pass through the area being old, shallow and overloaded. This will contribute to the flood risk in the area and will require improvements to the infrastructure to reduce risks. AWS have identified the sewers within this area as being at capacity. Significant network infrastructure upgrades are therefore required to accommodate the proposed growth. Strategies are currently being investigated by AWS to link the Eastern and Northern Fringes with the IP-One area in order to release capacity within this part of the network.

Tidal flood risk is a major issue in the majority of IP-One. The large part of the area is within Flood Zone 3, and using the Flood Hazard Maps produced as part of the SFRA most of the Flood Zone gives rise to “Danger to Most” and in some areas “Danger to All”. The Environment Agency’s proposed Ipswich Flood Defence Management Scheme would raise the level of protection within the IP-One area to the 0.3% Annual Probability event (1 in 300 year return period) with allowance for sea level rise over the life of the scheme. Although the implantation of the scheme (tidal barrier and raised defences) would raise the level of protection, the area will still be within Flood Zone 3 as the Flood Zones are developed without flood defences. In addition there is still a residual risk of flooding by either failure of the new defences, or overtopping in extreme events.

Development before the construction of the Ipswich Flood Defence Management Scheme should only be undertaken following the production of a detailed flood risk assessment which follows the sequential and exception test routes within PPS 25, and that the selection of development type and the access routes to be development need to be very carefully reviewed. Ideally very limited development should take place within the “Danger to Most” and “Danger to All” areas before construction of the Ipswich Flood Defence Management Scheme. Once the defences have been completed then FRA’s still need to be undertaken and the issue of ongoing residual risk managed carefully.

Parts of this development area are underlain by a high vulnerability major aquifer and an SPZ, the Inner Zone of which is located within the IP-One area. If any development takes place here then the Environment Agency will not allow the installation of SUDS which use infiltration techniques. Depending upon the exact location of development sites this may pose a constraint to the implementation of particular types of SUDS in this area.

To summarise the situation in IP-One if no action is taken then the following situation would occur.

Table 6.9 - Situation in IP-One Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future
Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 6.10- Activities required in IP-One development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Ipswich Discharge Reuse	Demand management Ipswich Discharge Reuse
Wastewater Treatment	Storm water limits	Storm water limits	Storm water limits Increase in consent to support employment.	Storm water limits. Increase in consent to support employment.
Flooding	SuDS (restrictions) FRAs Required - Exception tests. Flood Defence Improvements	SuDS (restrictions) FRAs Required - Exception tests. Flood Defence Improvements	SuDS (restrictions) FRAs Required - Exception tests.	SuDS (restrictions) FRAs Required - Exception tests.
Environment – Water Quality			BATNEEC required	BATNEEC required
Wastewater Infrastructure	Significant infrastructure upgrade required,	Significant infrastructure upgrade required,	Significant infrastructure upgrade required,	Significant infrastructure upgrade required,
Water Supply Infrastructure				

6.6.2 Ipswich North

Development within Ipswich North is primarily scattered with a couple of key areas. These are in Whitton, along the Bramford Road and to the south of the River Gipping adjacent to the Hadleigh Road Industrial Estate.

Water supply falls within the Ipswich Water Resource Planning Zone, PZ60, and so ongoing supply is dependant on the activities detailed in Section 6.3 above.

Wastewater treatment will be provided by the Cliff Quay STW, which again has been discussed in Section 6.4. However wastewater collection and transport of wastewater to the works is seen as a potential issue within the Ipswich area. There is a history of sewer flooding (mainly as a result of surface water overloading the combined foul/surface water system) and the trunk sewers are old, shallow and overloaded. Increased discharges into the trunk sewer network may adversely contribute to flooding in other areas, particularly the IP-One development area through which the low level trunk sewer, which collects water from the southern part of this area, flows. One solution posed by AWS to help solve the capacity issues at Cliff Quay STW is to investigate the possibility of transferring wastewater flows from the new growth in this area to the Sproughton STW catchment. This would require a strategic sewer and significant upgrades to Sproughton STW. It would also require analysis of the receiving watercourse to determine whether it could accommodate the increase in flow and pollution.

The flood risk within this area varies greatly. The northern part of the area is outside of the Flood Zones 2 and 3 and appears from the SFRA to be outside of any recorded local flooding. The sites adjacent to the River Gipping around the Hadleigh Road Industrial Estate are outside of the tidally influenced flood areas, but partially fall within the fluvial flood zone areas, which is likely to be defined as functional floodplain as there are no apparent defences separating this area from the River. Development in these areas will need Flood Risk Assessments to demonstrate the selection of appropriate development and the adoption of methods to minimise potential impacts on locations upstream and downstream.

This area is underlain by areas of both major and minor high ground water vulnerability. It is also located over the Outer Zone of an SPZ and in proximity to the Inner Zone. Restrictions may therefore be place on the use of infiltration type SUDS within this area.

To summarise the situation in Ipswich North if no action is taken then the following situation would occur.

Table 6.11 - Situation in Ipswich North Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 6.12 - Activities required in Ipswich North development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Ipswich Discharge Reuse	Demand management Ipswich Discharge Reuse
Wastewater Treatment	Storm water limits	Storm water limits	Storm water limits Increase in consent to support employment.	Storm water limits. Increase in consent to support employment.

Flooding	SuDS (restrictions) FRAs Required - Exception tests. Allocation out of functional fluvial floodplain	SuDS (restrictions) FRAs Required - Exception tests. Allocation out of functional fluvial floodplain	SuDS (restrictions) FRAs Required - Exception tests. Allocation out of functional fluvial floodplain	SuDS (restrictions) FRAs Required - Exception tests. Allocation out of functional fluvial floodplain
Environment – Water Quality			BATNEEC required	BATNEEC required
Wastewater Infrastructure	Upgrade/expansion Possible transfer to Sproughton STW			
Water Supply Infrastructure				

6.6.3 Ipswich East

The development sites to the east and south of the centre of Ipswich (outside of IP-One) have been grouped together as Ipswich East. This contains the large employment led developments to the north of Cliff Quay and in the region of the Ransomes site together with the residential led development areas around Rose Hill and other smaller development sites.

Water supply falls within the Ipswich Water Resource Planning Zone (PZ60) and so ongoing supply is dependant on the activities detailed in Section 6.3 above.

Wastewater treatment will be provided by the Cliff Quay STW, which again has been discussed in Section 6.4. However wastewater collection and transport of wastewater to the works is seen as a potential issue within the Ipswich area. There is a history of sewer flooding (mainly as a result of surface water overloading the combined foul/surface water system) and the trunk sewers are old, shallow and overloaded. AWS has identified this area as having sewers currently operating at capacity and would require significant infrastructure investment to accommodate any growth and strategic solutions are currently being investigated The trunk sewers feeding from these areas to the works are newer and have the capacity to bypass the works at times of extreme flow and discharge directly into the Orwell via screens. In addition the development sites adjacent to the Woodbridge STW could have their wastewater flows connected directly to that STW as it currently has capacity, although investment would be required to upgrade the works and assessments are required for the receiving watercourse. This option is currently being investigated by AWS. More specific issues within this area include surface water management and the separation of surface water from foul water systems.

The development areas fall outside of the current Flood Zones, and any local flood risk areas identified by the SFRA. As with all development there is a need to undertake FRA's and the adoption of SuDS within these developments will be important to aid in the management of flows within the combined sewerage system.

The area is not underlain by any major aquifers and only the western edge of the area is underlain by the Outer Zone of an SPZ. It is therefore unlikely that restrictions will be placed on the use of SUDS within this area.

To summarise the situation in Ipswich East if no action is taken then the following situation would occur.

Table 6.13 - Situation in Ipswich East Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 6.14 - Activities required in Ipswich East development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Ipswich Discharge Reuse	Demand management Ipswich Discharge Reuse
Wastewater Treatment	Infrastructure improvements	Infrastructure improvements	Infrastructure improvements. Increase in consent to support employment.	Infrastructure improvements. Increase in consent to support employment.
Flooding	SuDS FRA	SuDS FRA	SuDS FRA	SuDS FRA
Environment – Water Quality			BATNEEC required	BATNEEC required
Wastewater Infrastructure	Significant upgrade; Possible transfer of flow outside catchment; separation of combined sewers.			
Water Supply Infrastructure				

6.7 Summary Timeline

The following table shows a summary of the current state of each of the development areas in terms of issues with the areas considered, water supply, wastewater, environment and flooding.

Table 6.15 - Summary Timeline for Ipswich Borough

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
IP-One	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Ipswich North	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Ipswich East	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				

The key activities required to resolve the "red" time periods above are:

Water Supply - Implementation of the proposed Bucklesham Aquifer Storage Recovery Scheme in PZ 60 in AMP5
Implementation of the proposed Ipswich Discharge Reuse Scheme (PZ60) in AMP6

Wastewater - Implementation of new sewers or upgrade/extension of old; possible transferral of flows to neighbouring STW; and separation of combined sewers.

Flooding - Implementation of the Ipswich Flood Defence Management Scheme to reduce the tidal flood risk.
Allocation of development out of fluvial Flood Zone 3 areas upstream of Ipswich Centre or consideration of impact on potential functional floodplain.

6.8 Constraints to Development

The previous sections detail the issues and in many cases the worse case scenarios with regard to development within the area. This precautionary practice has been adopted to try and ensure that discussion and consultation is undertaken with the relevant authorities and responsible organisations before development takes place.

The main constraints to development and activities required are indicated below.

Water Supply - AWS are confident of maintaining supply provided activities put forward within their WRMP and Business Plans are implemented as programmed.

Wastewater treatment capacity - discharge consent increases required if employment development is to be included.

Flooding - ensure appropriate development within potential flood areas. Use PPS25 - Development and Flood Risk sequential and exception tests in these areas such as IP-One and Ipswich North where development sites are close or in existing Flood Zones 2 and 3.

Sanitary treatment capacity - replacement of Sludge Treatment Centre. AWS to consider levels of investment to improve sanitary treatment, using BATNEEC techniques processes if required, particularly if additional employment flows are to be accepted at Cliff Quay..

Wastewater Infrastructure - undertake additional investigation and modelling with detailed site allocations to establish infrastructure limits. Consider development local to the works in earlier years.

7 MID SUFFOLK DISTRICT SPECIFIC RESULTS

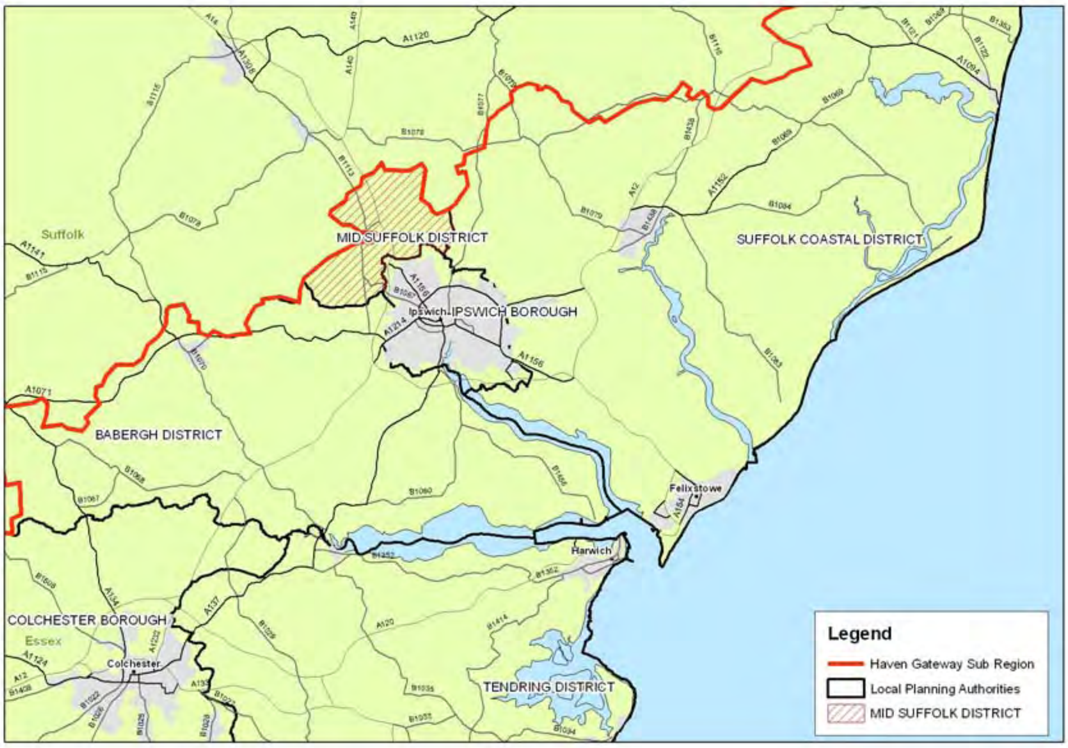
7.1 Introduction

The following section contains information which is specific within the Haven Gateway Water Cycle Study for Mid Suffolk District. The section has been divided up into a number of parts. The first few sections describe the District area, its development plans and Council wide issues relating to water supply, waste water disposal (including water quality) and flood risk management. Following that further sections will consider specific development areas in more detail where appropriate. Finally, a timeline showing potential actions has been developed.

7.2 Mid Suffolk District and Development

Mid Suffolk District extends from the north west corner of Ipswich northwards and contains the towns of Needham market and Stowmarket. Only a small part of the Mid Suffolk District area (around 4%) is included within the Haven Gateway Sub-region. This is essentially the part of the District covered by the Ipswich Policy Area (IPA).

Figure 7.1- Mid Suffolk District Location



The target growth identified in the adopted East of England Plan for the entire Mid Suffolk area is 8,300 dwellings over the 20 year period, at a rate of 415 per year from 2006 onwards. Of the 8,300 dwellings, at least 1,300 are expected to be built within the Haven Gateway Sub Region as part of the Ipswich Policy Area. Needham Market and Stowmarket are the main areas undergoing development within Mid Suffolk District however these are located outside the Haven Gateway and are not considered here.

The proposed leisure development known as 'SnOasis', has a trajectory showing around 800+ dwellings being built in association with the development from 2007 to 2021. This would be located within the Ipswich Policy Area and would satisfy the target for the East of England Plan. The 'SnOasis' development would also in addition provide 2,160 jobs (3.9Ha). Development is also taking place in Orion Business Park, Great Blakenham, again part of the Ipswich Policy Area.

The trajectories for both the proposed employment and residential development within the Haven Gateway region of the District are shown in Figures 7.2 and 7.3:

Figure 7.2- Mid Suffolk Housing Trajectory 2007-2021

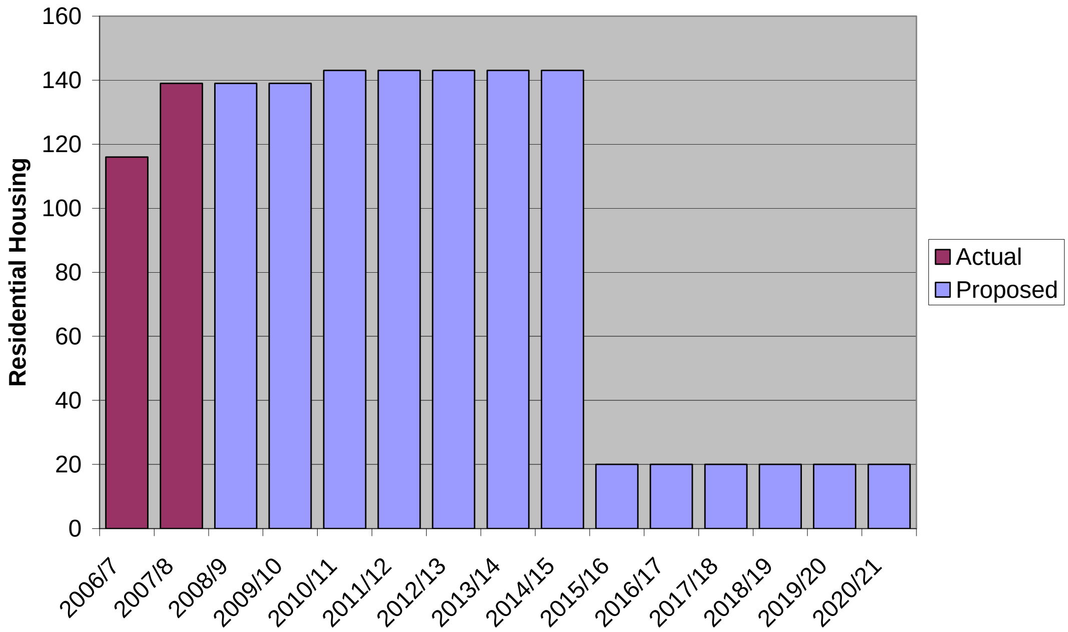
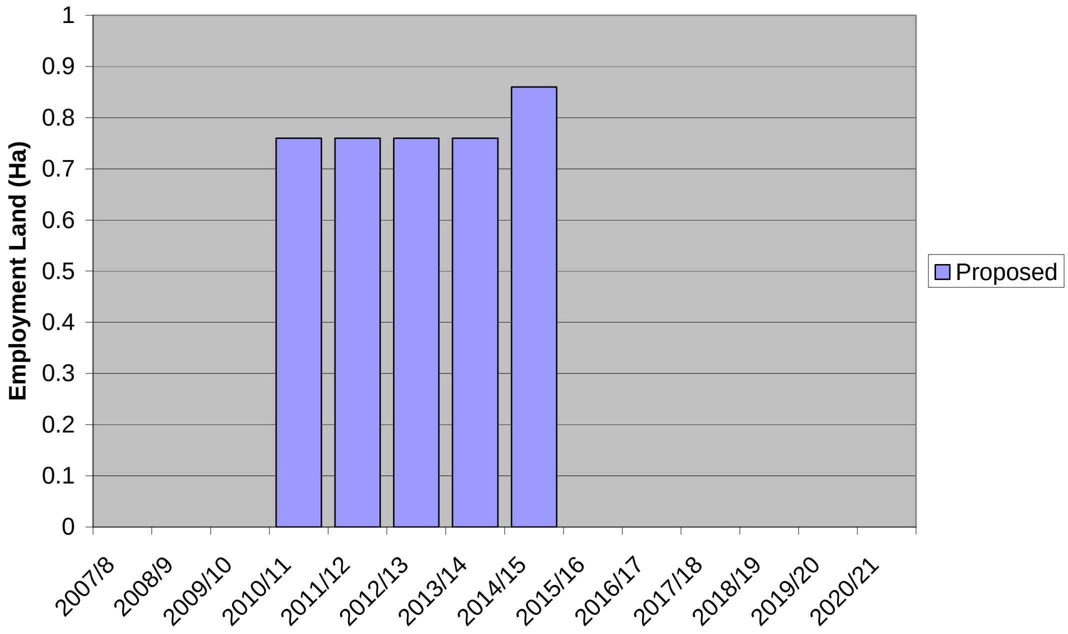


Figure 7.3- Mid Suffolk Employment Trajectory 2007-2021



The current adopted Local Plan for Mid Suffolk covers the period 1998 to 2006. Information obtained from Mid Suffolk's Local Development Scheme has shown that the Core Strategy and the site specific documents are at the early stages of preparation and their adoption is due in June 2010.

Ipswich Policy Area

Ipswich Borough has a tightly defined administrative area with few areas available for peripheral expansion. However parts of the 'greater' Ipswich urban area extend into the three adjoining districts - Mid Suffolk, Babergh and Suffolk Coastal. As a basis for planning the distribution of development in and around Ipswich, an 'Ipswich Policy Area' has been identified which has its own overall total of housing allocations.

The East of England Plan identifies that the Ipswich Policy Area should provide at least 20,000 new housing units between 2001 and 2021. Policy H1 of the Plan states that this should be at least 15,400 within Ipswich and up to 600 in Babergh, up to 3,200 in Suffolk Coastal and up to 800 in Mid Suffolk.

There are considerable outstanding Greenfield housing commitments within the Ipswich Policy Area. The effect of these proposals would be to achieve a higher degree of concentration of new Greenfield allocations within Ipswich itself. The development areas within Mid Suffolk district can be seen in Figure 7.4 (end of Section 7)

7.3 Water Supply

Mid Suffolk District is supplied by Anglian Water Services (AWS). Anglian Water is confident that they can supply demand within the region. The part of Mid Suffolk District in Haven Gateway falls within Water Resource Zone (WRZ) 10, as identified in AWS WRMP. WRZ10 covers the East Suffolk and Essex and is further subdivided into planning zones and the area to be considered is situated in Planning Zone (PZ) 60 - Ipswich.

The WRMP has identified a potential deficit in supply for the area of up to 16.68Ml/d as a result of planned growth and the predicted impact of climate change on reservoir supplies.

AWS have identified a number of proposed activities for addressing potential deficiencies across the zone. The activities to be implemented within AMP5 and include;

- Leakage control
- Reducing Usage
- Bucklesham Aquifer Recovery Scheme

In addition within AMP6 the Ipswich discharge re-use scheme is proposed.

Table 7.1 identifies the actions proposed by AWS for PZ60. However, please note: The following feasible options for addressing water supply in the area have been based on the draft WRMP. This document has now been finalised and the final version should be referenced to ensure that these options are still those preferred by the water company

Table 7.1 - Timeline of Preferred Water Resource Activities for Mid Suffolk

	PZ	AMP 5	AMP6	AMP7	AMP8	AMP9	Activity
Ipswich WS Area	60						General demand management
							Bucklesham ASR Scheme
							Ipswich discharge re-use

The Ipswich discharge re-use, which provides the bulk of the extra supply, is achieved by returning discharges, after additional treatment, to the River Gipping for abstraction downstream to refill Alton Water reservoir rather than discharging to the tidal River Orwell. The Bucklesham Aquifer Storage Recovery Scheme would utilise the current licence to abstract from the Mill River to the east of Ipswich. The scheme would treat the surface water resource of the Mill River for direct supply and store surplus surface water when available in the underlying confined Chalk aquifer for abstraction when the flows in the river are low.

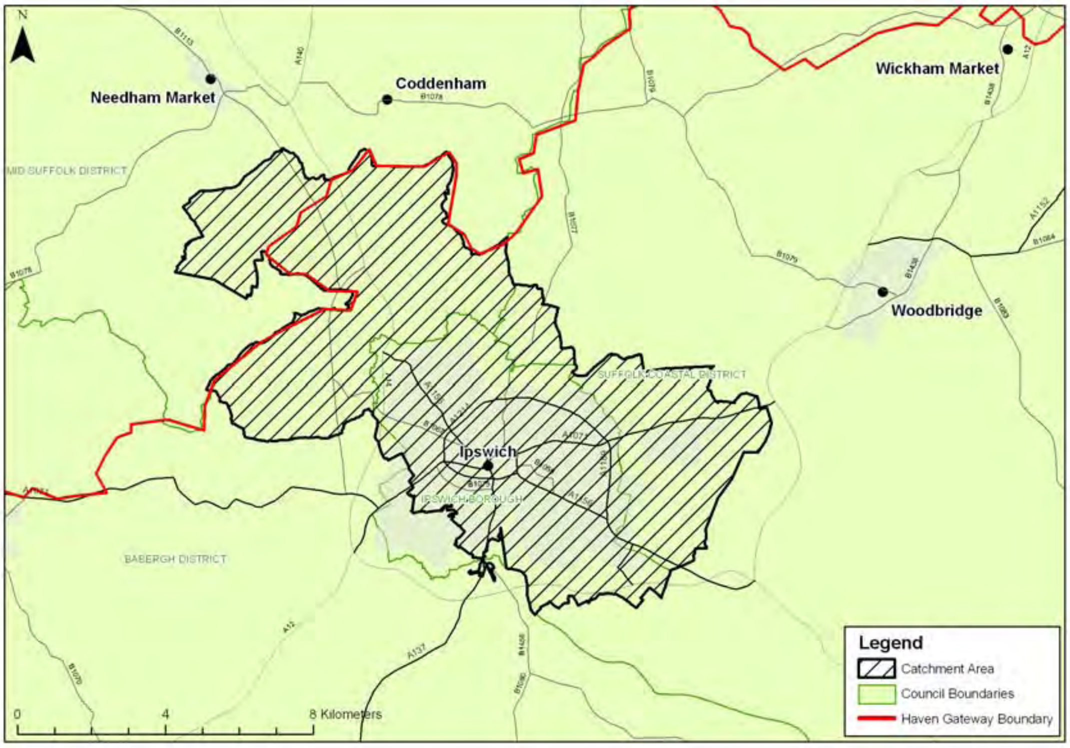
7.4 Wastewater Collection and Treatment

The whole of the area of Mid Suffolk District within the Haven Gateway falls within a single sewage treatment works catchment, that of Cliff Quay, as shown in Figure 7.5 (end of Section 7). This works serves not only this part of Mid Suffolk, but also the majority of Ipswich Borough and parts of Suffolk Coastal District. The issues relating to this large catchment are discussed below.

7.4.1 Cliff Quay

Cliff Quay STW (CLQYST) is located in Ipswich Borough. However, as illustrated in Figures 7.5 and 7.6, its catchment extends over 4,500ha covering most of Ipswich Borough but also parts of the Districts of Mid Suffolk, Babergh and Suffolk Coastal, a current total population of over 120,000.

Figure 7.6- Location of Cliff Quay STW Catchment



It therefore cannot be analysed independently within any one District and must consider the cumulative development in all four. Over the planning period (2001-2021) a total of 20,762 houses and just over 150ha of employment land are planned within the catchment of CLQYST, spread between Ipswich Borough, Mid Suffolk District, Babergh District (employment development only) and Suffolk Coastal District. CLQYST has a current consented DWF (cDWF) of 34,213m³/d, illustrated in Table 7.2.

Table 7.2- Discharge Capacity of the Cliff Quay STW, displaying current consented DWF, measured DWF (2007) and headroom availability

Site Name	STW	Current Consented DWF (m³/d)	Measured DWF 2007/JR08 (m³/d)	Headroom (m³/d)
Ipswich Policy Area	CLQYST	34,213	24,624	9,589

As shown in Figure 7.7 and Table 7.3 below, the planned development, considering both employment and residential, will exceed this consent in 2014/15, reaching a maximum of almost 29% exceedance by 2020/21.

Figure 7.7- Cliff Quay STW percentage headroom – residential and employment development

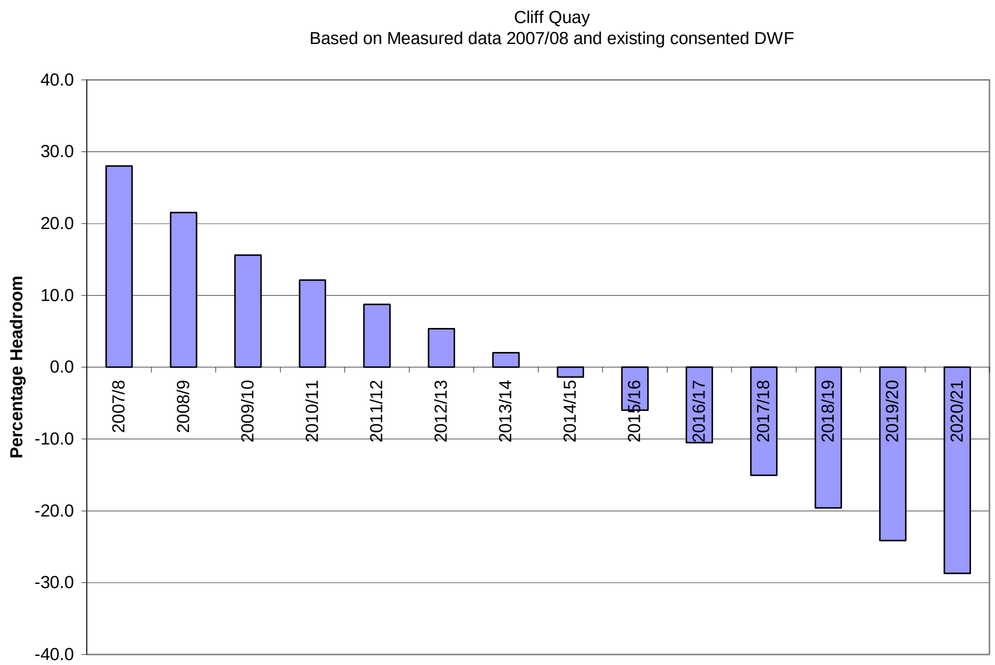


Table 7.3- Headroom availability of the Cliff Quay STW.

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Cliff Quay*														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Note: ** Cliff Quay contains the development projections across its entire catchment, including development in Suffolk Coastal District, Ipswich Borough and Mid Suffolk District.*

AWS however are only legally obliged to process sewage from residential development. When this is separated from the employment then the STW remains below its cDWF throughout the planning period, and remains almost 13% below the cDWF at the end by 2020/21, as shown in Figure 7.8 and Table 7.4 below:

Figure 7.8- Cliff Quay STW percentage headroom – residential development only

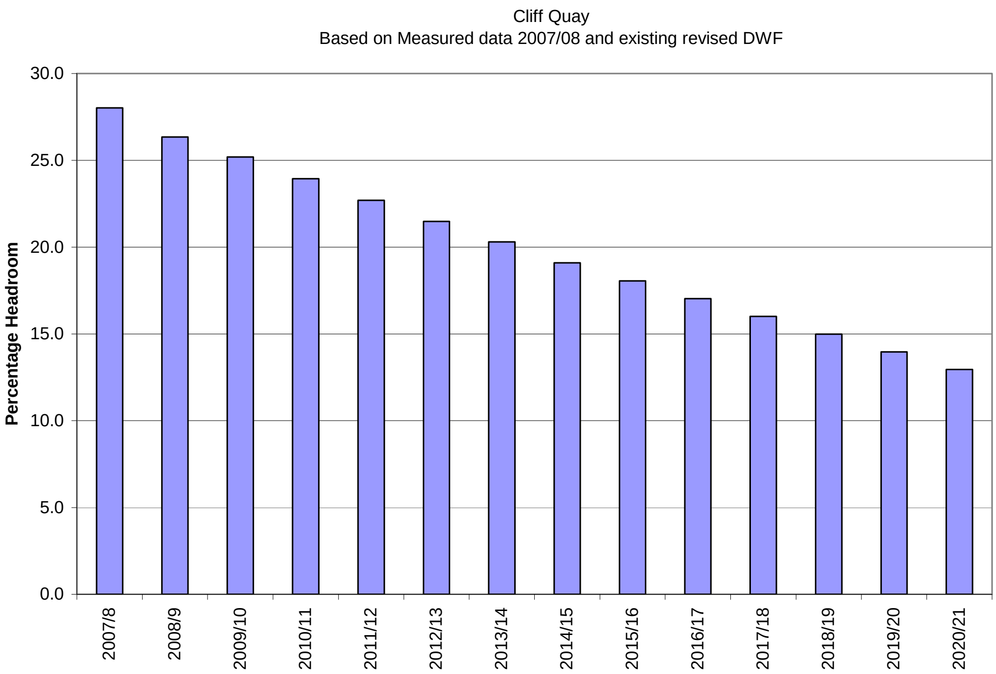


Table 7.4 - Headroom availability for the Cliff Quay STW, which concerns only residential development data

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Cliff Quay														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom
Note: * *Cliff Quay contains the development projections across its entire catchment, including development in Suffolk Coastal District, Ipswich Borough and Mid Suffolk District*

AWS have considered the potential impact of development on the Cliff Quay STW and have provided a summary of their findings for use within this WCS. Within their analysis they have considered 8,562 additional dwellings within the catchment between 2008 and 2016, which is roughly equivalent to the 8,789 dwellings considered within this study.

They have identified the main problems and restrictions in the system as being related to the volume of surface water discharge entering their combined sewer systems, resulting in flooding, and the underperformance of a Sludge Treatment Centre which impacts heavily on the STW. AWS consider the Sludge Treatment Centre to be the main limiting factor to the STW and therefore propose to replace it within AMP5, which they claim will enable the STW to continue within the existing flow and sanitary consent parameters until 2021 and beyond. They do not expect any changes in the DWF consents during the proposed growth period. In addition they suggest that tighter planning policies with regards to the surface water runoff would assist by limiting storm discharge and using site storage where the existing sewers are under capacity.

A long term potential strategy for the STW catchment announced by AWS is a potential diversion of flows to the neighbouring Sproughton STW. However, as identified within this report, that too is under pressure from the proposed development indicating that, without expansion or improvement, it is unlikely to be able to accept an increase in flows.

Environmental Considerations

Cliff Quay STW (consent AEETS/12128B, modified 2005) discharges into the tidal River Orwell (Grid Reference TM 1714 4144). The current consented dry weather flow discharge is 34,213m^3 per day. The current discharge consents state that the discharge shall not exceed:

- 200 milligrammes per litre of suspended solids;
- 175 milligrammes per litre of BOD; or
- 50 milligrammes per litre of ammoniacal nitrogen.

As there is still headroom in the current consent, it can be assumed that these discharge limits will still be acceptable. It should further be noted that current discharges are currently significantly more dilute than the consent allows for.
Anglian Water monitoring of the discharge point takes place to ensure that these consent limits are maintained. Samples for Cliff Quay STW indicate the levels are sufficiently under the limits for suspended solids and BOD (25% of the consented limit for BOD and 15% of the limit for suspended solids). Ammoniacal nitrogen is frequently meeting the consent limit. This indicates that future increases in discharges could have an impact to the levels of these pollutants.

The current state of the receiving environment

The Cliff Quay STW discharges directly into the Stour and Orwell Estuaries Ramsar, SPA and SAC designated site. The SSSI condition of the nearest Orwell Estuary units, which directly relate to the condition of the European designated areas, is a mix of ‘favourable’ and ‘unfavourable, no change’. The units are predominantly saltmarsh, indicating that saline influences are greater in the area and suggesting that variations in river quality will not directly jeopardise the integrity of the site. The unit which is unfavourable, no change condition is so due to coastal squeeze and the resulting erosion of saltmarsh.

Shotley STW also discharges directly into the River Orwell, approximately 11km downstream of the Cliff Quay STW outfall. Also the Sproughton STW discharges into a river which connects with the Orwell Estuary.

The impact of development

Modelled discharge accounting for all development types will exceed the consented limit in 2014/15 and this will continue to increase in the future. Projected dry weather discharge in 2020/21 is 39,666m^3 per day; this exceeds the consent limit by 14% or 5,453m^3 per day.

Shotley, Sproughton and Cliff Quay STWs are expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Orwell Estuary is considered unlikely due to the size and diluting action of the estuary. Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Whilst current discharge concentrations are lower than the consented limits, the reported values suggest that treatment is not currently achieving Best Available Technology (BAT) or Best Available Technology Not Entailing Excessive Costs (BATNEEC) levels (see Section 2.5). Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Cliff Quay met BATNEEC standards then the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Cliff Quay STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Cliff Quay in-combination with other discharges into the same watercourse. An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

<u>Conclusions</u>

With the exception of the replacement of the Sludge Treatment Centre and the reduction in surface water flows, AWS do not consider any further action is required for this STW within the planning period for residential development. However, as shown above, some degree of expansion/upgrade of the STW will be required in order to accommodate both residential and employment development.

Action will be needed, either by AWS (possibly funded by others), or by individual developers to cope with the discharges from the proposed employment development which, as identified above, could have a significant impact on the total flows within the catchment (potentially upwards of 10,000m3/d by 2021) and for the required improvements to the sewer network.

Modelling of predicted flows indicates that the consent limit is not currently being exceeded and will not be exceeded until 2014/15. Current testing undertaken by Anglian Water indicates that the pollutant loads are sufficiently under the designated limits (75% under) and this should be taken into consideration when assessing the future impacts. There is the potential that future flows will not exceed the pollutant loads in the consent.

In addition, the water quality analysis indicates that this STW requires an upgrade to its treatment procedures through the application of BATNEEC technologies in order to remain below its target pollutant limit throughout the planning period from 2014.

Table 7.5 - Cliff Quay STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Reduce surface water inflow	Reduce surface water inflow	Reduce surface water inflow. Re-route to Sproughton or increase consent	Reduce surface water inflow. Re-route to Sproughton or increase consent
Sanitary Treatment Improvements	Replacement of STC		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

7.5 Flood Risk

Development within the Mid Suffolk District occurs in Great Blakenham (including SnOasis), Claydon and potentially in Bramford which are all part of the Ipswich Policy Area. Mid Suffolk have produced a Level 1 SFRA (March 2008) and this has been used to consider the flood risk within this part of the District. As with all areas in England and Wales the Environment Agency have produced Flood Zone maps in line with PPS 25 and these have been compared with the proposed development sites to identify key areas of concern. Figure 7.9 (end of Section 7) shows the locations of Flood Zones 2 and 3 within the District.

The main watercourse within the area is the River Gipping which with its tributaries drains the majority of the south of the district. There have been numerous historical flood events in the Mid Suffolk study area, however these events are not located where development are proposed to take place in the District. With reference to sewage flooding there is limited information available on this issue which gives little evidence of sewage flooding in the Mid Suffolk District.

There have been a few reported occurrences of groundwater flooding from hard rock aquifers or superficial deposits in the Mid Suffolk area. It has also been stated here that groundwater flooding is not a significant risk in East Anglia. Areas however where chalk overlain by sand and gravel, can form a minor aquifer causing the potential for groundwater flooding.

More specifically to the Mid Suffolk district, there are some proposed development sites within Great Blakenham which lie within flood zones 2 and 3. The SnOasis development, planned to occur to the west of Great Blakenham, lies outside of the flood zones. However as the site lies within existing quarries then local issues of drainage and storage will need to be considered.

The selection of new development sites and the evaluation of existing sites should follow the guidance in PPS25 - Development and Flood Risk and use the Sequential and Exception tests where required. The Level 1 SFRA and, if carried out, the Level 2 SFRA will assist in the selection of sites in line with these tests.

7.5.1 Source Protection and Groundwater Vulnerability

As part of controlling surface water flooding, options may be considered that use retention or infiltration techniques. Therefore, before development can take place source protection and groundwater vulnerability issues must be appreciated and reviewed.

Source Protection Zones (SPZ) have been identified by the Environment Agency as requiring protection as water sources and these are shown in Figure 7.10 (end of Section 7). This figure indicates that most of the Mid Suffolk District contained within the Haven Gateway boundary is underlain by SPZs, most notably by the inner and outer zones. The Environment Agency will not support the use of SUDS which use infiltration techniques on any development sites which overlap the Inner Zone. This will therefore affect all development within this area.

An assessment of the vulnerability of groundwater to diffuse sources of pollution has also been supplied by the Environment Agency. Table 7.6 shows the groundwater vulnerability classifications present within Mid Suffolk District. Figure 7.11 (end of Section 7) shows the groundwater vulnerability classification map for Mid Suffolk District. Four main soil types are present, which are classified in terms of their vulnerability as described in the following table. H refers to a high vulnerability, I to an intermediate vulnerability and L to a low vulnerability. The numbers refer to the soil type. Most of the central area of the Haven Gateway Mid Suffolk District is classified as a major aquifer. These tend to be highly productive and used for water supply, therefore increasing the restrictions placed on surface water runoff from new building developments.

Table 7.6- Soil Classification Table

Soil Class	Description
H1	Soils which readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.
H3	Course textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but which have some ability to attenuate adsorbed pollutants because of their large clay or organic matter contents.
I1	Soils with Intermediate leaching potential (I). Soils which have a moderate ability to attenuate diffuse source pollutants.
L	Soils of low leaching potential in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal or they have the ability to attenuate diffuse pollutants.

7.6 Development Areas

The following section displays specific issues which relate to the development areas within Mid Suffolk.

7.6.1 Great Blakenham and SnOasis

The main area of development within the part of Mid Suffolk inside the HGSR is planned to take place in and around Great Blakenham. The SnOasis, a large leisure complex development, is planned for land to the west of Great Blakenham. Construction on this site has not yet started however the go ahead decision was made in November 2008. 1252 dwellings are to be built in Mid Suffolk between 2007-2021, many of which (800+) are associated with the SnOasis development.

Water supply has been discussed in Section 7.3 above with the development site falling within AWS' Ipswich PZ60. There are very few water supply issues as AWS have stated to be able to cope with increased demand however this is dependant on some activity to maintain an adequate supply over the study period.

Wastewater is treated at the Cliff Quay STW, which receives discharges from Ipswich, Babergh and Suffolk Coastal authorities as well as from Mid Suffolk. When the proposed residential and employment land discharges from all four districts flowing into Cliff Quay STW are analysed it resulted in the consented DWF being exceeded by 2014/15. The development at Great Blakenham and SnOasis (3.9Ha) is likely to contribute at least 400m^3/d based on the global water design flows used for discharge calculations of around 105m^3/Ha/d. If residential development alone is considered then there is sufficient headroom at Cliff Quay to receive discharges up to 2021. As a large part of this area has a wastewater network that feeds into the IP-One Area development site in Ipswich Borough, it is constrained. One solution posed by AWS to help solve the capacity issues at Cliff Quay STW is to investigate the possibility of transferring wastewater flows from the new growth in this area to the Sproughton STW catchment. This would require a strategic sewer and significant upgrades to Sproughton STW. It would also require analysis of the receiving watercourse to determine whether it could accommodate the increase in flow and pollution.

With reference more specifically to the village of Great Blakenham rather than SnOasis, some of the proposed development areas lie within Flood Zones 2 and 3. The SFRA indicates that there have been no historical flooding events occurring in the development areas proposed in the Mid Suffolk District. The SFRA does not identify any major sewage flooding events occurring in the District. Potential areas of ground water flooding have been highlighted where areas of hard, shallow rock are present. If development is proposed in these areas then more detailed FRA's will be required and development will need to be appropriately sited and comply with both sequential and exception tests within PPS25.

Parts of this development area are underlain by major aquifers, with the rest underlain by minor aquifers. The whole area is located within the catchment of a SPZ and the centre is underlain by the Inner Zone. Any proposed development within this Inner Zone will not be granted permission by the Environment Agency for the installation of SUDS which use infiltration techniques.

In conclusion to the information above, it can be seen that there is a need to provide alternative options for the Cliff Quay STW. This is so that the STW can cope with the increased discharge from employment development, as the STW at present can only manage outflow from the proposed residential development. There is also a need to investigate the wastewater infrastructure capacity as part of an update to this study.

To summarise the situation in Great Blakenham, if no action is taken, then the following situation would occur.

Table 7.7 - Situation in Great Blakenham Development Area if no action is taken:

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 7.8 Activities required in Great Blakenham development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Ipswich discharge re-use	Demand management
Wastewater Treatment			Employment Discharge activity	Employment Discharge activity
Flooding	SuDS (restrictions) FRAs required	SuDS (restrictions) FRAs required	SuDS (restrictions) FRAs required	SuDS (restrictions) FRAs required
Environment – Water Quality			BATNEEC required	BATNEEC required
Wastewater Infrastructure	Upgrade/expansion Possible transfer to Sproughton STW	Upgrade/expansion Possible transfer to Sproughton STW	Upgrade/expansion Possible transfer to Sproughton STW	Upgrade/expansion Possible transfer to Sproughton STW
Water Supply Infrastructure				

7.7 Summary Timeline

The following table shows a summary of the current state of each of the development areas in terms of issues with the three areas considered, water supply, wastewater, environment and flooding.

Table 7.9 - Summary Timeline for Mid Suffolk District

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Great Blakenham and SnOasis	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				

The key activities required to resolve the "red" time periods above are:

Water Supply - Implementation of the proposed Bucklesham Aquifer Storage Recovery Scheme in PZ 60 in AMP5
Implementation of the proposed Ipswich Discharge Reuse Scheme (PZ60) in AMP6

Wastewater - Implementation of new sewers or upgrade/extension of old; possible transferral of flows to neighbouring STW; and separation of combined sewers.

7.8 Constraints to Development

The previous sections detail the issues and in many cases the worse case scenarios with regard to development within the area. This precautionary practice has been adopted to try and ensure that discussion and consultation is undertaken with the relevant authorities and responsible organisations before development takes place.

The main constraints to development and activities required are indicated below.

Water Supply - AWS are confident of maintaining supply provided activities put forward within their WRMP and Business Plans are implemented as programmed.

Wastewater treatment capacity - discharge consent increases required if employment development is to be included, consideration of which works (Cliff Quay or Sproughton) should accept additional flows.

Flooding - ensure appropriate development within potential flood areas. Use PPS25 - Development and Flood Risk sequential and exception tests in these areas where development sites are close or in existing Flood Zones 2 and 3.

Sanitary treatment capacity - replacement of STC and implementation of BATNEEC techniques if additional discharge consents are required. AWS to consider levels of investment in improving sanitary treatment processes if required.

Wastewater Infrastructure - undertake additional investigation and modelling with detailed site allocations to establish infrastructure limits. Consideration of routing flows to different STW catchments to avoid congested infrastructure within Ipswich.

8 SUFFOLK COASTAL DISTRICT SPECIFIC RESULTS

8.1 Introduction

The following section contains information which is specific within the Haven Gateway Water Cycle Study for Suffolk Coastal District. The section has been divided up into a number of parts. The first few sections describe the District area, its development plans and Council wide issues relating to water supply, waste water disposal (including water quality) and flood risk management. Following that, further sections will consider specific development areas in more detail where appropriate. Finally, a timeline showing potential actions has been developed.

8.2 Suffolk Coastal District and Development

Part of Suffolk Coastal District forms the north eastern segment of the Haven Gateway sub region, bordered by the North Sea to the East and the River Orwell to the south. The location of the District in relation to the Haven Gateway, adjacent Local Authority areas and other key features are shown on Figure 8.1.

Figure 8.1: Haven Gateway Suffolk Coastal District Location

Containing the larger settlements of the Felixstowe and the Trimleys Peninsula, Woodbridge and the eastern Ipswich suburbs, the District has been identified to receive 13% of the development required within the Haven Gateway sub region in terms of the Annual Monitoring Report (AMR - 2007). The East of England Plan gives a total of 10,200 dwellings to be built in the period 2001-2021 at a rate of 510 dwellings per year. As identified within the Stage 1 report, the actual development has exceeded this in the past few years, and the trajectory for the remainder of the period shows development at a resulting slower rate.

The largest development areas have been identified to the west of the District as part of the Ipswich Policy Area, totalling over 2,200 dwellings. The largest planned employment development has been identified on the Felixstowe and the Trimleys peninsula, totalling nearly 460ha of land, in addition to 149 dwellings.

Figure 8.2 (end of Section 8) shows the potential Development Sites, including both residential and employment, planned within the part of the Suffolk Coastal District included within the Haven Gateway study area, as identified from the Council's trajectory data. These sites are scattered across much of the District and do not fall into easily distinguishable Development Areas. More detailed analysis has therefore been limited to the sites with greater than 50 dwellings and/or greater than 50ha of employment land. These are considered in some detail in later sections and, for ease of reference, have been named according to the STW catchment in which they fall:

- Aldeburgh and Thorpeness;
- Benhall (Saxmundham);
- Cliff Quay (Kesgrave, Rushmere);
- Felixstowe and the Trimleys;
- Leiston;
- Melton;
- Rendlesham;
- Woodbridge and Martlesham; and

The Stage 1 report considered additional development sites at Yoxford, Framlingham and Earl Soham, but these are located within the 10km buffer zone outside of the HGSR and not within Haven Gateway itself and have not been included within the Stage 2 analysis.

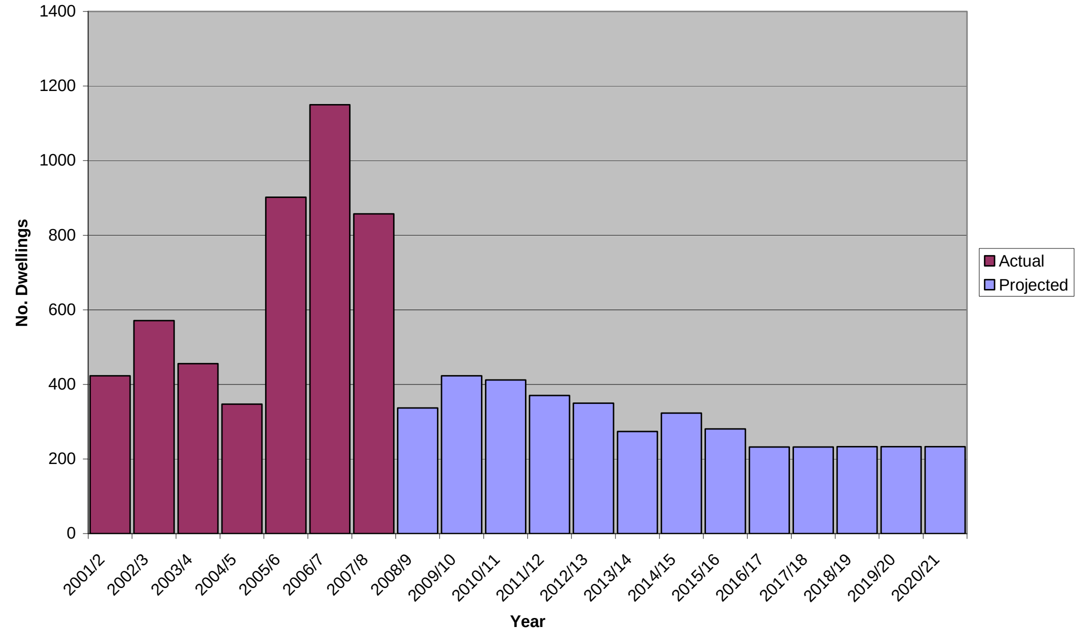
The Ipswich Policy areas of Kesgrave and Rushmere are expected to accommodate the majority of the residential development, with the trajectories indicating that 47% of the required development within Suffolk Coastal District is proposed to take place in this area. A further 15% is due to be located in the Benhall/Saxmundham Development Area.

A total of 670ha of employment land has been identified for development within Suffolk Coastal District and, as mentioned above, the majority of the employment development (69%) is planned to be located in Felixstowe and the Trimleys. However, detail on employment development is less well provided.

Housing trajectory data has been taken from the latest Annual Monitoring Report, published in December 2007 and supplemented with updated information supplied by SCDC following submission of the Stage 1 report.

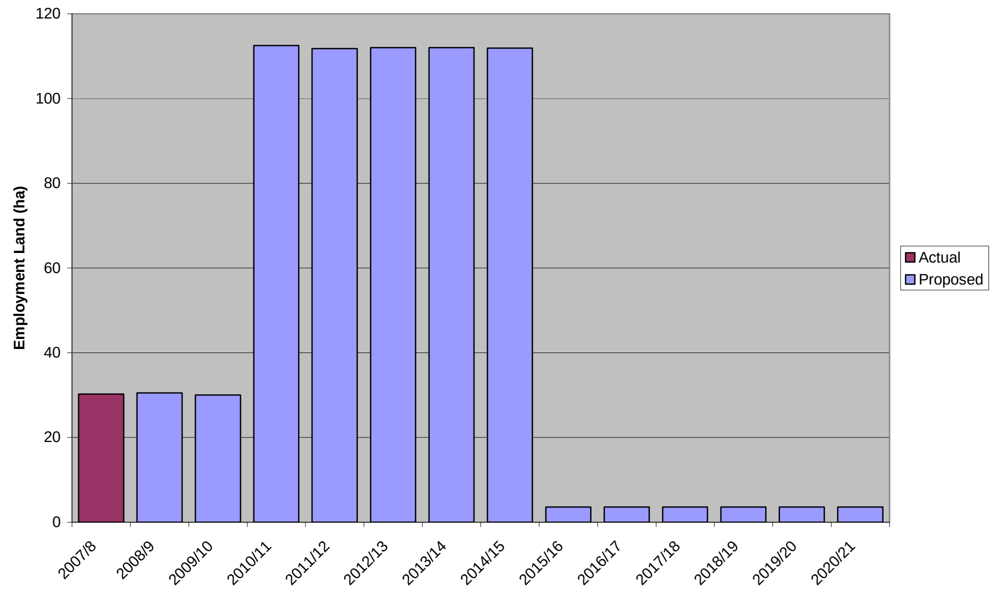
Figures 8.3 and 8.4 show the housing and employment trajectories across the planning period.

Figure 8.3: Housing Trajectory for Suffolk Coastal DC within Haven Gateway



The Strategic Allocation for the whole of Suffolk Coastal has been annualised as 510 dwellings per annum. The trajectory above falls short of this figure as the projected values only account for the area of Suffolk Coastal District which falls within the Haven Gateway study area and not the entire District.

Figure 8.4: Employment Trajectory for Suffolk Coastal DC within Haven Gateway



8.2.1 Ipswich Policy Area

Ipswich Borough has a tightly defined administrative area with few areas available for peripheral expansion. However parts of the 'greater' Ipswich urban area extend into the three adjoining districts - Mid Suffolk, Babergh and Suffolk Coastal. As a basis for planning the distribution of development in and around Ipswich, an 'Ipswich Policy Area' has been identified which has its own overall total of housing allocations.

The East of England Plan identifies that the Ipswich Policy Area should provide at least 20,000 new housing units between 2001 and 2021. Policy H1 of the Plan states that this should be at least 15,400 within Ipswich and up to 600 in Babergh, up to 3,200 in Suffolk Coastal and up to 800 in Mid Suffolk.

There are considerable outstanding Greenfield housing commitments within the Ipswich Policy Area. The effect of these proposals would be to achieve a higher degree of concentration of new Greenfield allocations within Ipswich itself.

8.3 Water Supply

Suffolk Coastal District is supplied by two water companies. Essex and Suffolk Water (ESW) supply the north part of the District within the study area, and Anglian Water Services (AWS) supplying the southern half. The River Alde marks the boundary between the two within the study area, with the Development Areas of Benhall/Saxmundham, Leiston and Aldeburgh and Thorpeness falling within ESW' supply zone and the rest with AWS'.

8.3.1 Essex and Suffolk Water

The study area of Suffolk Coastal contained within the Haven Gateway growth area falls into the Blyth Water Resource Zone of the Suffolk Supply Area. A review of their dWRMP, as discussed in Section 3 above, indicates that, although identified as being located within an area of Serious Water Stress by the EA, ESW considers that this WRZ will remain with a surplus of supply to forecast demand over the whole planning horizon. It also intends to utilise this surplus to assist in providing supply to their western Suffolk WRZ – Hartismere. By the end of AMP6 (2019/20) ESW estimate a Dry Year excess of 2.11Ml/d, with headroom, and a Normal Year excess of 2.16Ml/d, with headroom.

All the water supplied within the Blyth WRZ is sourced from the Chalk aquifer at Walpole, Benhall, Saxmundham, Parham and Little Glemham and from the Crag at Goldfair Green and Leiston. WTW are located at all these sources, with the exception of Little Glenham and Leiston which are treated at Benhall WTW and Coldfair Green WTW respectively.

Although certain assumptions regarding leakage and metering targets and the continuity of groundwater supplies exist, the ESW do not identify any limitations for the proposed development in terms of water supply. However, it must be borne in mind that the capacity and extent of the water supply network has not been reviewed here and may prove a limit to the location of development sites or may require additional costs associated with improving the water infrastructure.

8.3.2 Anglian Water Services

The southern part of Suffolk Coastal District located within the Haven Gateway study area is located within AWS' East Suffolk and Essex WRZ10 and split between two of Planning Zones – PZ64 Woodbridge and PZ60 Ipswich. The eastern half falls within the Woodbridge PZ and the western half within the Ipswich PZ. Both identify a deficit, of -2.51Ml/d and -16.68Ml/d respectively, with the Ipswich deficit identified as a result of planned growth and the predicted impact of climate change on reservoir supplies.

This WRZ is predominantly supplied by groundwater from the Chalk aquifer, although surface water storage reserviors are also located at Alton and Ardleigh (the latter of which is jointly operated with THWS). Within the two PZs located within Suffolk Coastal District, water management options have been proposed to maintain the supply-demand balance, including an allowance for target headroom. These are detailed within Section 3, with a number of activities scheduled within AMP5 and AMP6. Table 8.1 below summarises the key activities and their timing in terms of AMP periods.

However, please note: The following feasible activities for addressing water supply in the area have been based on the draft WRMP. This document has now been finalised and the final version should be referenced to ensure that these options are still those preferred by the water company

Table 8.1: Timeline of Preferred Water Resource Activities for Ipswich and Woodbridge PZs

	PZ	AMP 5	AMP6	AMP7	AMP8	AMP9	Activity
Ipswich Water Supply	60						General demand management
							Bucklesham ASR Scheme
							Ipswich discharge re-use
	64						Transfer from PZ60 - Ipswich

The Ipswich discharge re-use, which provides the bulk of the extra supply, is achieved by returning discharges to the tidal River Orwell after additional treatment to the River Gipping for abstraction to refill Alton Water reservoir. The Bucklesham Aquifer Storage Recovery Scheme would utilise the current licence to abstract from the Mill River to the east of Ipswich. The scheme would treat the surface water resource of the Mill River for direct supply and store surplus surface water when available in the underlying confined Chalk aquifer for abstraction when the flows in the river were low.

Through these options AWS are satisfied that they have sufficient options to maintain the supply-demand balance, although the number of assumptions and reliance upon the activities must be appreciated and may cause barriers to development. In addition, similarly to ESW, it must be borne in mind that the capacity and extent of the water supply network has not been reviewed here and may prove a limit or additional cost with regards to the location of the proposed development.

8.4 Wastewater Collection and Treatment

The area of Suffolk Coastal District included within the Haven Gateway study area is serviced by 26 sewage treatment works, of which two – Westleton STW and Cliff Quay STW – are located outside the study area. Westleston is located in Suffolk Coastal District, north of the study area, and Cliff Quay is located in Ipswich Borough. The catchments of the 26 STWs serving the study area are shown in Figure 8.5 (end of Section 8). Of these, 21 are affected by the projected development. These are listed below.

- Aldeburgh
- Alderton
- Benhall (Saxmundham)
- Blaxhall
- Cliff Quay
- Felixstowe and the Trimleys
- Gedgrave (Orford)
- Grundisburgh
- Hollesley
- Kirton
- Leiston
- Levington
- Melton
- Nacton
- Otley
- Rendlesham
- Sudbourne
- Thorpeness
- Tuddenham
- Wickham Market
- Woodbridge and Martlesham

Based on the measured DWF values for 2007(JR08), together with the current Consented DWF values, the present day available headroom for all 26 STWs are shown in Table 8.2 below.

Table 8.2: Discharge capacities of STWs in Suffolk Coastal DC

STW Code	Site Name	Consented DWF (m^3/d)	Measured DWF 2007/JR08 (m^3/d)	Headroom (m^3/d)
ALDEST	ALDEBURGH STW	1196	***841***	***355***
ALDNST	ALDERTON STW	82	52	30
BENHST	BENHALL STW	1500	919	581
BLAXST	BLAXHALL STW	159	52	107
CHARST	CHARSFIELD STW	53	52	1
CLQYST	IPSWICH-CLIFF QUAY RAEBURN STW	34213	24624	9589
FELIST	FELIXSTOWE STW	9229	6356	2873
GEDGST	GEDGRAVE-CHANTRY MARSHES STW	140	157	-17
GRUNST	GRUNDISBURGH STW	200	288	-88
GTBEST	GT BEALINGS-BOOT ST STW	*No data*	*No data*	*No data*
HOLLST	HOLLESLEY STW	1400	334	1066
KIRTST	KIRTON-DRUNKARDS L STW	370	149	221
LBEAST	LITTLE BEALINGS STW	*No data*	*No data*	*No data*
LEISST	LEISTON-VALLEY RD STW	1400	585	815
LEVIST	LEVINGTON STW	22	***36***	***-14***
MELTST	MELTON STW	950	987	-37
NACTST	NACTON STW	N/A	*No data*	*No data*
OTLYST	OTLEY STW	159	57	102
PLAYST	PLAYFORD STW	*No data*	*No data*	*No data*
RENDST	RENDLESHAM-PARK STW	645.5	258	387.5
SDBNST	SUDBOURNE-SNAPE RD STW	50	***42***	***8***
TNESST	THORPENESS STW	482	332	150
TUDLST	TUDDENHAM-DONKEY LA STW	288	***198***	***90***
WESNST	WESTLESTON STW	248	126	122
WIMKST	WICKHAM MARKET STW	580	307	273
WOODST	WOODBRIDGE-CREEK FM STW	4800	2288	2512

Note: values in ***bold italics*** are based on calculated values from the JR08 results rather than measured.

This shows that four STWs – Gedgrave, Grundisburgh, Levington and Melton are currently operating above their consented DWFs. Future development within these STW catchments will therefore require careful consideration.

The results of the projected wastewater analysis for the twenty STWs affected by the current planned development are presented in Table 8.3 below (Aldeburgh and Thorpeness have been combined for the purposes of this analysis). This shows whether the headroom at each STW in each year is more than 20% of the consented DWF (Green), between 20% and 0% (Amber) and negative headroom (Red). The eleven catchments in which development is already planned are discussed further in the following sections.

Table 8.3: Summary of STW Headroom for affected STWs in Suffolk Coastal DC – Employment and Residential Development

STW Ref.	Catchment Settlement(s) / Development Area	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
ALDEST /TNESST	Aldeburgh and Thorpeness														
ALDNST	Alderton														
BENHST	Benhall (Saxmundham)														
BLAXST	Blaxhall														
CLQYST	Cliff Quay*														
FELIST	Felixstowe and The Trimleys														
GEDGST	Gedgrave (Orford)														
GRUNST	Grundisburgh														
HOLLST	Hollesley														
KIRTST	Kirton														
LEISST	Leiston														
LEVIST	Levington														
MELTST	Melton														
NACTST	Nacton														
OTLYST	Otley														
RENDST	Rendlesham														
SDBNST	Sudbourne														
TUDLST	Tuddenham														
WIMKST	Wickham Market														
WOODST	Woodbridge and Martlesham														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Note: * *Cliff Quay contains the development projections across its entire catchment, including development in Suffolk Coastal District, Ipswich Borough and Mid Suffolk District.*

This shows twelve works with a lack of headroom to cope with the projected growth of both housing and employment over the study period and two other works which fall within 20% of the limit of their headroom by the end of the planning period. However, when only the residential development is considered, only four works display a lack of headroom within the planning period, and two other STWs fall within 20% of the limit of their headroom.

The STWs which serve the Development Areas outlined in Section 8.2 and are identified as exceeding their discharge consent, in terms of combined residential and employment development are as follows:

- Benhall
- Cliff Quay
- Felixstowe and the Trimleys
- Leiston
- Melton
- Rendlesham
- Woodbridge and Martlesham

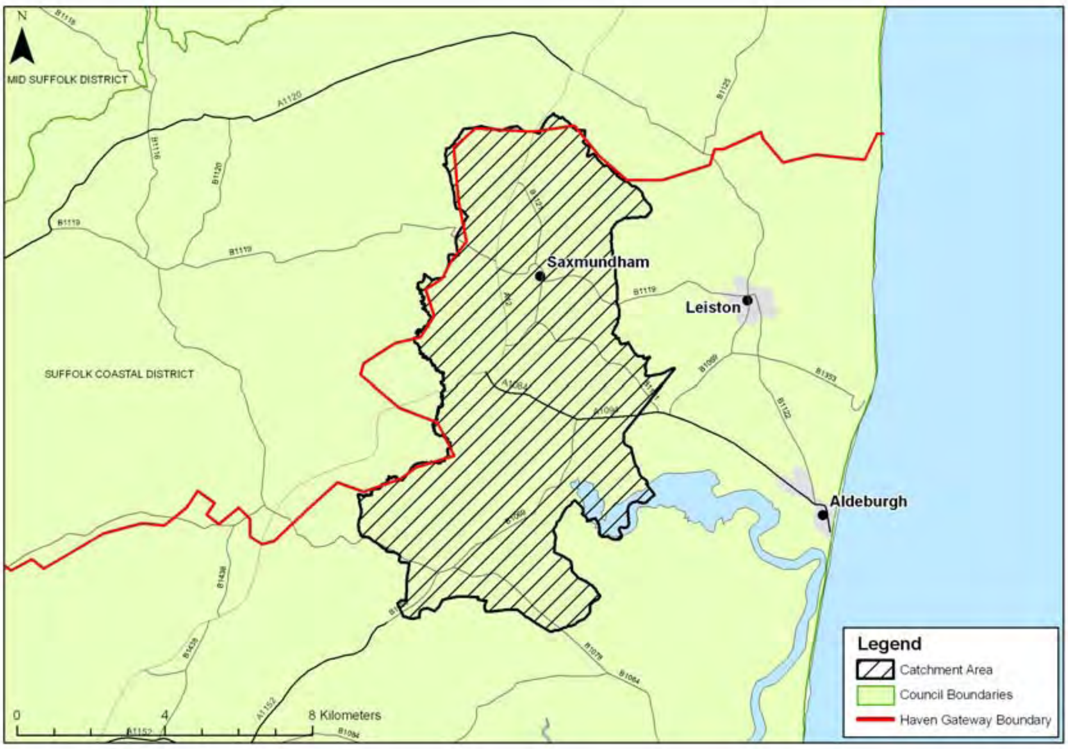
These seven works are discussed further below. At present it would not appear that AWS are applying for an increased consented flow at any of these STWs, although they have applied for an increase at Tuddenham, which is not expected to be significantly affected by any development within the Haven Gateway.

Very limited information was available for this study with which to make an assessment of the capacity of the wastewater infrastructure (sewer pipes, pumping stations etc). However, brief comment was provided by AWS for each of the STW catchments in which a future potential for residential development has been identified. These are discussed within the analysis of individual STWs below and within the discussion of individual development areas.

8.4.1 Benhall STW

Benhall STW (BENHST) receives discharge from the settlement of Saxmundham and surrounding areas as shown in Figure 8.6 below:

Figure 8.6: Location of Benhall STW Catchment



A fairly high residential development is planned in this area totalling 704 dwellings. In addition 13ha of employment land is also predicted. The STW has a current consented DWF of 1,500m³/d and is currently operating with 39% headroom. However, the STW rapidly exceeds its capacity due to the commencement of development and is predicted to become negative in 2009/10, totalling 2,255m³/d by 2020/21, which is greater than 50% over capacity, as shown in Figure 8.7,and Table 8.4 below:

Figure 8.7: Benhall STW percentage headroom – residential and employment development

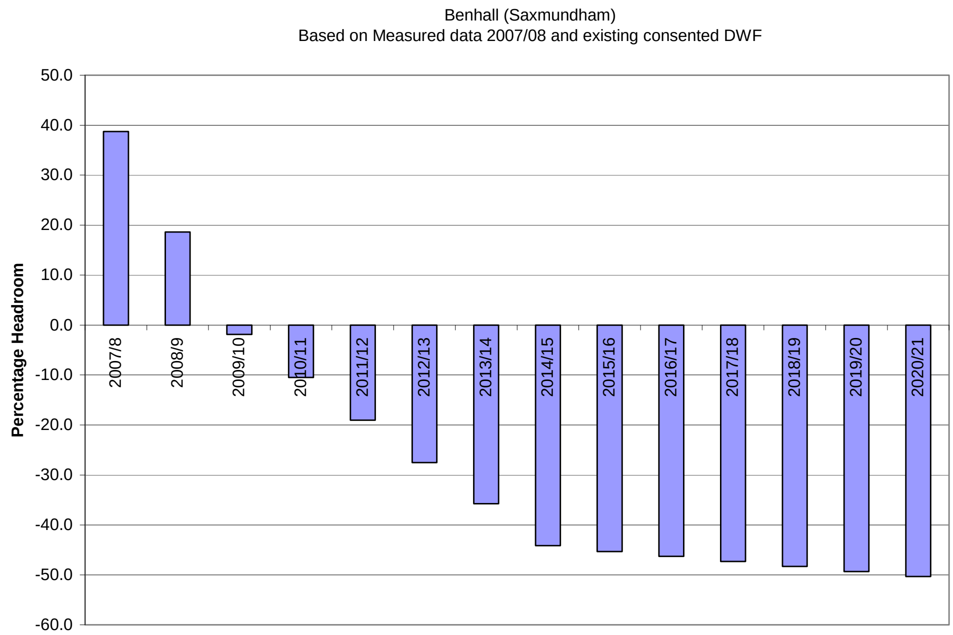


Figure 8.4 - Headroom availability of the Benhall STW - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BENHST	Saxmundham														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

Alternative treatment options would therefore be required in order to accommodate this development. However, when the predicted residential development is considered by itself, the STW remains below its consented DWF for the entire planning period, reaching a minimum of 22% headroom by the end of the planning period, as shown in Figure 8.5 and Table 8.8 below:

Figure 8.8: Benhall STW percentage headroom – residential development only

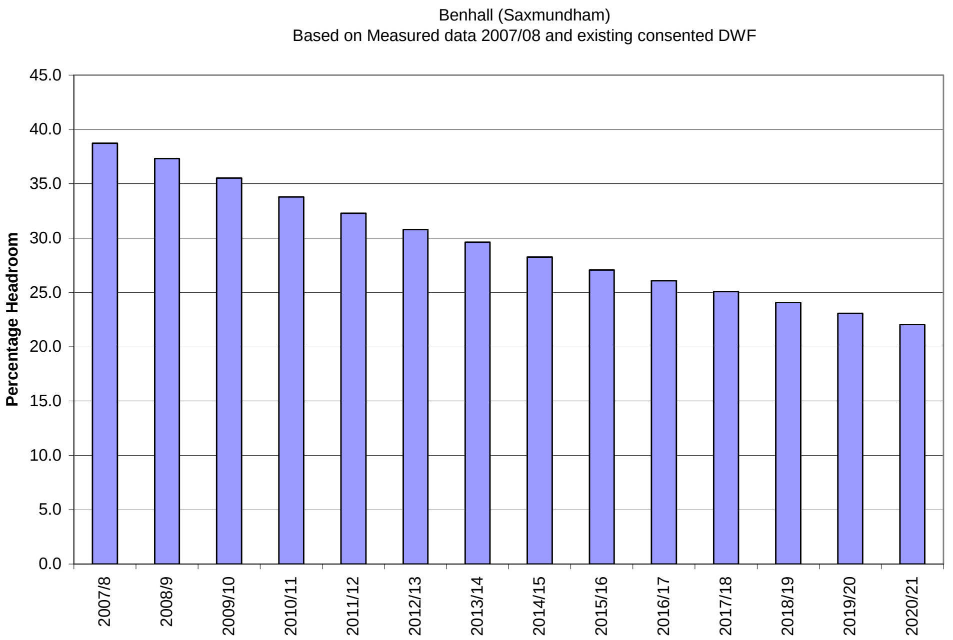


Figure 8.5 - Headroom availability of the Benhall STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BENHST	Saxmundham														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

There is therefore enough headroom to accommodate the residential development planned within the catchment and this has been confirmed by AWS, but in order to accommodate the employment proposals as well then additional measures will need to be employed, such as an increased discharge consent or alternative treatment.

AWS have also identified capacity issues throughout the Benhall catchment. They would therefore prefer development to avoid this catchment where possible and, where it is necessary, locate it as close to the STW as possible (i.e. in the south of the catchment).

Environmental Considerations

Benhall STW discharges secondary treated sewage effluent into the River Fromus (at Grid Reference TM 3822 6056). The current consented discharge (ASENF/2052D modified June 2005) is 3,985m^3 per day, with a consented dry weather flow of 1,500m^3 per day. According to the conditions of the current consent the discharge shall not exceed:

- 10 milligrammes per litre of BOD with an upper limit of 40 milligrammes per litre;
- 5 milligrammes per litre of ammoniacal nitrogen with an upper limit of 20 milligrammes per litre;
- 20 milligrammes per litre of suspended solids; or
- a 'significant quantity' of solid matter having a size greater than 6 millimetres in more than two dimensions.

Anglian Water carry out regular sampling at the discharge points to ensure that current consent limits are being met. Trends in the sampling indicate that the quantity of suspended solids and ammoniacal nitrogen in the water is being sufficiently maintained and is in fact well under the consent limit (at around 30% and 50%, respectively, of the consented concentration). The BOD is consistently around 50% of the consented concentration.

The current state of the receiving environment

The River Fromus currently has a GQA grade (2006) of E (very poor) for chemical and C grade (fairly good) for biological standards. These grades have been consistent since 2001, with an E grade for chemical GQA since 1985. The phosphate GQA grade for the river is 2, indicating a low level of phosphate. If consented STW (dry weather) discharge increases by 39% by 2020/21 this may increase the low amount of phosphate currently in the river.

The biological GQA relates to macro-invertebrate communities which have varying tolerances to pollution; an increase in BOD and nitrogen in the water could affect these communities, in particular decreasing the presence of less tolerant species.

The River Fromus discharges into the Alde-Ore system approximately 8km from the Alde-Ore Estuary SPA, and Ramsar designated site and Alde-Ore and Butley Estuaries SAC site. The SSSI condition of the nearest Alde-Ore estuary units, which will directly relate to the condition of the European designated area, is favourable. The units are predominantly saltmarsh and reedbed indicating that saline influences are greater than fluvial in this area, and suggesting that variations in river quality will not directly jeopardise the integrity of the site. Additionally reedbeds are reasonably tolerant to high nutrient loads.

It is likely that 8km is a sufficient distance to create a dilution of the discharged effluent and is not expected to impact the site. The river also flows past a SSSI called Gromford Meadow; this small site comprises one unit which is currently in an 'unfavourable, recovering' condition due to a lack of diversity in terrestrial floral species but is expected to return to favourable condition shortly.

The impact of development

Modelled discharge in 2009/10, considering flows from all development types, will exceed the current consent, and this will continue to increase into the future. Projected dry weather discharge in 2020/21 is 2, 255m^3 per day; this exceeds the current consent by 755m^3 per day (50%). Therefore in order to accommodate planned growth an increase in consented discharge may be necessary.

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 3.8kg of ammoniacal nitrogen, and 15.1kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Benhall met BATNEEC standards it would not be sufficient to prevent the BOD limits being exceeded from as early as 2010/11; given that flow levels are already thought to be higher than the modelled values, BATNEEC is not considered a viable option at this location. If BAT was installed then the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Benhall STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Benhall in-combination with other discharges into the same watercourse.

Designated sites are not likely to be affected by changes to the consented discharge levels at Benhall STW, and no water quality-related activities require the consent of Natural England. An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

<u>Conclusions</u>

This STW has sufficient capacity to cope with the proposed residential development throughout the planning period. However, it does not have the capacity to meet the requirements of the employment development as well. If all the proposed development is to go ahead a significant upgrade to the existing STW or a rerouting of flows to a neighbouring STW is therefore required. The catchment also suffers from a lack of capacity in the sewers, which will require significant upgrade if development is to be placed away from the STW. These required upgrades to the STW and sewer network would require funding from either AWS and/or individual developers.

Although currently the dry weather flow is being exceeded, testing by Anglian Water of the area surrounding the STW indicates that the pollutant loads are not being exceeded and are significantly under the consent limits. The increase in development will result in these limits being exceeded at some point in the future, however it is unlikely that this will occur in the near future.

The water quality analysis indicates that the pollution flows from the STW could exceed consent as early as 2009/10 if sanitary treatment was to fall to current consented levels. This could be controlled in the short term by the implementation of BATNEEC technologies, but in the future these would not be sufficient and significant investment will be required to implement BAT technologies for the remainder of the planning period.

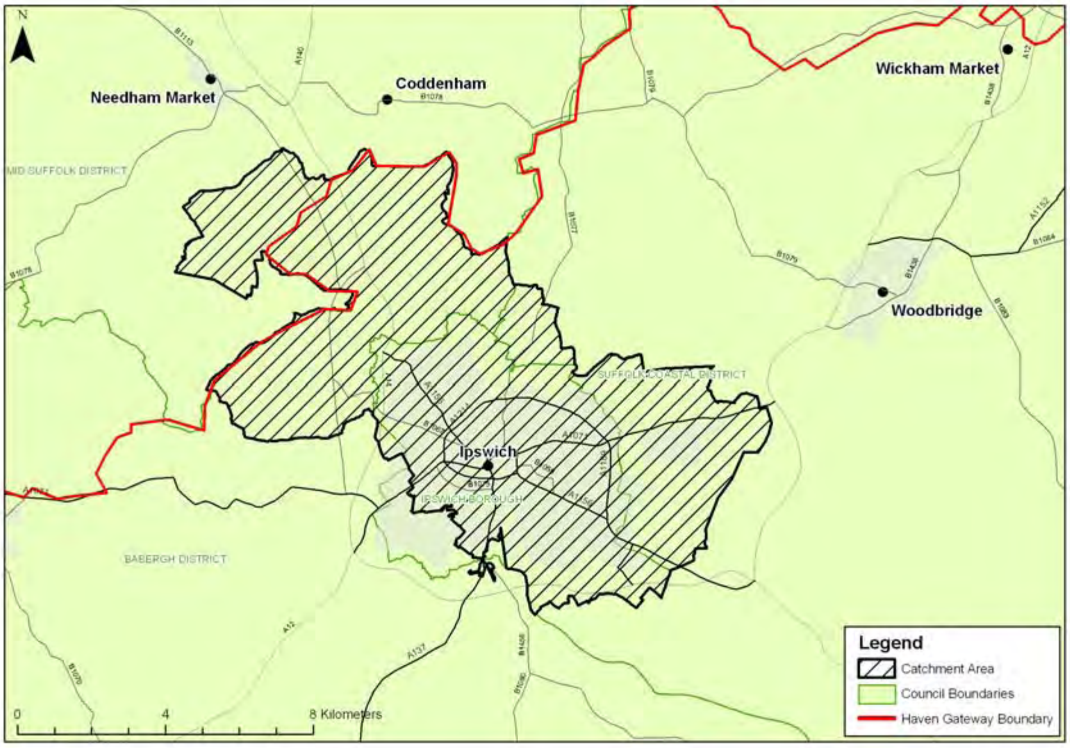
Table 8.6 - Benhall STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Consent increase for employment development	Consent increase for employment development	Consent increase for employment development	Consent increase for employment development
Sanitary Treatment Improvements	Potentially implement BATNEEC Technologies	Potentially to BAT Technologies	Potentially to BAT Technologies	Potentially to BAT Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

8.4.2 Cliff Quay STW

Cliff Quay STW (CLQYST) is located in Ipswich Borough. However, as illustrated in Figure 8.9, its catchment extends over 4,500ha covering most of Ipswich Borough but also parts of the Districts of Mid Suffolk, Babergh and Suffolk Coastal, a current total population of over 120,000.

Figure 8.9- Location of Cliff Quay STW Catchment



It therefore cannot be analysed independently within any one District and must consider the cumulative development in all four. Over the planning period (2001-2021) a total of 20,762 dwellings and just over 150ha of employment land are planned within the catchment of CLQYST, spread between Ipswich Borough, Mid Suffolk District, Babergh District (employment development only) and Suffolk Coastal District. CLQYST has a current consented DWF of 34,213m³/d, illustrated in Table 8.7.

Table 8.7- Discharge Capacity of the Cliff Quay STW, displaying current consented DWF, measure DWF (2007) and headroom availability

Site Name	STW	Current Consented DWF (m³/d)	Measured DWF 2007 (m³/d)	Headroom (m³/d)
Cliff Quay	CLQYST	34,213	24,624	9,589

As shown in Figure 8.10 and Table 8.8 below, the planned development, considering both employment and residential, will exceed this consent in 2014/15, reaching a maximum of almost 29% exceedance by 2020/21.

Figure 8.10: Cliff Quay STW percentage headroom – residential and employment development

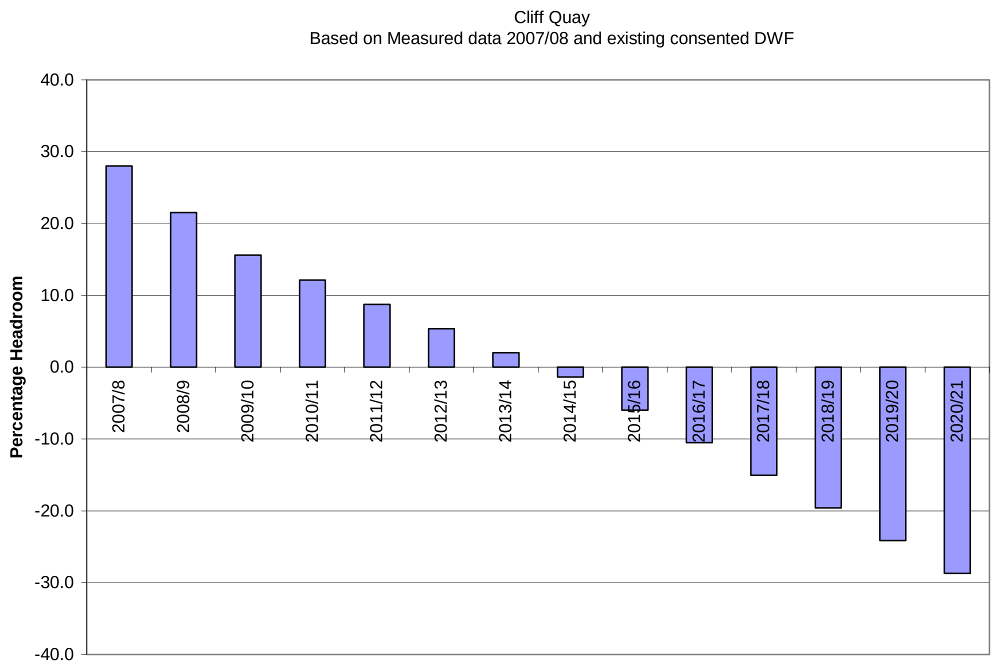


Table 8.8- Headroom availability of the Cliff Quay STW.

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Ipswich Policy Area														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

AWS however are only legally obliged to process sewage from residential development. When this is separated from the employment then the STW remains above its cDWF throughout the planning period, and remains almost 13% below the cDWF at the end by 2020/21, as shown in Figure 8.11 and Table 8.9 below.

Figure 8.11: Cliff Quay STW percentage headroom – residential development only

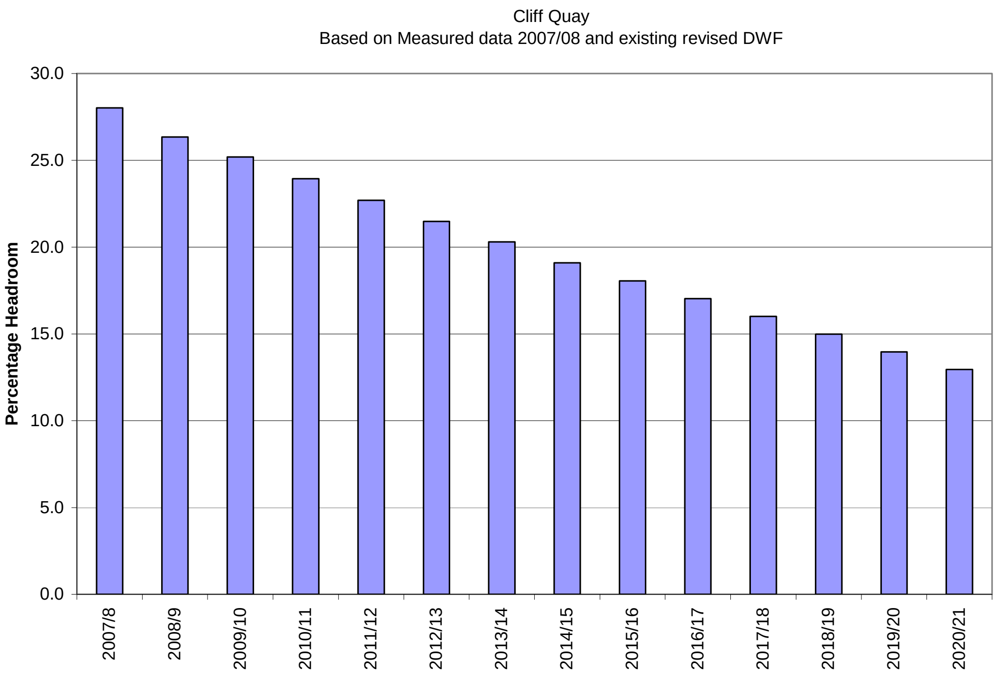


Table 8.9- Headroom availability for the Cliff Quay STW, which concerns only residential development data

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	Ipswich Policy Area														

AWS have considered the potential impact of development on the Cliff Quay STW and have provided a summary of their findings for use within this WCS. Within their analysis they have considered 8,562 additional dwellings within the catchment between 2008 and 2016, which is roughly equivalent to the 8,789 dwellings considered within this study.

They have identified the main problems and restrictions in the system as being related to the volume of surface water discharge entering their combined sewer systems, resulting in flooding, and the underperformance of a Sludge Treatment Centre which impacts heavily on the STW. AWS consider the Sludge Treatment Centre to be the main limiting factor to the STW and therefore propose to replace it within AMP5, which they claim will enable the STW to continue within the existing flow and sanitary consent parameters until 2021 and beyond. They do not expect any changes in the DWF consents during the proposed growth period. In addition they propose tighter planning policies with regards to the surface water runoff in terms of limited storm discharge and site storage where the existing sewers are under capacity.

A long term potential strategy for the STW catchment announced by AWS is a potential diversion of flows to the neighbouring Sproughton STW. However, as identified within this report, that too is under pressure from the proposed development indicating that, without expansion or improvement, it is unlikely to be able to accept an increase in flows.

Environmental Considerations

Cliff Quay STW (consent AEETS/12128B, modified 2005) discharges into the tidal River Orwell (Grid Reference TM 1714 4144). The current consented dry weather flow discharge is 34,213m^3 per day. The current discharge consents state that the discharge shall not exceed:

- 200 milligrammes per litre of suspended solids;
- 175 milligrammes per litre of BOD; or
- 50 milligrammes per litre of ammoniacal nitrogen.

As there is still headroom in the current consent, it can be assumed that these discharge limits will still be acceptable. It should further be noted that current discharges are currently significantly more dilute than the consent allows for.

Anglian Water monitoring of the discharge point takes place to ensure that these consent limits are maintained. Samples for Cliff Quay STW indicate the levels are sufficiently under the limits for suspended solids and BOD (25% of the consented limit for BOD and 15% of the limit for suspended solids). Ammoniacal nitrogen is frequently at the consent limit. This indicates that future increases in discharges could have an impact to the levels of these pollutants.

The current state of the receiving environment

The Cliff Quay STW discharges directly into the Stour and Orwell Estuaries Ramsar, SPA and SAC designated site. The SSSI condition of the nearest Orwell Estuary units, which directly relate to the condition of the European designated areas, is a mix of ‘favourable’ and ‘unfavourable, no change’. The units are predominantly saltmarsh, indicating that saline influences are greater in the area and suggesting that variations in river quality will not directly jeopardise the integrity of the site. The unit which is unfavourable, no change condition is so due to coastal squeeze and the resulting erosion of saltmarsh.

Shotley STW also discharges directly into the River Orwell, approximately 11km downstream of the Cliff Quay STW outfall. Also the Sproughton STW discharges into a river which connects with the Orwell Estuary.

The impact of development

Modelled discharge accounting for all development types will exceed the consented limit in 2014/15 and this will continue to increase in the future. Projected dry weather discharge in 2020/21 is 39,666m^3 per day; this exceeds the consent limit by 14% or 5,453m^3 per day.

Shotley, Sproughton and Cliff Quay STWs are expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Orwell Estuary is considered unlikely due to the size and diluting action of the estuary. Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Whilst current discharge concentrations are lower than the consented limits, the reported values suggest that treatment is not currently achieving Best Available Technology (BAT) or Best Available Technology Not Entailing Excessive Costs (BATNEEC) levels (see Section 2.5). Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Cliff Quay met BATNEEC standards then the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Cliff Quay STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Cliff Quay in-combination with other discharges into the same watercourse. An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

With the exception of the replacement of the Sludge Treatment Centre and the reduction in surface water flows, AWS do not consider any further action is required for this STW within the planning period for residential development. However, as shown above, some degree of expansion/upgrade of the STW will be required in order to accommodate both residential and employment development.

Action will be needed, either by AWS (possibly funded by others), or by individual developers to cope with the discharges from the proposed employment development which, as identified above, could have a significant impact on the total flows within the catchment (potentially upwards of 10,000m3/d by 2021) and for the required improvements to the sewer network.

Modelling of predicted flows indicates that the consent limit is not currently being exceeded and will not be exceeded until 2014/15. Current testing undertaken by Anglian Water indicates that the pollutant loads are sufficiently under the designated limits (75%

under) and this should be taken into consideration when assessing the future impacts. There is the potential that future flows will not exceed the pollutant loads in the consent.

In addition, this STW has been identified as requiring an upgrade in its treatment procedures, through the implementation of BATNEEC technologies, in order to ensure the pollution consent is not exceeded. If this is implemented then the STW will remain below its target pollutant limit throughout the planning period.

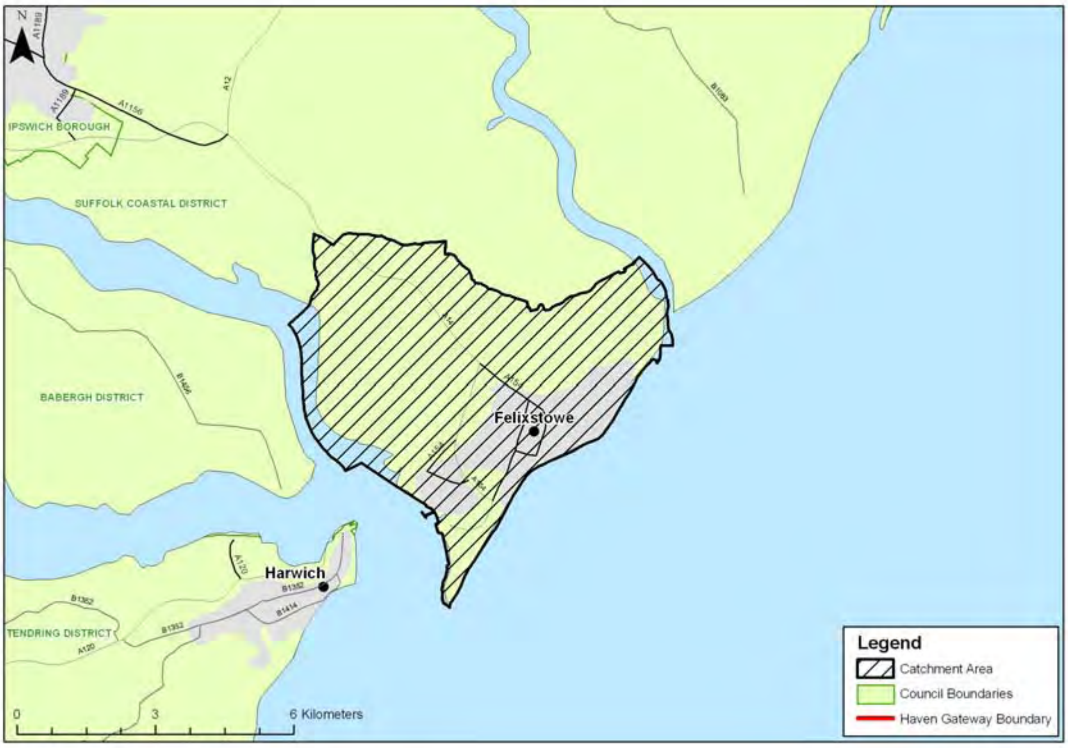
Table 8.10 - Cliff Quay STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Reduce surface water inflow	Reduce surface water inflow	Reduce surface water inflow. Re-route to Sproughton or increase consent	Reduce surface water inflow. Re-route to Sproughton or increase consent
Sanitary Treatment Improvements	Replacement of STC		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

8.4.3 Felixstowe and the Trimleys STW

Felixstowe and the Trimleys STW receive wastewater from the peninsula bounded by River Orwell and Harwich Harbour to the south and the River Deben to the north. This area is shown in Figure 8.12**:**

Figure 8.12: Location of Felixstowe and the Trimleys STW Catchment



Only 3% of the total residential development within Suffolk Coastal, 149 dwellings, but the majority of the employment development, totalling 460ha, is planned within this catchment. The current consented DWF for the works is 9,229m³/d.

Using the measured value in 2007/8 as a starting point for the projected capacity of the works, and the development trajectories outlined in Section 8.2 then the percentage headroom to 2020/21 is shown in the Figure 8.13 and Table 8.11 below:

Figure 8.13: Felixstowe and the Trimleys STW percentage headroom – residential and employment development

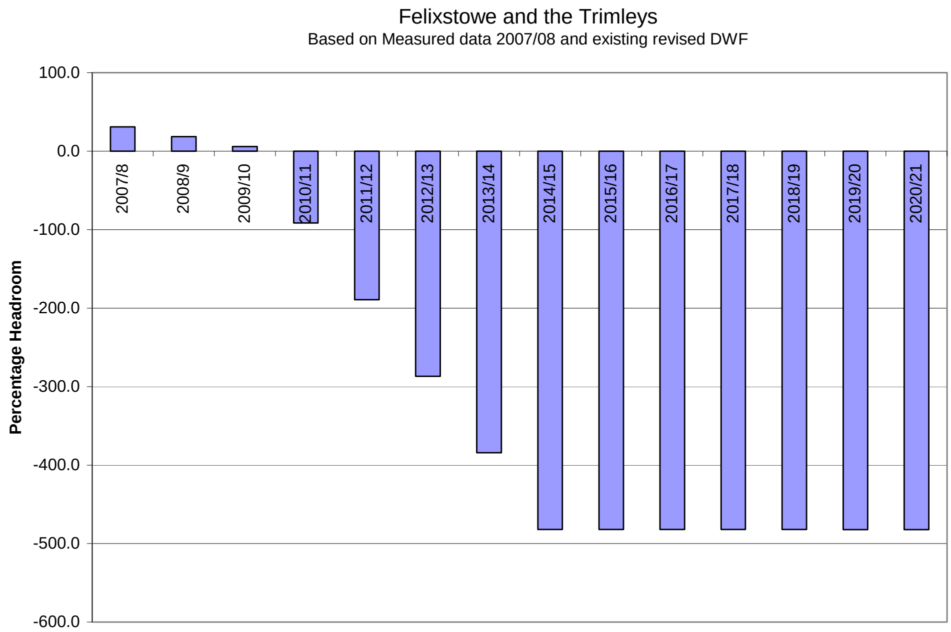


Table 8.11 - Headroom availability for Felixstowe and the Trimleys STW - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
FELIST	Felixstowe														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

The combined residential and employment development raise the discharge to 53,724³/d which is greater than 480% of the current consented DWF. The high degree of employment development is largely related to the ongoing development of Felixstowe port and as such will have a much lower degree of outflow than the standard values used in the global assessments. Removing the employment development completely results in the STW remaining a greater than 30% above its consented limit throughout the planning period, as shown in Figure 8.14 and Table 8.12 below:

Figure 8.14: Felixstowe and the Trimleys STW percentage headroom – residential development only

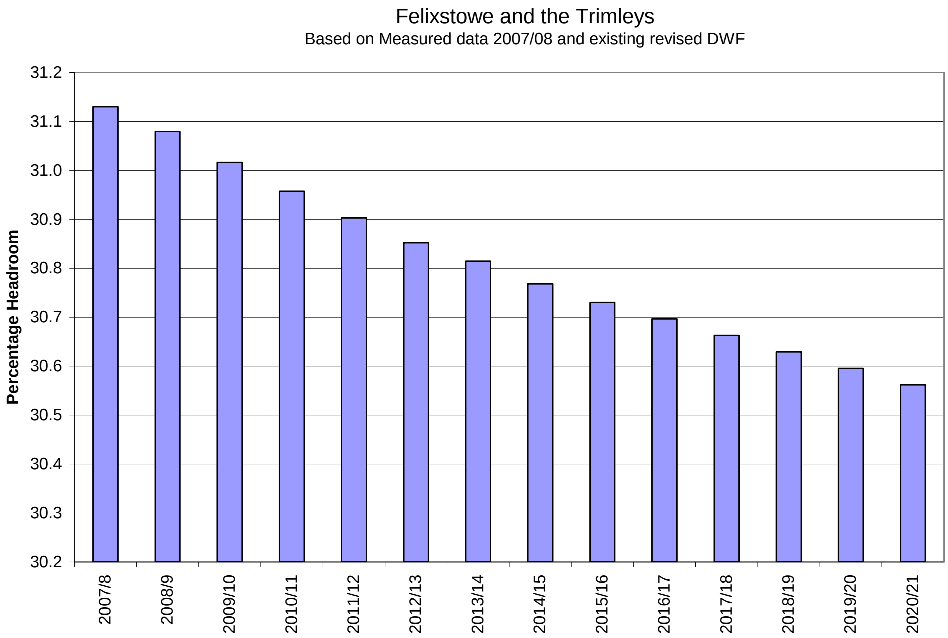


Table 8.12 - Headroom availability for Felixstowe and the Trimleys STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
FELIST	Felixstowe														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

There is therefore enough headroom to accommodate the residential development planned within the catchment, but in order to accommodate the employment proposals as well then additional measures may need to be employed, such as increased discharge consent. Unfortunately AWS have not provided any comment on the capacity of the sewer network within this STW catchment.

Environmental Considerations

Felixstowe and Trimley STW (consent ASETS/12143B, modified 2006) discharges into the tidal River Orwell (Grid Reference TM 2823 3237). The current consented discharge is 24,307m^3 per day, with a consented dry weather flow of 9,229m^3 per day. The current discharge consents state that the discharge shall not exceed:

- 120 milligrammes per litre of suspended solids;
- 60 milligrammes per litre of BOD with an upper limit of 120 milligrammes per litre ; or
- 50 milligrammes per litre of ammoniacal nitrogen with an upper limit of 100 milligrammes per litre.

Anglian Water carry out regular sampling at the discharge points to ensure that current consent limits are being met. Trends in the sampling indicate that the quantity of suspended solids and ammoniacal nitrogen in the water is being sufficiently maintained and is in fact well under the consent limit (at around 17% and 20%, respectively, of the consented concentration).

The current state of the receiving environment

The Felixstowe and Trimley STW discharges directly into the Stour and Orwell Estuaries near Harwich Harbour. The area of discharge is outside of any designated areas.

Felixstowe beach is designated under the Bathing Water Directive sets a number of microbiological and physico-chemical standards that bathing waters must either comply with ('mandatory' standards) or endeavour to meet ('guideline' standards). The STW outfall is approximately 5km from the beach area. In 2008 Felixstowe beach passed these standards and achieved the more stringent guideline standard (for total and faecal coliforms and faecal streptococci), as well as the mandatory standard.

The impact of development

Modelled discharge flows show that by 2010/11 the current consent will be exceeded and this will continue to increase into the future. Projected dry weather discharge in 2020/21 is 53, 724m^3 per day; this exceeds the current consent by 44,495m^3 or 582% per day. Therefore in order to accommodate planned growth an increase in consented discharge may be necessary.

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 224.7kg of ammoniacal nitrogen, and 5339.4kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Benhall met BATNEEC standards then the current consent limits would not be exceeded within the plan period.

The area surrounding the Felixstowe and Trimley STW has not been assessed in the draft Water Framework Directive classifications (Environment Agency, 2009). More detailed future assessment by the Environment Agency could able to provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Felixstowe and Trimley in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

This STW has the capacity to accommodate all the proposed residential development. However, the projections which include the employment development show the capacity of the discharge consent being exceeded as early as 2010/11. As mentioned above, the majority of the employment development within this catchment refers to the redevelopment of the port and as such, should have a smaller impact on the STW than displayed here. This will require further investigation and analysis before development can take place. Further analysis will also be required to assess the capacity of the sewer network and whether upgrade, and therefore investment, is required for the development to proceed.

Although currently the dry weather flow is being exceeded, testing by Anglian Water of the area surrounding the STW indicates that the pollutant loads are not being exceeded and are significantly under the consent limits. The increase in development will result in these limits being exceeded at some point in the future, however it is unlikely that this will occur in the near future. There is a substantial increase in the modelled dry weather flow from 2011/12 which may impact the pollutant load.

The water quality analysis has indicated that the proposed development may cause the current pollutant discharge consent to be exceeded as early as 2010/11 if development continues and high rates of wastewater result from the employment development. However, this can be overcome through the investment in, and implementation of, BATNEEC technologies throughout the planning period.

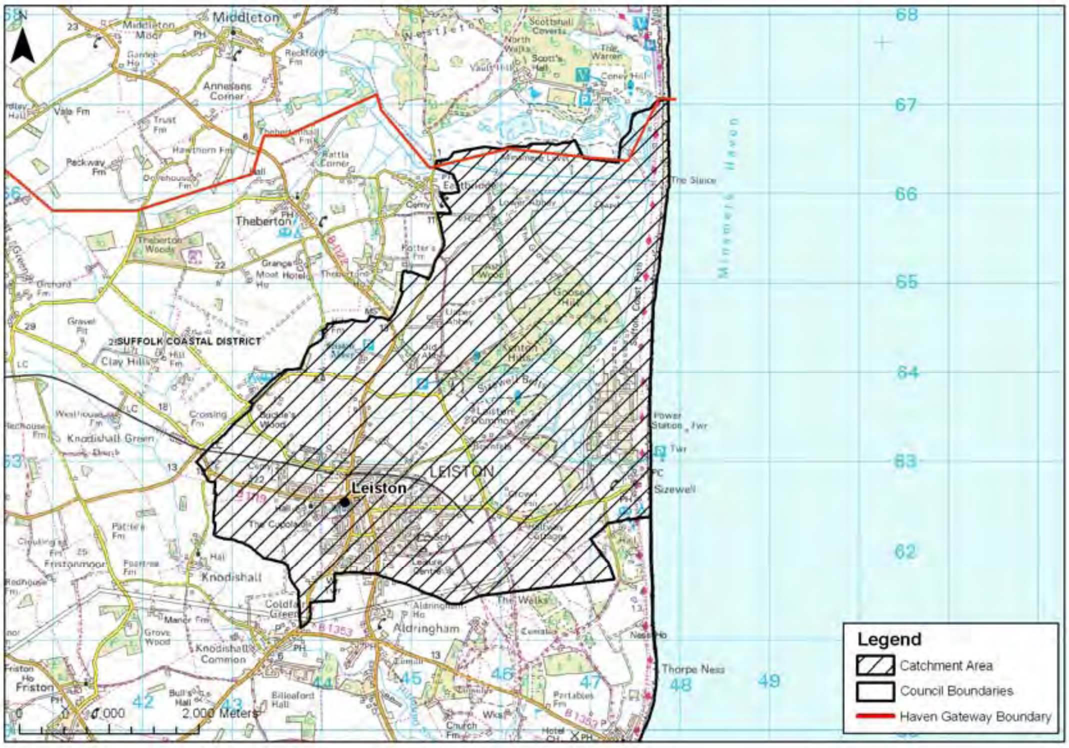
Table 8.13 - Felixstowe and the Trimleys STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Consent Increase			
Sanitary Treatment Improvements		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies

8.4.4 Leiston STW

Leiston STW receives discharge from the village of Leiston on the east coast of Suffolk Coastal District. Sizewell power station is also contained within its catchment, as shown in Figure 8.15 below:

Figure 8.15: Location of Leiston STW Catchment



There is limited development planned within this catchment, with a total of 189 dwellings and 16ha of employment land predicted between 2008 and 2021. The STW has a current consented DWF of 1,400m³/d and is currently operating with a headroom of greater than 58%. However, once the development commences, this headroom is rapidly utilised, dropping below 20% by 2011/12 and becoming negative the following year. By 2021 the consented DWF is predicted to have been exceeded by 62%, as shown in Figure 8.16 and Table 8.14 below:

Figure 8.16: Leiston STW percentage headroom – residential and employment development

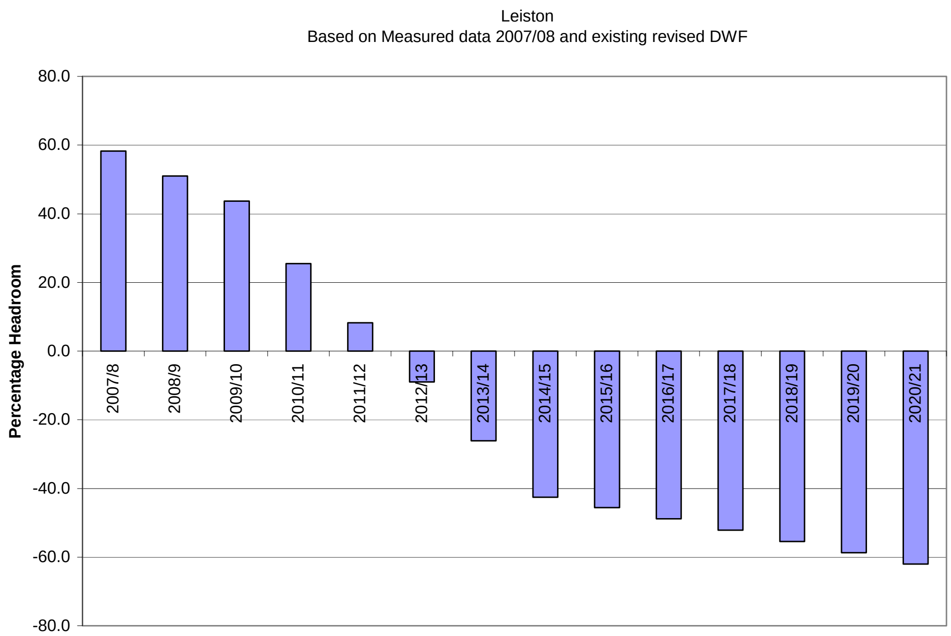


Table 8.14 - Leiston STW headroom availability - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
LEISST	Leiston														

However, when only the residential development is considered the works do not exceed the consented limit, reaching a headroom of 53% in the final year of the planning period as shown in Figure 8.17 and Table 8.15:

Figure 8.17: Leiston STW percentage headroom- only residential development considered

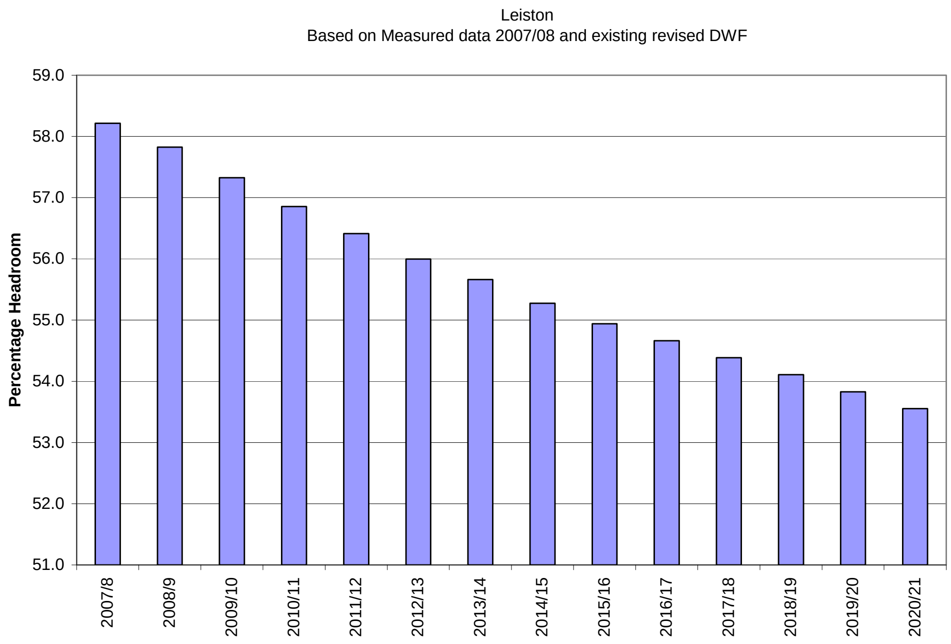


Table 8.15 - Leiston STW headroom availability - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
LEISST	Leiston														

There is therefore enough headroom to accommodate the residential development planned within the catchment and this is agreed by AWS, but in order to accommodate the employment proposals as well then additional measures need to be employed, such as an increased discharge consent.

The catchment suffers from a combined sewer system that suffers from a lack of capacity and therefore flooding from Combined Sewer Overflows (CSOs). As such AWS recommends that development takes place in the northeast of the catchment where flows can be transferred directly to the STW.

Environmental Considerations

Leiston STW (consent variation ASENF/1122B, April 2005) discharges into the Leiston Beck (at Grid Reference TM 4523 6331). The maximum volume of discharge is 3,629m^3 per day, with a consented dry weather flow limit of 1,400m^3 per day. In the consent conditions it is stated that the discharge shall not exceed;

- 10 milligrammes per litre of BOD with an upper limit of 45 milligrammes per litre
- 5 milligrammes per litre of ammoniacal nitrogen

- 20 milligrammes per litre of suspended solids;

Sampling of the Leiston STW discharge point by Anglian Water indicate that the levels of suspended solids and BOD may be reaching a limit where active management is taking place; if this is the case, any future increase in discharge may increase the need for this management. The levels of ammoniacal nitrogen are very consistent, at levels far below the consented limits and are not thought to present a significant management problem.

The current state of the receiving environment

The GQA grades (2006) for the Leiston-Minsmere sluice section of Leiston Beck is D (fair) for biological and E (poor) for chemical quality. The large increase in discharge in the future could potentially have a negative impact on these already low grades unless the discharge is managed to minimize both the concentration and absolute amount of pollutants entering the beck.

The discharge point is 300m from Sizewell Marshes SSSI and 2.4km from the Minsmere-Walberswick SPA, SAC and Ramsar designated site. Sizewell Marshes SSSI is a lowland unimproved meadow known for assemblages of breeding birds and invertebrates. The SSSI is currently in favourable condition with no water quality related issues. However if any effects on water quality could impact the invertebrate species present, this would have a knock on effect for the bird species found on the site.

The majority of the Minsmere-Walberswick SSSI units closest to the discharge point are currently in favourable condition. One is in 'unfavourable, recovering' condition due to too much water on the site affecting the invertebrate populations. In the condition assessment it has been stated that STWs feeding into the ditch system in the SSSI have been put forward for inclusion in the water company's Asset Management Plan (AMP) programme. Coastal influences dominate the majority of the site, and it is therefore unlikely that the increased discharge will further impact the site; this is particularly the case since the site is over 2km downstream of the discharge point, allowing for dilution.

Impact of development

Modelled discharge in 2012/13 will exceed the current consent, and will continue to rise into the future. Projected dry weather discharge in 2020/21 is 2,268m^3 per day which exceeds the current consent by 868m^3 or 62% per day.

If the consented dry weather discharge volume were increased in order to accommodate all development, at the current consented discharge concentrations this could allow the additional release of up to 4.3kg of ammoniacal nitrogen, and 17.4kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

It is felt that there are no apparent significant environmental constraints on increasing discharge from Leiston STW, so long as pollutant concentrations are maintained at levels appropriate to the receiving water course and sensitive receptors downstream, and that appropriate monitoring is carried out to ensure that this is the case. However where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Whilst current discharge concentrations are lower than the consented limits, the reported values suggest that treatment is not currently achieving Best Available Technology (BAT) or Best Available Technology Not Entailing Excessive Costs (BATNEEC) levels (see Section 2.5). Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Leiston met BATNEEC standards it would be sufficient to prevent the BOD limits being exceeded and the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Leiston STW is moderate, the grade below good. The standards set for meeting this classification are 1.1mg/l ammonia and 6.5 mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Leiston in combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

Currently the dry weather flow and the pollutant load of the water is under the consented limits, however testing of the pollutant levels indicate that in the future the limits may be exceeded. The increases predicted in the future flows modelling indicate that by 2020/21 the pollutant loads will be exceeded.

This STW has capacity to accommodate the additional flows from the residential development, but not from all the employment development. Investment is required to reduce flooding from the CSOs and to enable development to be located away from the STW. Investment is also required to implement BATNEEC technologies from 2012 to refrain the pollutant loads from exceeding their consents.

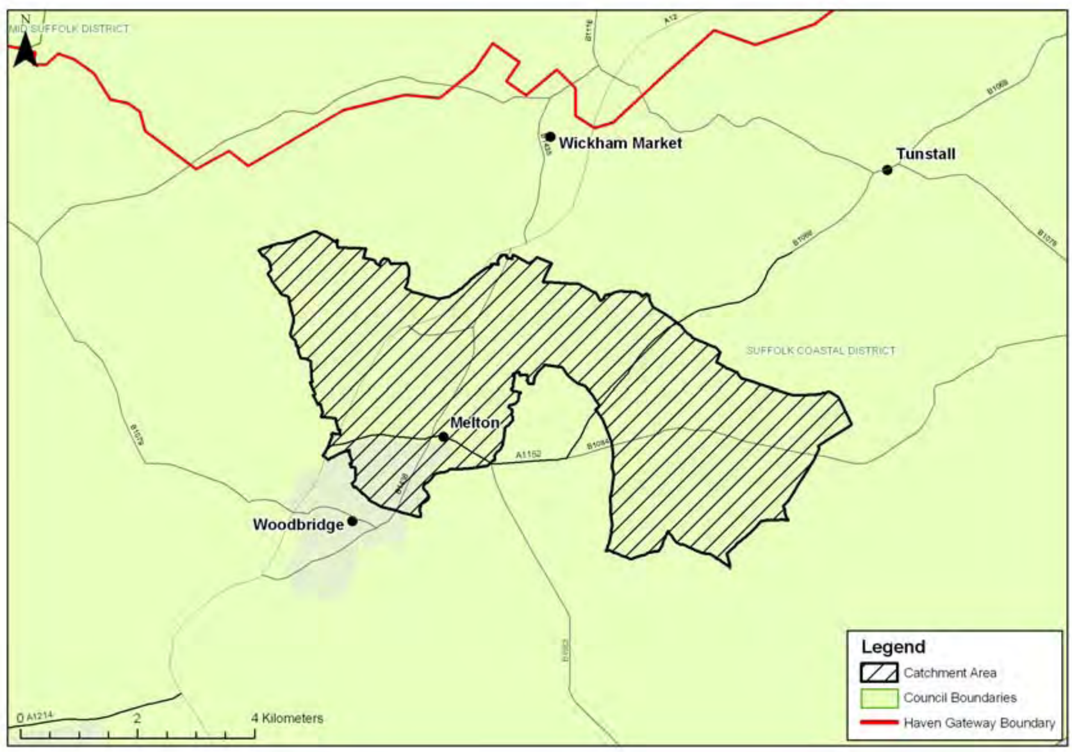
Table 8.16 - Leiston STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sanitary Treatment Improvements		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

8.4.5 Melton STW

Melton STW receives the wastewater from the villages of Melton, which forms the northern suburb of Woodbridge, Ufford and Bredfield, as shown in Figure 8.17 below:

Figure 8.18: Location of Melton STW Catchment



Development within this catchment totals 232 dwellings (5% of the total for the District) and 10.4ha of development land (2% of the total). Its current consented DWF is 950m³/d, which it is already exceeding by almost 4%. Once the employment and residential development is considered, this STW exceeds its CDWF by over 113% by 2020/21, as shown in Figure 8.19 and Table 8.17 below:

Figure 8.19: Melton STW percentage headroom – residential and employment development

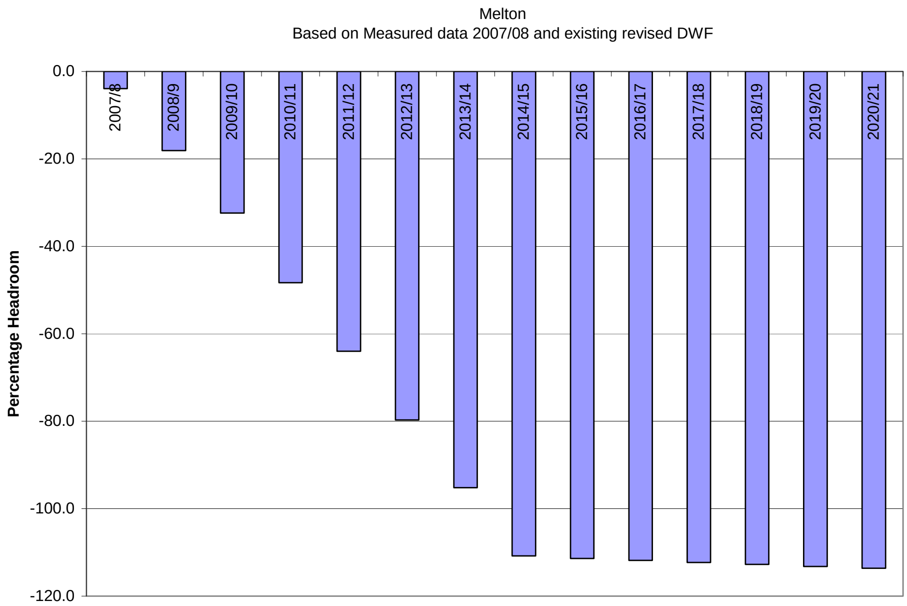


Table 8.17 - Melton STW headroom availability - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
MELTST	Melton														

When just the residential development is considered the exceedance is much less at just 11.7%, illustrated in Figure 8.20 and Table 8.18:

Figure 8.20: Melton STW percentage headroom – residential development only

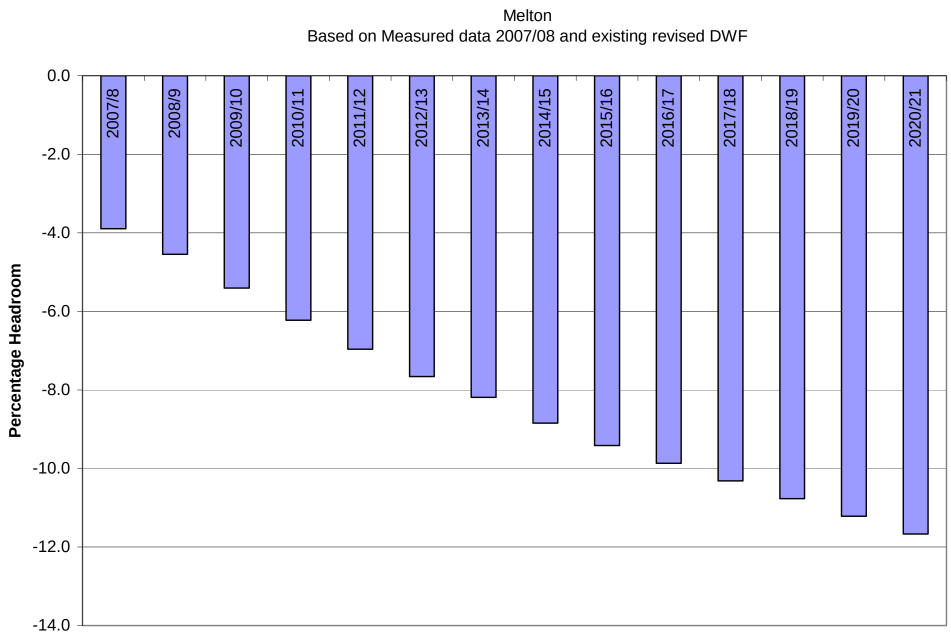


Table 8.18 - Melton STW headroom availability - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
MELTST	Melton														

This STW therefore needs additional measures to be employed in order to accommodate its current flow, before any development is considered. This increase could be in excess of 100 m³/d by the end of the study period. AWS agree with this assessment and have stated that investment is needed in the STW before any new connections can be made. Ideally they would like the new development to be located in proximity to the TPS (off Melton Road) or where flows can be pumped directly to the TPS. They have also stated that the foul water catchment has capacity; however improvements may be needed to accommodate the growth as historically there are issues surrounding surface water drainage.

Environmental Considerations

Melton STW (consent variation AW4TS/717XD, modified June 2001) discharges directly into the Deben estuary (Grid Reference TM 2821 4967). The maximum daily flow discharge is 8,385m^3 per day, with a dry weather flow of 950m^3 per day. The conditions of the consent limit the composition of the discharge, stating that it shall not exceed:

- 28 milligrammes per litre of BOD with an upper limit of 63 milligrammes; or

- 42 milligrammes per litre of suspended solids.

Sampling at the discharge point is carried out by Anglian Water to ensure that the levels stated in the consent are not surpassed. The samples for suspended solids and BOD indicate the limits are not currently being exceeded (they are both below 50% of the limit).

The current state of the receiving environment

The STW discharges directly into the Deben Estuary, a Ramsar and SPA site. The SSSI unit into which the STW discharges is currently in an ‘unfavourable, declining’ condition due to the erosion of the saltmarsh. The Natural England assessment of the unit determines that the reasons for this decline are coastal squeeze and water pollution, caused by agricultural run off. Although these causes are not associated with the treatment and discharge of waste water, increased discharge and pollutant load from the facility could exacerbate the current situation.

SSSI units surrounding the receiving unit are currently in favourable condition, but pollution was again identified as a potential issue, albeit from agricultural runoff. Due to the discharge point falling directly into the designated area with no opportunity for dilution in a river etc, the impact of the pollutants and suspended solids in the discharge will be greater than from other STW.

Approximately 1km downstream of the discharge point is Ferry Cliff SSSI. It is an earth heritage site, due to the large number of ancient mammalian fossils found there and is in favourable condition. Natural England does not require notification of changes to water processes affecting this site, and as such it is not felt that this site will be negatively affected by the increased discharge from Melton STW.

The Woodbridge STW also discharges into the Deben Estuary, approximately 3km from the outfall of Melton STW. The potential for these discharges to have a combined effect on the condition of the Deben Estuary is considered unlikely due to the size and diluting action of the estuary.

Impact of development

Current calculated dry weather flow figures, considering all new development types, indicate that this limit is already being exceeded. By 2020/21 the dry weather flow, accounting for all development types, is expected to increase to 2,030m^3 per day, an increase of 114% or 1,080m^3 per day.

If the consented dry weather discharge volume were increased in order to accommodate all development, at the current consented discharge concentrations this could allow the additional release of up to 45.4kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

If discharge volumes are required to increase from this site it is suggested that mechanisms be employed to ensure that there will be no significant effect on either the receiving water course or the sensitive receptors downstream. Where possible the

Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Melton operated to BATNEEC standards it would be sufficient to prevent the BOD limits being exceeded and the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Melton STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Melton in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

<u>Conclusions</u>

Although the current dry weather flow is being exceeded, the pollutant load is currently under 50% of the consented limit, indicating potentially sufficient headroom for future increases in flow caused be developments. The water quality analysis indicates that, if pollution discharges were currently at their consented limits, then the impacts of the proposed development could be overcome by the implementation of BATNEEC technologies throughout the planning period.

Both the environmental and capacity of the existing consents suggest that further development in this area may require both treatment improvements and consent increases in order to accommodate development. Although there is theoretically spare capacity within the foul water system, upgrade or expansion may be required in order to enable the new developments to connect to this space.

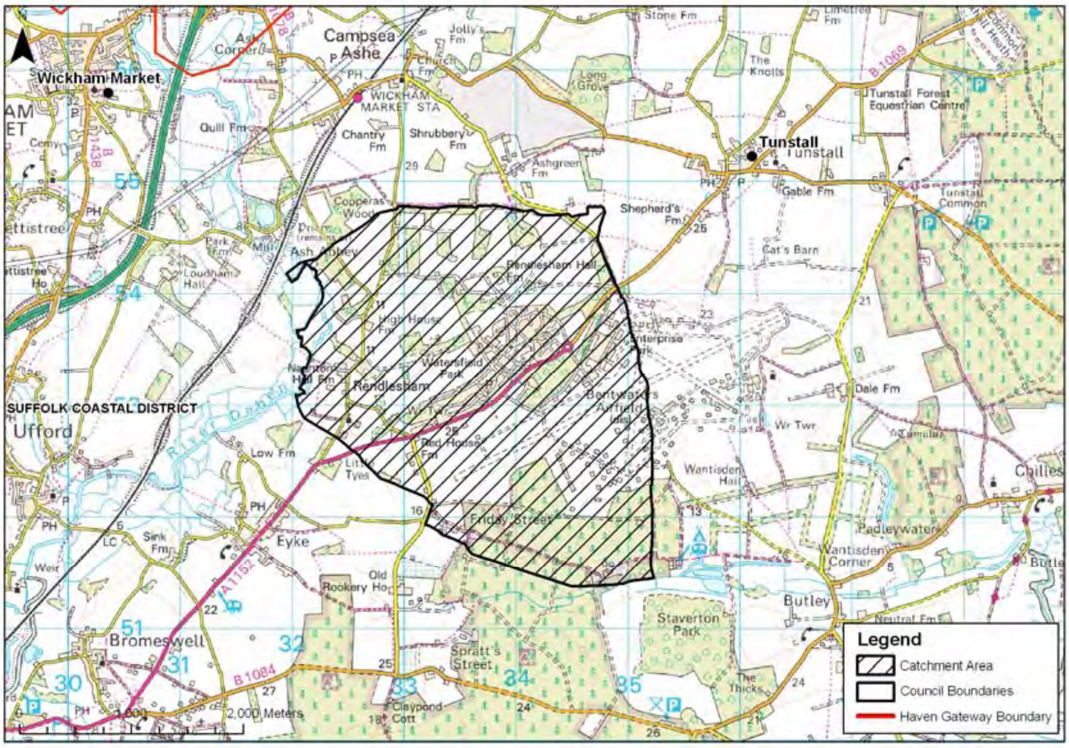
Table 8.19 - Melton STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Increase consent. Reduce surface water inflow	Increase consent. Reduce surface water inflow	Increase consent. Reduce surface water inflow	Increase consent. Reduce surface water inflow
Sanitary Treatment Improvements	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required regarding surface water flows	Improvements required regarding surface water flows	Improvements required regarding surface water flows	Improvements required regarding surface water flows

8.4.6 Rendlesham STW

Rendlesham STW serves a small catchment in the centre of the study are of Suffolk Coastal District serving Rendlesham village and Bentwaters Airfield. The catchment area is shown in Figure 8.21 below:

Figure 8.21: Location of Rendlesham STW Catchment



The current consented DWF for this STW is 646m³/d and it is currently operating with a 60% headroom. A total of 481 dwellings (10% of the total residential development) and 22ha of employment land are proposed within this small area. This causes the headroom to rapidly be exceeded, reaching -18.8% in 2010/11 and -322% in 2020/21, as shown in Figure 8.22 and Table 8.20 below:

Figure 8.22: Rendlesham STW percentage headroom – residential and employment development

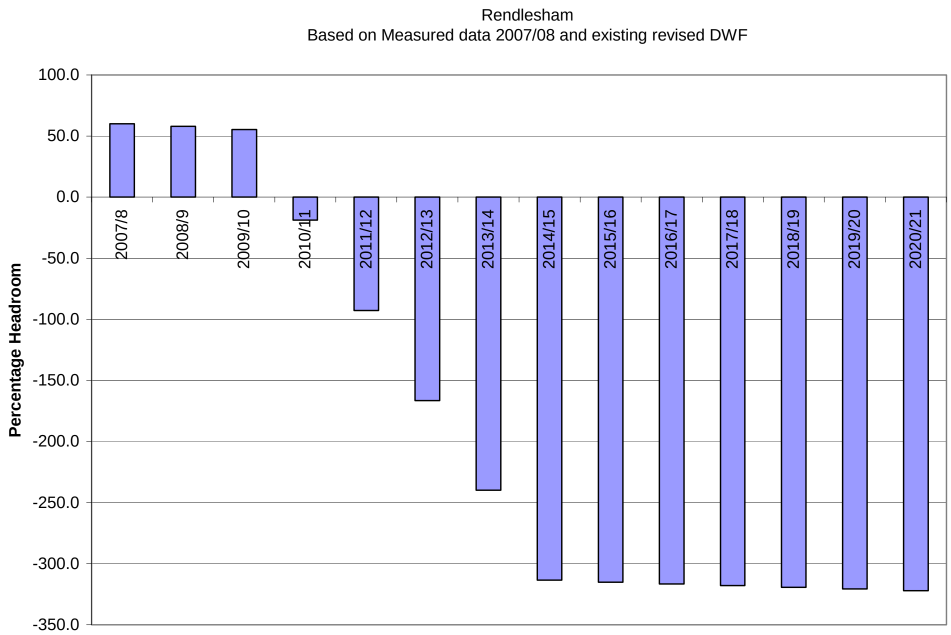


Table 8.20 - Rendlesham STW headroom availability - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
RENDST	Rendelsham														

However, similarly to the other STWs mentioned above, if the employment is removed from the equation the STW retains a headroom of greater than 20% throughout the planning period, reaching a minimum of 36.4% in 2020/21, as shown in Figure 8.23 and Table 8.21:

Figure 8.23: Rendlesham STW percentage headroom – residential development only

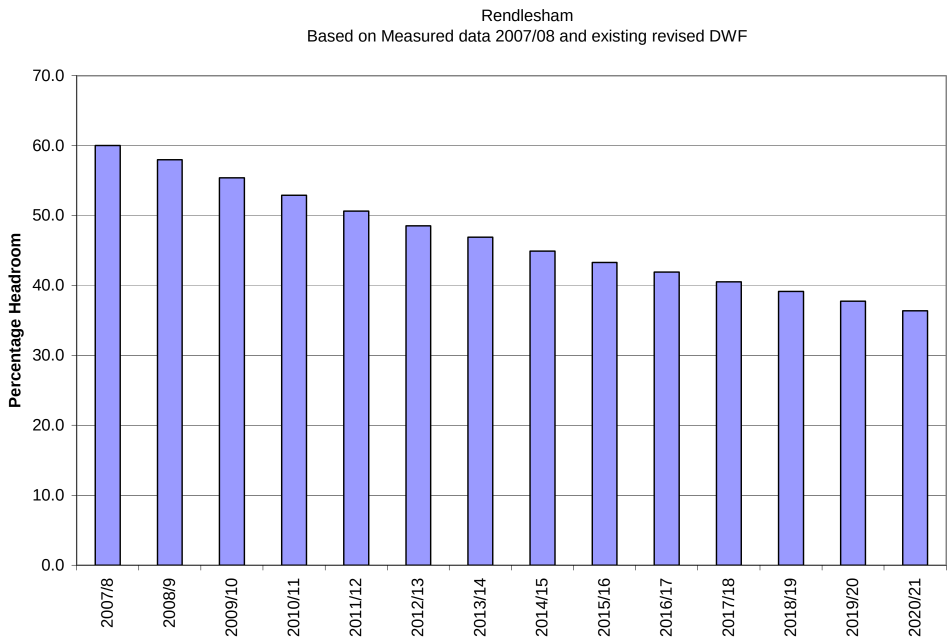


Table 8.21 - Rendlesham STW headroom availability - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
RENDST	Rendelsham														

There is therefore enough headroom to accommodate the residential development planned within the catchment, reiterated by AWS, but in order to accommodate the employment proposals as well then additional measures need to be employed, such as an increased discharge consent or alternative treatment.

AWS have not provided direct comment on the infrastructure network, however they have stated that they would prefer any additional development to be located in proximity to the STW so flows can be transferred directly to the works, or in proximity to the pumping stations at RAF Rendelsham.

Environmental Considerations

Rendlesham STW (consent variation ASENF/19613, December 2005) has two discharge points into the River Deben (Grid References TM 3236 5368 and TM 3230 5363). The discharge flow is 1,678m^3 per day, with a dry weather discharge limit of 646m^3 per day. The conditions of the consent limit the composition of the discharge, stating that it shall not exceed:

- 10 milligrammes per litre of BOD with an upper limit of 40 milligrammes per litre;
- 8 milligrammes per litre of ammoniacal nitrogen with an upper limit of 30 milligrammes per litre; or
- 25 milligrammes per litre of suspended solids.

Anglian Water sampling at the discharge point indicate that the consent limits have not been exceeded and the amounts of nitrogen, suspended solids and BOD are consistently well under the limits. Nitrogen levels are currently 12.5% of the consented limit, suspended solids 20% of the limit and BOD 40% under the consent limit.

The current state of the receiving environment

The GQA grades (2006) for the River Deben are currently C (fairly good) for both biological and chemical GQA. The chemical GQA grade has been C since 1986, except in 1999 when it decreased to a D. The biological GQA grade is declining; in 1992 and 1994 it was an A (very good) and all other years since 1990 it has been a B. 2006 was the first year it decreased to a C. Further sampling in the future will show if this trend will continue, but as biological grades have previously been high it can be assumed that there is potential for increased pollutants in the river to affect the macro-invertebrate communities, bringing about a transition to pollutant tolerant species.

The phosphate GQA grade for this stretch of the River Deben has consistently been high (level 4) since 2001, indicating the potential for increased eutrophication if nutrient (e.g. phosphate) inputs increase.

The discharge points are approximately 3.6km from Deben Estuary Ramsar and SPA designated site. The closest SSSI unit, which corresponds to the European designated site, to the discharge point is currently in 'favourable' condition, requiring very little management. The distance from the discharge point to the sensitive area should allow sufficient dilution.

Impact of development

Modelled discharge accounting for all development types will exceed the current consent in 2010/11; this will continue to increase into the future. Projected dry weather discharge in 2020/21 is 2,724m^3 per day; this exceeds the current consent by 2,079m^3 per day (322%).

If the consented dry weather discharge volume were increased in order to accommodate all development, at the current consented discharge concentrations this could allow the additional release of up to 16.6kg of ammoniacal nitrogen and 52kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

The Woodbridge STW and Melton STW also discharge into the Deben Estuary, approximately 9km and 6km respectively, from the outfall of Rendlesham STW. As there is such a large modelled increase in discharge in the future at this STW, there is potential for the Deben Estuary site to be affected. Also, the site assessment for the entire Deben Estuary has identified water pollution as an issue and as such it is recommended that water quality is carefully monitored and maintained for this discharge point.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Rendlesham met BATNEEC standards it would not be sufficient to prevent the BOD limits being exceeded from as early as 2013/14; given that flow levels are already thought to be higher than the modelled values, BATNEEC is not considered an appropriate level of treatment at this location. If BAT was installed then the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Rendlesham STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river. More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Rendlesham in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is likely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

<u>Conclusion</u>

Although with residential dwellings alone the capacity of this works is adequate, if employment is considered and accommodated then the environmental considerations will need to be taken into account within any potential increases in discharge consent.

The dry weather flow is currently not being exceeded and there is substantial headroom in both dry weather flow and pollutant load. Although it is predicted that the dry weather flow will be exceeded in 2010 the pollutant load is currently significantly under the consented limits, indicating that there is likely to be sufficient headroom for increases in flow caused be developments.

With regards to the pollution consents, if the current discharges are at their sanitary consented limits then investment will be required to implement BATNEEC technologies in order to keep the pollution discharge within consent beyond 2010/11. Significant investment will be required to implement BAT technologies beyond 2013/14.

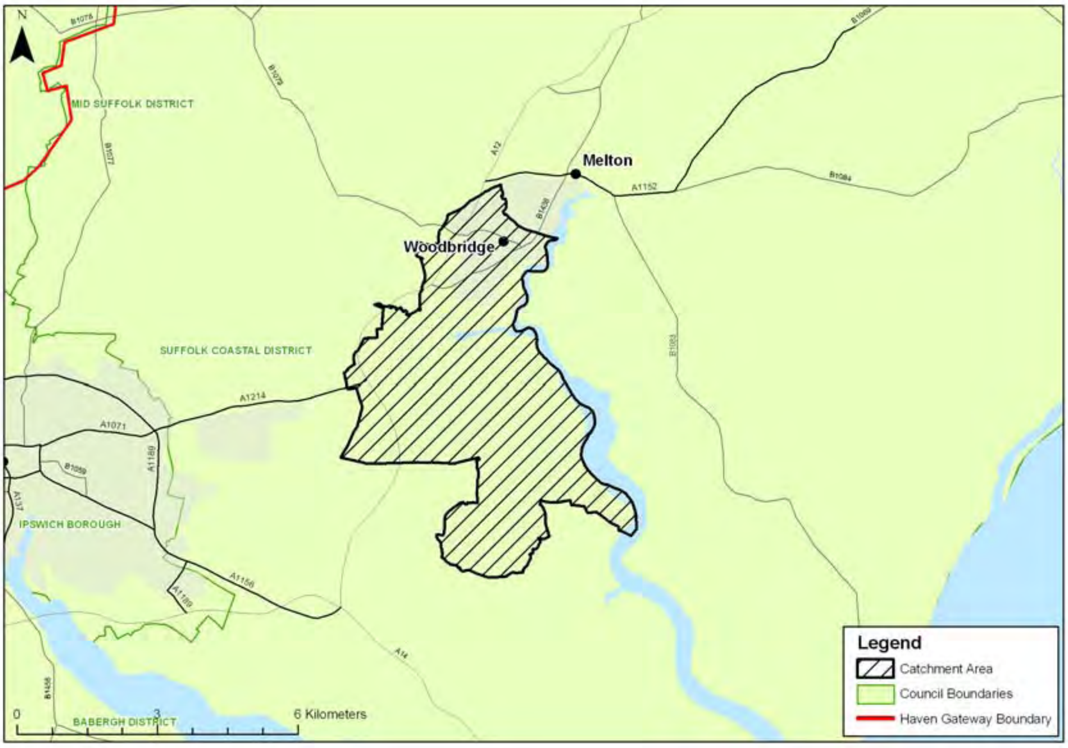
Table 8.22 - Rendlesham STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent		Increase consent for employment development	Increase consent for employment development	Increase consent for employment development
Sanitary Treatment Improvements	Potentially implement BATNEEC Technologies	Potentially implement BAT Technologies	Potentially implement BAT Technologies	Potentially implement BAT Technologies

8.4.7 Woodbridge and Martlesham STW

This STW serves a larger population, encompassing the towns of Woodbridge and Martlesham and the villages of Newbourne and Waldringfield. This catchment is shown in Figure 8.24 below:

Figure 8.24: Location of Woodbridge and Martlesham STW Catchment



A total of 6% of the residential development (295 dwellings) and 16% of the employment development (107ha) is planned within this catchment. The current consented DWF is 2,715m³/d. Although currently operating with a headroom of greater than 50%, this STW is predicted to exceed its consent in 2010/11 when both the employment and residential development projections are considered. By 2020/21 the headroom is exceeded by over 167%, as shown in Figure 8.25 and Table 8.23 below:

Figure 8.25: Woodbridge and Martlesham STW percentage headroom – residential and employment development

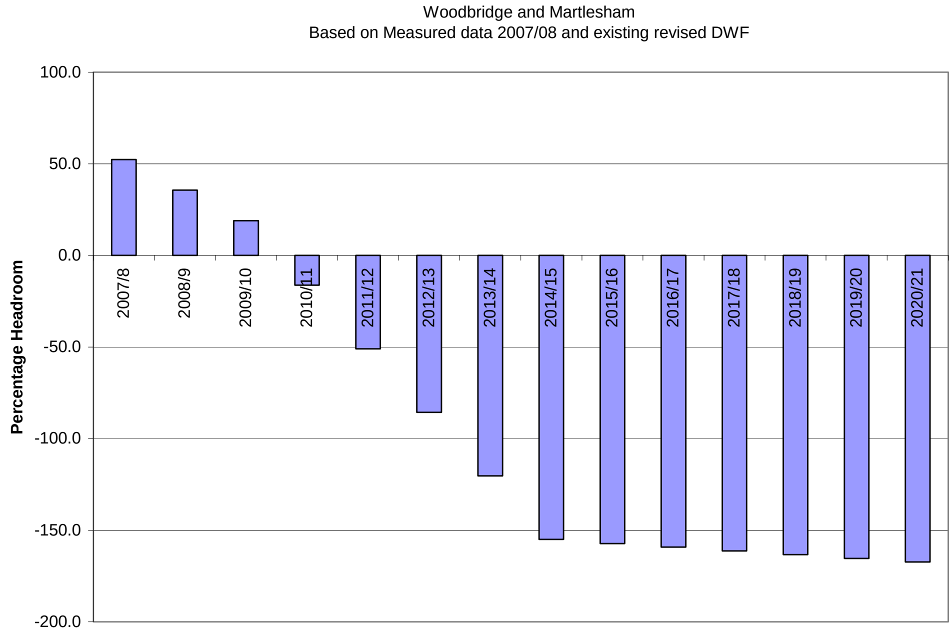


Table 8.23 - Woodbridge and Martlesham STW headroom availability - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
WOODST	Woodbridge and Martlesham														

However, if the employment is removed from the equation the STW retains a headroom of greater than 20% throughout the planning period, reaching a minimum of 50.3% in 2020/21, as shown in Figure 8.26 and Table 8.24:

Figure 8.26: Woodbridge and Martlesham STW percentage headroom – residential development only

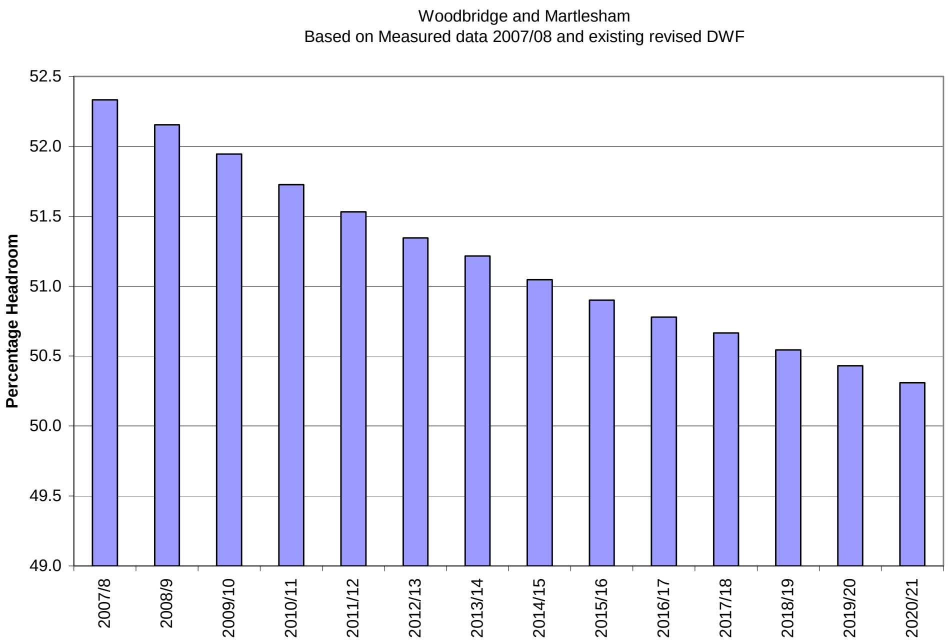


Table 8.24 - Woodbridge and Martlesham STW headroom availability - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
WOODST	Woodbridge and Martlesham														

There is therefore enough headroom to accommodate the residential development planned within the catchment, but in order to accommodate the employment proposals as well then additional measures need to be employed, such as increased discharge consent or alternative treatment.

The sewers within this area have been noted by AWS as having capacity issues with a history of flooding. AWS therefore suggest growth is positioned within this catchment so flows can be transmitted directly to the STW.

Environmental Considerations

Woodbridge and Martlesham STW (consented in December 2006 through variation ASETS/1250), discharges into Martlesham Creek (at Grid Reference TM 2598 4729).

The discharge volume is limited to 12,786m^3 per day, with a dry weather discharge flow of 4,800m^3 per day. The consent states that the discharge shall not exceed:

- 35 milligrammes per litre of BOD with an upper limit of 70 milligrammes per litre;
- 70 milligrammes per litre of suspended solids; or
- 95 microgrammes per litre of copper.
-

Sampling of the water at the discharge point by Anglian Water indicates that the levels of suspended solids and BOD are being maintained and adequately come under the limit (both are 29% of the consented limit). This also suggests that future increases in throughflow could be maintained within the consented limits.

The current state of the receiving environment

The STW discharges straight into Martlesham Creek which is part of the Deben Estuary SPA, and Ramsar designated site. The SSSI units surrounding the discharge point are in ‘unfavourable declining’ and ‘favourable’ conditions. There are two units in ‘unfavourable declining’ condition; these are areas of saltmarsh affected by coastal squeeze and water pollution from agricultural run off. Erosion appears to be the main cause of the decline in the condition of these units. The ‘favourable’ condition unit is a mix of saltmarsh and reedbed and provides habitat for an important mollusc species. Due to the closeness of the discharge point to the designated site there is the potential that the increased discharge may have an impact on the site; the impact of increased suspended solids is a particular consideration.

Although no significant current issues in the area relate to discharge from this STW, if discharge volumes are required to increase it is suggested that mechanisms be employed to ensure that there will be no significant effect on either the receiving water course or the designated sites downstream.

Impact of development

Modelled discharge, accounting for increases in all types of development, will exceed the current consent in 2010/11, and this will continue to increase into the future. Projected dry weather discharge in 2020/21 is 12,833m^3 per day; this exceeds the current consent by 8,033m^3 or 167% per day.

If the consented dry weather discharge volume were increased in order to accommodate all development, at the current consented discharge concentrations this could allow the additional release of up to 562.3kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Whilst current discharge concentrations are lower than the consented limits, the reported values suggest that treatment is not currently achieving Best Available Technology (BAT) or Best Available Technology Not Entailing Excessive Costs

(BATNEEC) levels (see Section 2.5). Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Woodbridge met BATNEEC standards then the current consent limits would not be exceeded within the plan period. Increases in copper loads would require additional management; this is likely to be required upstream of the STW itself, and may be progressed through agreements governing discharges to the sewer system, depending on the source.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Woodbridge STW is poor. The standards set for meeting this classification are 2.5mg/l ammonia and 9mg/l BOD within the river.

The Rendlesham STW and Melton STW also discharge into the Deben Estuary, approximately 9km and 6km respectively, from the outfall of Woodbridge and Martlesham STW. The potential for these discharges to have a combined effect on the condition of the Deben Estuary is considered likely. Also, the site assessment for the entire Deben Estuary has identified water pollution as an issue and as such it is recommended that water quality is carefully monitored and maintained for this discharge point.

More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Woodbridge in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is likely to require assessment under the Habitats Regulations due to the distance from the internationally designated site and potential for combined effects of a number of STW; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

The Woodbridge and Martlesham STW has capacity to accept the additional flows from the proposed residential development but not from the employment development. For all proposed growth to take place additional investment, upgrade and consent increases are required. There are also capacity issues identified in the sewer network so additional investment will also be required to upgrade and extend the network.

The dry weather flow is currently not being exceeded and there is substantial headroom in both dry weather flow and pollutant load. Although it is predicted that the dry weather flow will be exceeded in 2010 the pollutant load is currently significantly under the consented limits, indicating that there will be sufficient headroom in sanitary consents for increases in flow caused be developments.

The STW is currently operating within its pollution consent limits. If current discharge was at the consented limits then the consents would be exceeded in 2010/11 but pollutants could be overcome through the implementation of BATNEEC technologies, although this would require some investment.

Table 8.25 - Woodbridge and Martlesham STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent		Potential increase consent for employment development	Potential increase consent for employment development	Potential increase consent for employment development
Sanitary Treatment Improvements		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

8.5 Flood Risk Management

As with all areas in England and Wales the Environment Agency have produced Flood Zone maps in line with PPS 25 and these have been compared with the proposed development sites to identify key areas of concern. The Environment Agency Flood Zone maps indicate that large areas of the Haven Gateway Suffolk Coastal District are located within Flood Zones 2 and 3, as shown on Figure 8.27 (end of Section 8). These are most notable along the coastal strip and along the estuaries of the River Alde-Ore, River Orwell, River Deben and the Hundred River, but are also extensive in the floodplains of the inland rivers. These affect many existing settlements, but also many of the Development Areas, most notably Aldeburgh and Thorpeness, Felixstowe, Woodbridge and Martlesham and Melton.

Suffolk Coastal commissioned a joint Strategic Flood Risk Assessment (Level 1 and 2) with Waveney District, which was published in November 2007. This SFRA outlines a number of flood events, both tidal and fluvial, which have affected Suffolk Coastal District over recent years, including the following, which are relevant to the study area:

- 1947 Coastal flooding from the North Sea;
- 1953 tidal flooding from the North Sea, which breached defences and resulted in numerous deaths;
- 1979 flooding of the Hundred River and River Alde due to snowmelt and rainfall falling on frozen ground resulting in flood damage in its valley;
- 1993 flooding from a combination of fluvial and tidal events, in both February and October; and
- 1995 and 2000 widespread flooding.

The main sources of flood risk were determined to be from the North Sea and the Rivers Alde-Ore, Deben and Orwell. The SFRA determined that, due to the geology, the risk of groundwater flooding was deemed relatively low with no recorded occurrences within the study area, but that a risk of surface water flooding did exist and required management through implementation of techniques, such as SUDS, in all new developments.

Much of the coastline and main settlements around Suffolk Coastal District are protected by flood defences, as documented in the SFRA and NFCDD database, most notably around Felixstowe and the Alde-Ore and Deben estuaries. As part of the Level 2 SFRA it was deemed necessary to model breach and overtopping scenarios for the purposes of producing flood hazard maps in many locations within the District. The locations modelled which are relevant to the Haven Gateway study area are:

- Sizewell;
- Aldeburgh (2 locations);
- Woodbridge (2 locations); and
- Felixstowe

The consequences of these scenarios are discussed further in section 8.6 below with reference to the Development Areas.

The Suffolk Flood Plan includes maps of the Flood Watch and Flood Warning areas within Suffolk County. These include most of the areas located within Flood Zones 2 and 3, including the majority of the Coastal strip and the floodplains of the major rivers.

The selection of new development sites and the evaluation of existing sites should follow the guidance in PPS25 - Development and Flood Risk and use the Sequential and Exception tests where required. The Level 1 and 2 SFRAs will assist in the selection of sites in line with these tests.

8.5.1 Source Protection and Groundwater Vulnerability

As part of controlling surface water flooding, options may be considered that use retention or infiltration techniques. Therefore, before development can take place source protection and groundwater vulnerability issues must be appreciated and reviewed.

Source Protection Zones (SPZ) have been identified by the Environment Agency as requiring protection as water sources. As shown in Figure 8.28 (at the end of section 8), a number of Source Protection Zones (SPZs) are located within the study area of Suffolk Coastal District. These are located to the north and west of the study area, with centres located close to the following settlements:

- Rushmere (Ipswich)
- Playford
- Tuddenham St Mary
- Westerfield
- Woodbridge

- Sutton Heath
- Wickham Market
- Aldeburgh
- Leiston
- Coldham Green
- Saxmundham
- Stratford St Andrew (north of)

The catchments of these generally extend towards the west and therefore intersect with a number of the Development Areas. The SPZs are classified into 'Inner', 'Outer' and 'Total Catchment' Zones. Where a development site is underlain by an Inner Zone the Environment Agency will not support the use of SUDS which use infiltration techniques.

An assessment of the vulnerability of groundwater to diffuse sources of pollution has also been supplied by the Environment Agency. Figure 8.29 shows the groundwater vulnerability map for the area (at the end of section 8) and Table 8.26 shows the groundwater vulnerability classifications present within Suffolk Coastal District. Aquifers extend underneath almost all of the study area of Suffolk Coastal District, although most of these are classified as 'Minor'. These are described as having 'variable permeability', consisting of, in general terms, fractured or potentially fractured rocks which do not have a high primary permeability or they are unconsolidated deposits. However, limited areas of the aquifer on the very western perimeter of the study area (which do not interact with any of the Development Areas) are classified as 'Major'. These tend to be highly productive and used for potable water supply.

Seven main soil types are present, which are classified in terms of their vulnerability as described in the following table. H refers to a high vulnerability, I to an intermediate vulnerability and L to a low vulnerability. The numbers refer to the soil type.

Table 8.26 : Aquifer Soil Types Present within Suffolk Coastal District as shown on Figure 8.28

Soil Classification	Description
H1	Soils which readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.
H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.
H3	Course textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but which have some ability to attenuate adsorbed pollutants because of their large clay or organic matter contents.
HU	Designates a restored mineral working and/or urban areas where soil information is based on fewer observations and therefore classified a worst case vulnerability classification.
I1	Soils which can possibly transmit a wide range of pollutants.
I2	Soils which can possibly transmit non-weakly adsorbed pollutants and liquid discharges but are unlikely to transmit adsorbed pollutants.
L	Soils of low leaching potential in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal or they have the ability to attenuate diffuse pollutants.

National Rivers Authority Map 1995

The most extensive soil classification within Suffolk Coastal District is vulnerability type H2, which covers the much of the central swath of the District and intersects with all of the Development Areas. Other areas of high vulnerability are located along the coastal strip. Soils of low leaching potential are located along the western and northern boundaries of the District. The proximity of these soil types to the Development Areas is discussed in more detail in Section 8.6.

8.6 Development Areas

The following Development Areas have been determined based upon their classification within the Sewage Treatment Works (STW) catchments, as provided by AWS. They have been classified in this way as the wastewater treatment has been shown to be the most limiting factor to growth, within this study (as highlighted in Section 2.4 it was not possible to assess the capacity of the wastewater infrastructure which may prove to be a greater limitation than the treatment works) However, all elements of the Water Cycle will be reviewed for each Development Area in the following sections. The AMR figures for individual development sites have been updated by the Council following their review of the Stage 1 report.

8.6.1 Felixstowe and the Trimleys

The proposed development in this Development Area is scattered around Felixstowe town – most notably to the south around the docks and to the east – and close to the A14 in Trimley St Mary. The residential development, totalling 149 dwellings in the period 2007 to 2021, is located at two sites – one to the east of Felixstowe close to the A1021 and the other close to the A14 in Trimley St Mary. The employment development, which is mostly located within Felixstowe, totals 460ha and is planned for development between 2007 and 2015.

All the proposed development in this area feeds into the Felixstowe STW, which although it is currently operating within its discharge consent, is predicted to substantially exceed its cDWF within the planning period from 2010/11. However, it does have capacity to accommodate the predicted residential flow, without the employment development, retaining a DWF 30% above its consent by the end of the planning period. To accommodate the employment development additional capacity will need to be sought. However, the network capacity, for which AWS have not provided comment, has not been considered as part of this study and may pose a constraint to development and may require infrastructural upgrades within the planning period. BATNEEC standards may also be required within this catchment to enable the STW to remain within its pollution consent limits.

This Development Area is located within AWS supply area, within the Ipswich Planning Zone, PZ60. As identified in 8.3 above, this zone has a current deficit in the supply demand balance of -16.68Ml/d. However, AWS propose a number of schemes, to be implemented within AMP5 and AMP6 to overcome this shortfall, provided sufficient supply for the proposed development, namely increased demand management, the Bucklesham ASR to utilise the Mill River abstractions and the Ipswich Discharge reuse. If these schemes are not implemented, or are not sufficient once in operation, this WRZ may not be able to cope with the proposed development. In addition, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructure upgrade within the planning period.

Large areas to the south and north of this Development Area are located within the Environment Agency's Flood Zones 2 and 3, being at risk from both tidal and fluvial influences, and Felixstowe was identified within the SFRA as one of the two locations at greatest potential risk from a 200 year flood event. The town has been inundated on a number of different occasions, including 1953, 1978 and 1993 and, in addition to the tidal and fluvial flood risk, is at risk from an overflow of the surface water drainage systems, which, in the South Docks in particular, is reliant upon pumped drainage. Although protected by sea and river flood defences, the SFRA modelled a breach scenario for the purpose of producing a flood hazard map of the area (which can be viewed within the Level 2 SFRA). This scenario illustrated the vulnerability of the docks and southern tip of the peninsula, which is the location for much of the employment development. In the 1 in 200 plus climate change breach scenario, most of the southern peninsula was affected. As the breach scenarios were positioned in areas of defence currently considered to be of a low grade or standard, this exercise illustrates a desperate need to improve the defences in this area before additional development takes place. Within this area in particular, it is important that site specific FRAs are undertaken.

The central band of this Development Area, orientated from northwest to southeast, is underlain by a minor aquifer, as is the eastern seaboard. However, as no SPZs have been identified within proximity of this area, there should not be too many restrictions placed upon the implementation of SUDS schemes, which, due to the problems noted in the surface water drainage systems, are vital for all new developments. However, the proximity to the coastline and estuary should be noted and appreciated.

To summarise the situation in Felixstowe and the Trimleys if no action is taken then the following situation would occur.

Table 8.27- Situation in Felixstowe and the Trimleys Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure				
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.28 - Activities required in Felixstowe and the Trimleys development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Bucklesham ASR Ipswich discharge reuse	Demand management Ipswich discharge reuse
Wastewater Treatment	-	Increase in discharge consent to support employment	Increase in discharge consent to support employment	Increase in discharge consent to support employment
Flooding	SuDS Upgrade of defences FRAs Required Upgrade in drainage system	SuDS Upgrade of defences FRAs Required Upgrade in drainage system	SuDS Upgrade of defences FRAs Required Upgrade in drainage system	SuDS Upgrade of defences FRAs Required Upgrade in drainage system
Environment – Water Quality	Potential BATNEEC required	Potential BATNEEC required	Potential BATNEEC required	Potential BATNEEC required
Wastewater Infrastructure	-	-	-	-
Water Supply Infrastructure				

8.6.2 Aldeburgh and Thorpeness

The development planned within Aldeburgh and Thorpeness totals 207 dwellings, with no additional employment. The trajectory for this development peaks within the first five years before becoming steady at 10 dwellings per year from 2016.

All the proposed development feeds into the Aldeburgh and Thorpeness STWs. These are located close together and can share capacity so have been analysed together. They have sufficient capacity to cope within the proposed development, retaining a headroom above 23% throughout the planning period. Assuming they can maintain the biological, chemical (etc) discharge consents within the total discharge consent, this growth should not have an adverse environmental impact and therefore there does not appear to be a requirement to make any changes to the capacity or cDWF of this STW within the planning period. However, the network capacity has been identified by AWS as having capacity issues associated with the old town system. Currently the preferred location for development is therefore in the northwest of the catchment with flows directed to the Leiston Road TPS, which has been newly refurbished. It is also advised that the Environment Agency Review of Consents, once finalised later in 2009, is reviewed in a future update of this study.

As the STW has not been identified as exceeding consent within the planning period, environmental analysis has not been carried out for this development area.

The Development Area is located within the ESW supply zone. Within their dWRMP ESW have identified a surplus of water available within their aquifer supplies and do not identify a supply demand balance problem within their planning horizon. However, there are assumptions made regarding the continuity of this groundwater supply and regarding metering and leakage targets, but if these remain as expected the water supply should not pose a constraint to development. In addition, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructure upgrade within the planning period.

Most of this Development Area is located within the Environment Agency's Flood Zones 2 and 3, including substantial parts of Aldeburgh town and Thorpeness village. The SFRA also identifies this area as being particularly sensitive to flooding as it is bordered by the North Sea to the east, the River Alde to the south and the Hundred River and Marshlands to the north. Defences are in place, but are sections are considered to be low grade. As a result the SFRA ran two breach simulations in the area. The first impacted the southern extent of Thorpeness and the northern extent of Aldeburgh at the 1 in 200 year return period event. The second simulation shows a severe impact on the south of Aldeurgh at the 1 in 200 year plus climate change event and the 1000 year event. This indicates a vital need to upgrade these defences to protect both the current and planned developments. The SFRA also identifies a susceptibility of Aldeburgh to surface water flooding and highlights the need for SUDS schemes and communal storage areas so the sewer network is not overwhelmed by surface water flow. Dependent upon the location of the planned development within the area, there is a need to review the flood potential and therefore carry out site specific FRAs.

The entire Development Area, with the exception of the centre of Aldeburgh town, is underlain by the minor aquifer. The centre of an SPZ is also located within the Development Area, to the west of Aldeburgh, with part of the town located within its catchment. This will have to be considered when planning SUDS techniques as part of the new developments within the area, especially where the development sites overlap with the Inner Zone of the SPZ. In this area the Environment Agency will not support the use of SUDS which utilise infiltration techniques.

To summarise the situation in Aldeburgh and Thorpeness if no action is taken then the following situation would occur.

Table 8.29 - Situation in Aldeburgh and Thorpeness Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	G			
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	A	A	A	A
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.30 - Activities required in Aldeburgh and Thorpeness development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management
Wastewater Treatment	-	-	-	-
Flooding	SuDS FRAs required Flood defence upgrade Improvements to surface water drainage	SuDS FRAs required Flood defence upgrade Improvements to surface water drainage	SuDS FRAs required Flood defence upgrade Improvements to surface water drainage	SuDS FRAs required Flood defence upgrade Improvements to surface water drainage
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	Upgrade/expansion required in town system	Upgrade/expansion required in town system	Upgrade/expansion required in town system	Upgrade/expansion required in town system
Water Supply Infrastructure				

8.6.3 Benhall (Saxmundham)

The Benhall (Saxmundham) Development Area has been identified to receive fairly significant development within the planning period. A total of 704 dwellings and 13ha of employment land are planned by 2021, with the bulk planned in the next 5 years. The employment development has been identified for locations in and around Saxmundham, whereas the residential development is intended for a site at Benhall.

As discussed above, although the STW which serves this Development Area is currently operating with a 39% headroom, it is predicted to exceed its cDWF in 2009/10 when all the planned development is considered. However, when only the residential development is included, it remains greater than 22% above its cDWF throughout the planning period. To accommodate the residential development there is therefore no need to upgrade this works, but if the employment is also to be accommodated then increased discharge consent or alternative treatment options will need to be sought. AWS have not currently identified any plans for this STW. However, the sewer network is currently at capacity throughout the catchment and will require upgrade. In addition investment may be required to implement BATNEEC technologies to the sanitary treatment beyond 2009/10 and BAT technologies beyond 2010/11 to maintain sanitary discharges in a worst case scenario.

The Development Area is located within the ESW supply zone. Within their dWRMP ESW have identified a surplus of water available within their aquifer supplies and do not identify a supply demand balance problem within their planning horizon. However, there are assumptions made regarding the continuity of this groundwater supply and regarding metering and leakage targets, but if these remain as expected the water supply should not pose a constraint to development. In addition, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructure upgrade within the planning period.

The River Fromus bisects the Development Area from north to south. The associated Environment Agency Flood Zones 2 and 3 are relatively narrow but do impact on some of the developed area. The CFMP identifies Saxmundham as being at a risk of river flooding and at a medium risk of surface water flooding. Any new development planned in proximity to this watercourse will therefore require a FRA. The NFCDD does not identify any flood defences within the Development Area.

The entire Development Area is underlain by the minor aquifer. A SPZ is also located to the west of Saxmundham, the catchment of which encompasses almost all of the Development Area and the Inner Zone located in the western half of the SPZ. This will have to be considered when planning the new developments within the area and may limit the surface water management techniques, such as SUDS, which may be utilised. Where development sites overlap the Inner Zone of the SPZ, the Environment Agency will not support the use of SUDS which use infiltration techniques.

To summarise the situation in Benhall and Saxmundham if no action is taken then the following situation would occur.

Table 8.31 - Situation in Benhall (Saxmundham) Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	G			
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.32 - Activities required in Benhall (Saxmundham) development area to enable development to continue as planned

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources	Demand management	Demand management	Demand management	Demand management
Wastewater Treatment	-	Increased consent to support employment	Increased consent to support employment	Increased consent to support employment
Flooding	SuDS (restricted) FRAs required Construction of flood defences	SuDS (restricted) FRAs required Construction of flood defences	SuDS (restricted) FRAs required Construction of flood defences	SuDS (restricted) FRAs required Construction of flood defences
Environment – Water Quality	Possible BATNEEC required. Possible BAT required	Possible BAT required	Possible BAT required	Possible BAT required
Wastewater Infrastructure	Significant upgrade/expansion required	Significant upgrade/expansion required	Significant upgrade/expansion required	Significant upgrade/expansion required
Water Supply Infrastructure				

8.6.4 Cliff Quay (Kesgrave, Rushmere)

The Cliff Quay Development Area includes the Ipswich suburbs of Kesgrave and Rushmere, which form part of the Ipswich Policy Area. Within Suffolk Coastal District 2,238 dwellings, but only 0.7ha of employment land are planned for development. The housing development peaks over the next five years, but is still to remain above 100 dwellings per annum for the rest of the planning period.

As discussed above, the assessment of the STW must consider all the development within its catchment, including that scheduled for Ipswich Borough and Mid Suffolk District. This analysis concludes that the Cliff Quay STW is due to exceed its current consented DWF in 2014/15 when both the employment and residential developments are accounted for. However, removing the employment development keeps the STW above its cDWF throughout the planning period, although it does fall within 20% of its headroom from 2014/15 onwards. AWS have identified the capacity restrictions and associated them with the poor operation of the associated Sludge Treatment Centre and an abundance of surface water flows into the system. To solve this issue, AWS require support form Local Authorities through their Core Strategies for surface water separation. This does however mean that tight restrictions will be place on the collection of surface water flows from new development sites and will require measures to be emplaced as part of the development to deal with the surface water. AWS have also identified that the existing sewer network infrastructure is unable to serve the proposed developments in this area. In addition the development sites adjacent to the Woodbridge STW could have their wastewater flows connected directly to that STW as it currently has capacity, although investment would be required to upgrade the works and assessments are required for the receiving watercourse. This option is currently being investigated by AWS. More specific issues within this area include surface water management and the separation of surface water from foul water systems.

This Development Area is located within AWS supply area, within the Ipswich Planning Zone, PZ60. As identified in Section 8.3 above, this zone has a current deficit in the supply demand balance of -16.68Ml/d. However, AWS propose a number of schemes, to be implemented within AMP5 and AMP6 to overcome this shortfall, provided sufficient supply for the proposed development, namely increased demand management, the Bucklesham ASR to utilise the Mill River abstractions and the Ipswich Discharge reuse. If these schemes are not implemented, or are not sufficient once in operation, this WRZ may not be able to cope with the proposed development. The capacity of the supply networks has not been discussed within this report and may pose a constraint to development or require infrastructure upgrade within the planning period.

None of this Development Area falls within the Environment Agency's Flood Zones 2 or 3 and no reference was made to flooding problems within either the SFRA or CFMP. However, as mentioned above the management of surface water within the area may become a critical issue as the STW reaches capacity. Small Ordinary Watercouses also dissect the area and will require review and site specific FRAs if they fall in proximity to any of the potential development sites.

The entire area is underlain by the minor aquifer and a SPZ is located to the south of the Development Area, with its catchment encompassing most of the development site. This will have to be considered when planning the new developments within the area and may limit the surface water management techniques, such as SUDS, which may be utilised, especially where development is to be located over the Inner Zone of the SPZ. In this area the Environment Agency will not support the use of SUDS which use infiltration techniques.

To summarise the situation in Cliff Quay, if no action is taken then the following situation would occur.

Table 8.33 - Situation in Cliff Quay (Kesgrave and Rushmere) Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.34 - Activities required in Cliff Quay (Kesgrave and Rushmere) development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Bucklesham ASR	Demand management Bucklesham ASR Ipswich discharge reuse	Demand management Ipswich discharge reuse
Wastewater Treatment	Limits for storm water Surface water storage	Limits for storm water Surface water storage STC replacement	Limits for storm water Surface water storage STC replacement Increased consent to support employment	Limits for storm water Surface water storage Increased consent to support employment
Flooding	SuDS (restricted) Potential FRAs	SuDS (restricted) Potential FRAs	SuDS (restricted) Potential FRAs	SuDS (restricted) Potential FRAs
Environment – Water Quality			BATNEEC required	BATNEEC required
Wastewater Infrastructure	Significant upgrade; Possible transfer of flow outside catchment; separation of combined sewers.	Significant upgrade; Possible transfer of flow outside catchment; separation of combined sewers.	Significant upgrade; Possible transfer of flow outside catchment; separation of combined sewers.	Significant upgrade; Possible transfer of flow outside catchment; separation of combined sewers.
Water Supply Infrastructure				

8.6.5 Leiston

Leiston is located to the northeast of the study area of Suffolk Coastal District. A total of 189 dwellings and 16.3ha of employment development are proposed within this Development Area, mostly to the northern side of Leiston town. The majority of this development is due to take place before 2015.

The Leiston STW is currently operating with a 58% headroom. However, when both the employment and residential development are accommodated, the STW exceeds its cDWF in 2012/13 and is 62% beyond it by the end of the planning period. However, when only the residential development is considered this STW remains more than 20% above its cDWF for the duration of the planning period. AWS has no current plans to upgrade this STW but additional consent may need to be sought to accommodate the employment plans or alternative treatment sought. However, the network capacity, which has not been considered as part of this study, may pose a constraint to development and may require infrastructural upgrades within the planning period.

The Development Area is located within the ESW supply zone. Within their dWRMP ESW have identified a surplus of water available within their aquifer supplies and do not identify a supply demand balance problem within their planning horizon. However, there are assumptions made regarding the continuity of this groundwater supply and regarding metering and leakage targets, but if these remain as expected the water supply should not pose a constraint to development. As the catchment suffers from a lack of capacity and flooding from the Combined Sewer Overflows (CSOs), AWS recommends that development takes place in the northeast of the catchment where flows can be transferred directly to the STW. Investment is also required for the implementation of BATNEEC standards beyond 2012.

Only the very north of the Development Area is encroached by the Environment Agency Flood Zones but these do not intersect with the locations identified for development. However, it is likely that the headwaters and smaller tributary streams of the modelled watercourses may lie in proximity to the development locations. In addition the town is located just over 2km from the coast, separated by an expanse of relatively flat land, potentially placing it at risk from extreme tidal flooding events. This is exemplified by the SFRA which states that Leiston and Sizewell, on the coast, were affected by the 1993 and 2000 flood events. The breach simulations carried out as part of the SFRA did not impact Leiston, although the 1 in 200 year with climate change reaches Lovers Lane to the northeast of the town. The SFRA however does note that storm water management is especially important within Leiston and must be accommodated within all new development so as not to exacerbate existing problems. Dependant upon the location of the proposed developments to Ordinary Watercourses, site specific FRAs may be required.

Similarly to most of the Suffolk Coastal study area, the Leiston Development Area is underlain by the minor aquifer. It also has a SPZ, including the Inner Zone, located to the southwest of the town. The catchment of this SPZ extends across most of the western half of Leiston and will impact at least two of the development sites. This will have to be considered when planning the new developments within the area and may limit the surface water management techniques, such as SUDS, which may be utilised. This is especially relevant to the implementation of SUDS which use infiltration techniques as the Environment Agency will not support their use where a development site is located above the Inner Zone of a SPZ.

To summarise the situation in Leiston if no action is taken then the following situation would occur.

Table 8.35 - Situation in Leiston Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	A	A	A	A
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.36 - Activities required in Leiston development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management	Demand management	Demand management
Wastewater Treatment	-	Increased consent to support employment	Increased consent to support employment	Increased consent to support employment
Flooding	SuDS (restricted) FRA's required Possible detailed modelling of tidal flood risk	SuDS (restricted) FRA's required Possible detailed modelling of tidal flood risk	SuDS (restricted) FRA's required Possible detailed modelling of tidal flood risk	SuDS (restricted) FRA's required Possible detailed modelling of tidal flood risk
Environment – Water Quality		BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure	Upgrade/expansion of sewer network, especially CSOs	Upgrade/expansion of sewer network, especially CSOs	Upgrade/expansion of sewer network, especially CSOs	Upgrade/expansion of sewer network, especially CSOs
Water Supply Infrastructure				

8.6.6 Melton

Melton is a village located to the northeast of Woodbridge town on the banks of the River Deben estuary. A total of 232 dwellings and 10.4ha of development land are planned within this Development Area over the planning period, with the majority of the development due to take place before 2015.

As mentioned above the capacity of the Melton STW is critical for the planned development as the STW is already operating above its cDWF. When both employment and residential development are considered, the STW is predicted to exceed its cDWF by 113% by 2021, or by 11.7% when only the residential development is considered. An alternative treatment works or increased discharge consent will be required before development can proceed. At present AWS has not announced any plans to upgrade this STW. Investment is also required to upgrade the sewer system, most notably with regards to surface water and to potentially implement BATNEEC standards beyond 2009/10 throughout the planning period.

Melton is located within AWS' supply area, within the Woodbridge Planning Zone, PZ64. As identified in Section 8.3 above, this zone has a current deficit in the supply demand balance of -2.51Ml/d. However, AWS propose a transfer from the Ipswich PZ60 within AMP5 to overcome this shortfall, providing sufficient supply for the proposed development. This scheme is reliant upon the increased supply into PZ60 as a result of the demand management increases and the Bucklesham ASR to utilise the Mill River abstractions. If these schemes are not implemented, or are not sufficient once in operation, this transfer may not be available and thus WRZ may not be able to cope with the proposed development. In addition, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructure upgrade within the planning period.

Much of the eastern side of Melton is located within the Environment Agency's Flood Zones 2 and 3 originating from the River Deben, which is noted within the SFRA as having suffered numerous flooding events in the recent past. Raised sea defences are located along the banks of the estuary and are recorded in the NFCDD as being at a 1 in 250 year standard. A breach scenario was included within the SFRA and indicated a severe impact on the potential development sites at all return periods. This will need to be reviewed alongside site specific FRAs before development can commence in this area.

The minor aquifer underlay's almost all of this Development Area and the catchment of a SPZ, located to the southwest in Woodbridge, intersects with the southwestern part of this Development Area. This SPZ interacts with one of the development areas, with the Inner Zone located in proximity to the west, and therefore may result in a restriction to the surface water management techniques, such as SUDS, available for use in the area. This is especially relevant to the implementation of SUDS which use infiltration techniques as the Environment Agency will not support their use where a development site is located above the Inner Zone of a SPZ.

To summarise the situation in Melton if no action is taken then the following situation would occur.

Table 8.37 - Situation in Melton Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	A	A	A	A
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.38 - Activities required in Melton development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Transfer from PZ60	Demand management Transfer from PZ60	Demand management Transfer from PZ60
Wastewater Treatment	Consent increase to support residential and employment or implementation of transfer to another STW	Consent increase to support residential and employment or implementation of transfer to another STW	Consent increase to support residential and employment or implementation of transfer to another STW	Consent increase to support residential and employment or implementation of transfer to another STW
Flooding	SuDS (restricted) FRAs Required Maintenance of flood defences	SuDS (restricted) FRAs Required Maintenance of flood defences	SuDS (restricted) FRAs Required Maintenance of flood defences	SuDS (restricted) FRAs Required Maintenance of flood defences
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure	Improvements required for surface water	Improvements required for surface water	Improvements required for surface water	Improvements required for surface water
Water Supply Infrastructure				

8.6.7 Rendlesham

Rendlesham is a small village located to the southeast of Wickham Market, on the other side of the River Deben. The planning trajectories indicate the intention to build 481 dwellings and 22ha of employment land in proximity to this village by 2021.

The area is serviced by a small STW with a cDWF of just 646m³/d. Although it is currently operating with a 60% headroom, the planned development will rapidly exceed this capacity, becoming negative in 2010/11 and reaching a maximum exceedance of 322% by 2021. However, if only the residential development is considered the STW retains a headroom of greater than 20% throughout the planning period. At present AWS have no plans to upgrade this STW or increase its cDWF, although this will be required to accommodate the employment development. AWS have not provided comment on the capacity of the sewer networks themselves but have indicated that, without investment, the location of the development will be limited. Investment may also be required to implement BATNEEC technologies, based on the current discharges being at consented levels, from 2010/11 and BAT technologies from 2013/14.

The Rendlesham Development Area is located within AWS' supply area, within the Woodbridge Planning Zone, PZ64. As identified in Section 8.3 above, this zone has a current deficit in the supply demand balance of -2.51Ml/d. However, AWS propose a transfer from the Ipswich PZ60 within AMP5 to overcome this shortfall, providing sufficient supply for the proposed development. This scheme is reliant upon the increased supply into PZ60 as a result of the demand management increases and the

Bucklesham ASR to utilise the Mill River abstractions. If these schemes are not implemented, or are not sufficient once in operation, this transfer may not be available and thus WRZ may not be able to cope with the proposed development. In addition, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructure upgrade within the planning period.

This Development Area is not located within any of the Environment Agency's Flood Zones, although the River Deben does lie just outside the area to the west. There is also no reference to the village in the SFRA or CFMP. However, small Ordinary Watercourses may be present which will require review if located in proximity to any of the development sites.

The minor aquifer only encroaches on the very northwest and southeast corners of the Development Area and no SPZs are located in proximity to the village. Therefore, it is expected that very few restrictions will be placed on the utilisation of surface water management techniques, such as SUDS, within this Development Area.

To summarise the situation in Rendlesham if no action is taken then the following situation would occur.

Table 8.39 - Situation in Rendlesham Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	A	A	A	A
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.40 - Activities required in Rendlesham development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Transfer from PZ60	Demand management Transfer from PZ60	Demand management Transfer from PZ60
Wastewater Treatment	-	Increased consent to support employment	Increased consent to support employment	Increased consent to support employment
Flooding	SuDS FRA's	SuDS FRA's	SuDS FRA's	SuDS FRA's
Environment – Water Quality	Possible BATNEEC required	Possible BATNEEC required Possible BAT required	Possible BAT required	Possible BAT required
Wastewater Infrastructure	Investment to reduce limitations on development location	Investment to reduce limitations on development location	Investment to reduce limitations on development location	Investment to reduce limitations on development location
Water Supply Infrastructure				

8.6.8 Woodbridge and Martlesham

Woodbridge is located to the northeast of Ipswich, with the villages of Martlesham and Martlesham Heath located to the southwest. Emphasis is placed upon employment development in this area with a total of 107ha of employment land (16% of the total within Suffolk Coastal District) and 295 dwellings planned by 2021. Similarly to most of the other Development Areas, the majority of this development is planned by 2015.

The Woodbridge STW is currently operating with a headroom of 50%, but this quickly decreases once development commences, exceeding its CDWF in 2010/11 and reaching a total exceedance of more than 167% by the end of the planning period. However, if only the residential development is considered the STW retains a headroom of greater than 50% throughout the planning period. At present AWS have not identified any plans to upgrade this STW or increase its discharge consent, which will be required if all the employment development is to be accommodated. AWS have indicated that the sewer network is already operating at capacity and suffering major flooding issues. Investment is therefore required to solve this issue before development takes place. Investment may also be required to enable the STW to meet apply BATNEEC technologies to sanitary treatment from now throughout the planning period.

Woodbridge and Martlesham are located within AWS' supply area, within the Woodbridge Planning Zone, PZ64. As identified in Section 8.3 above, this zone has a current deficit in the supply demand balance of -2.51Ml/d. However, AWS propose a transfer from the Ipswich PZ60 within AMP5 to overcome this shortfall, providing sufficient supply for the proposed development. This scheme is reliant upon the increased supply into PZ60 as a result of the demand management increases and the

Bucklesham ASR to utilise the Mill River abstractions. If these schemes are not implemented, or are not sufficient once in operation, this transfer may not be available and thus WRZ may not be able to cope with the proposed development. In addition, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructure upgrade within the planning period.

Similarly to Felixstowe, Woodbridge was identified within the SFRA as being a location at the greatest potential risk from a 200year flood event. Woodbridge itself lies on the west bank of the Deben estuary and is separated from Martlesham by the Martlesham Creek. The Environment Agency Flood Zones from both these sources impact current development and may intersect with potential development locations. Both watercourses are protected by raised flood defences. The defences on the Deben Estuary are built to a 250 year design standard and those on Martlesham Creek are built to a 50 year design standard. The SFRA simulated a breach scenario in Woodbridge which indicated a severe impact on the town and development sites. The SFRA also states that FRAs will be required for all new developments within the town, and most notably those to the east.

The minor aquifer impact all of the Development Area, which is also surrounded by multiple SPZs. One of these is located on the northeastern border of the Development Area with its catchment covering most of north Woodbridge. Therefore, there may be restrictions emplaced with regards to the surface water management techniques, such as SUDS, available for use in the area. This is especially relevant to the implementation of SUDS which use infiltration techniques as the Environment Agency will not support their use where a development site is located above the Inner Zone of a SPZ. In addition, the proximity of the developments to the estuary and creek must be appreciated.

To summarise the situation in Woodbridge and Martlesham if no action is taken then the following situation would occur.

Table 8.41 - Situation in Woodbridge and Martlesham Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 8.42 - Activities required in Woodbridge and Martlesham development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand management	Demand management Transfer from PZ60	Demand management Transfer from PZ60	Demand management Transfer from PZ60
Wastewater Treatment	-	Consent increase to support employment	Consent increase to support employment	Consent increase to support employment
Flooding	SuDS FRAs Required Maintenance of flood defences	SuDS FRAs Required Maintenance of flood defences	SuDS FRAs Required Maintenance of flood defences	SuDS FRAs Required Maintenance of flood defences
Environment – Water Quality	BATNEEC required	BATNEEC required	BATNEEC required	BATNEEC required
Wastewater Infrastructure	Significant upgrade/investment required to overcome sewer flooding issues.			
Water Supply Infrastructure				

8.7 Summary Timeline

The following table shows a summary of the current state of each of the development areas in terms of issues with the areas considered, water supply, wastewater, environment and flooding.

Table 8.43 - Summary Timeline for Suffolk Coastal District

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Felixstowe and the Trimleys	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure				
	Water Supply Infrastructure				
Aldeburgh and Thorpeness	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	A	A	A	A
	Water Supply Infrastructure				
Benhall (Saxmundham)	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
	Water Supply Infrastructure				
Cliff Quay (Kesgrave, Rushmere)	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Leiston	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	A	A	A	A
	Water Supply Infrastructure				
Melton	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	A	A	A	A
	Water Supply Infrastructure				
Rendlesham	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	A	A	A	A
	Water Supply Infrastructure				
Woodbridge and Martlesham	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				

The key activities required to resolve the “red” time periods above are:

Water Supply - Implementation of the proposed transfer of water from Ipswich (PZ60) to Woodbridge (PZ64) in AMP5.
Implementation of the proposed Bucklesham Aquifer Storage Recovery Scheme in PZ 60 in AMP5
Implementation of the proposed Ipswich Discharge Reuse Scheme (PZ60) in AMP6

Wastewater - Detailed review of development and discharges to establish the required increase in the consented DWF for Melton STW, and apply if necessary.
Implementation of new sewers or upgrade/extension of old; possible transferral of flows to neighbouring STW; and separation of combined sewers.

Flooding - Investigation into the potential for improving flood defences around the Felixstowe peninsula and limiting development to that which meets the vulnerability criteria.
Investigation into the potential for improving flood defences around Aldeburgh town and Thorpeness village and limiting development to that which meets the vulnerability criteria.

Water Quality - Implementation of BATNEEC and BAT technologies to maintain pollution levels below consent.

8.8 Constraints to Development

The previous sections detail the issues and in many cases the worse case scenarios with regard to development within the area. This precautionary practice has been adopted to try and ensure that discussion and consultation is undertaken with the relevant authorities and responsible organisations before development takes place.

The main constraints to development and activities required are indicated below.

Water Supply - Both AWS and ESW are confident of maintaining supply provided activities put forward within their WRMP and Business Plans are implemented as programmed.

Wastewater treatment capacity at Melton - discharge consent increases required if development continues as proposed. Many of the other STWs may require an increase in consent to enable employment development to continue as proposed.

Flooding - ensure appropriate development within potential flood areas. Use PPS25 - Development and Flood Risk sequential and exception tests in these areas such as Sproughton where development sites are close or in existing Flood Zones 2 and 3.

Sanitary treatment capacity at Benhall (Saxmundham) - investigate available treatment headroom to accept discharge increases. AWS consider levels of investment in improving sanitary treatment processes if required.

Wastewater Infrastructure - undertake additional investigation and modelling with detailed site allocations to establish infrastructure limits. Consider locating development closer to STWs or with direct connection to the STWs in Benhall, Leiston, Melton, Rendlesham and Woodbridge/Martlesham in the short term to allow infrastructure improvements to be developed in the future if required.

9 TENDRING DISTRICT SPECIFIC RESULTS

9.1 Introduction

The following section contains information which is specific within the Haven Gateway Water Cycle Study for Tendring District. The section has been divided up into a number of parts. The first few sections describe the District area, its development plans and Council wide issues relating to water supply, waste water disposal (including water quality) and flood risk management. Following that, further sections will consider specific development areas in more detail where appropriate. Finally, a timeline showing potential actions has been developed.

9.2 Tendring District and Development

Tendring District forms the south eastern segment of the Haven Gateway, bordered by the River Stour to the north, the River Colne to the west and the North Sea to the east and south. The location of the District in relation to the Haven Gateway, adjacent Local Authority areas and other key features are shown in Figure 9.1

Figure 9.1: Tendring District Location

Containing the larger settlements of Clacton, Harwich, Jaywick, Brighlingsea and Manningtree, the District has been identified to receive 13% of the development required within the Haven Gateway sub region, in terms of the Annual Monitoring Reports (AMR - 2007) and 17% in terms of the draft East of England Plan. The East of England Plan gives a total of 8,500 dwellings to be built in the period 2001-2021. Tendring District

Council adopted its Local Plan in December 2007; work has started on the LDF and it is expected that the Core Strategy preferred option will be identified for consultation late in 2009.

As identified within the Stage 1 report, the area has grown approximately at the anticipated rate resulting in an indicative annual average of 425 dwellings per year required between 2006-2021 which is expected to be achieved utilising Brownfield Sites in the short term (up to 2011) but requiring significant Greenfield allocation up until 2021. No major developments have been identified, although larger developments are expected at sites around Clacton and Jaywick, Harwich and Dovercourt (identified as a Growth Points and regeneration area), Frinton and Walton, Brightlingsea and Manningtree with smaller developments in the more rural areas of the District. The major employment development is planned to take place in and around Harwich, with the Bathside Bay development intended to result in 770 new jobs from the creation of a new international container port and an additional 930 jobs from associated business.

Figure 9.2 (at the end of Section 9) shows the potential Development Areas, including both residential and employment, planned within Tendring District as identified from the Council's trajectory data. These are considered in some detail in later sections and, for ease of reference, have been named according to the STW catchment in which they fall:

- Brightlingsea
- Clacton
- Harwich and Dovercourt
- Jaywick
- Lawford, Manningtree and Mistley
- Thorrington
- St Osyth
- Walton and Frinton
- Wix

Harwich and Dovercourt and Clacton are expected to accommodate the majority of the residential development, with the trajectories indicating the location of 27% and 31% of the required development to take place in these two areas respectively. A further 21% is due to be located in Jaywick and 10% in and around Frinton and Walton.

A total of 204ha of employment land has been identified for development within Tendring District and, as mentioned above, the majority of the employment development (77%) is planned to be located in Harwich and Dovercourt. However detail on employment development is less well provided.

Housing trajectory data has been taken from the latest AMR report, published in December 2007 and supplemented with updated information supplied by Tendring District Council following submission of the Stage 1 report and the draft Stage 2 submission. These are site based until 2011 and averaged beyond, showing the following total development within the District from 2001/2 to 2020/21:

Figure 9.3: Housing Trajectory for Tendring District

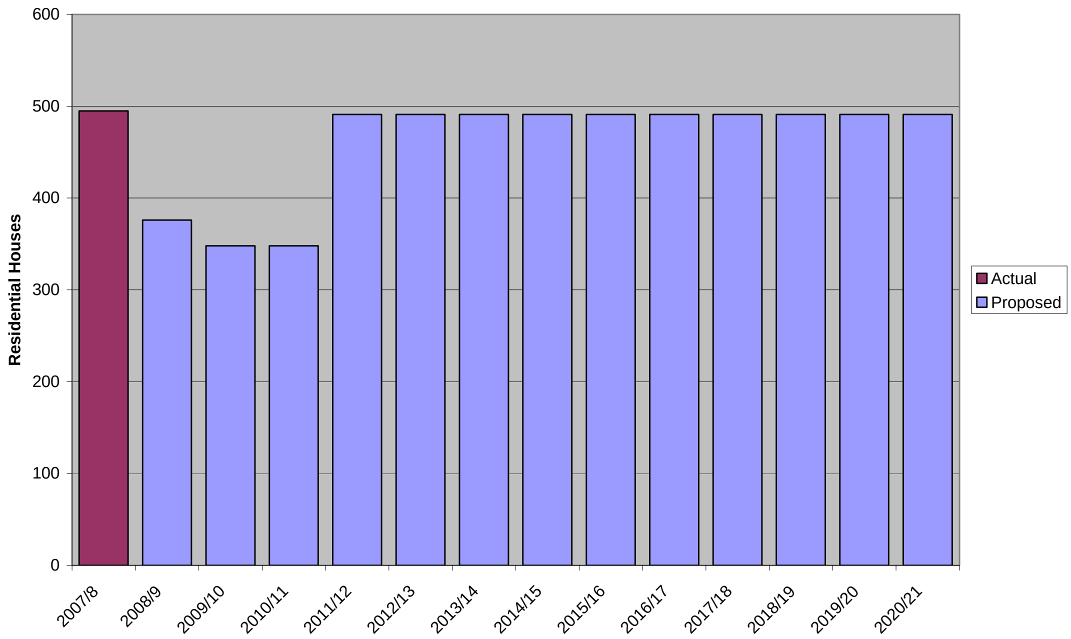
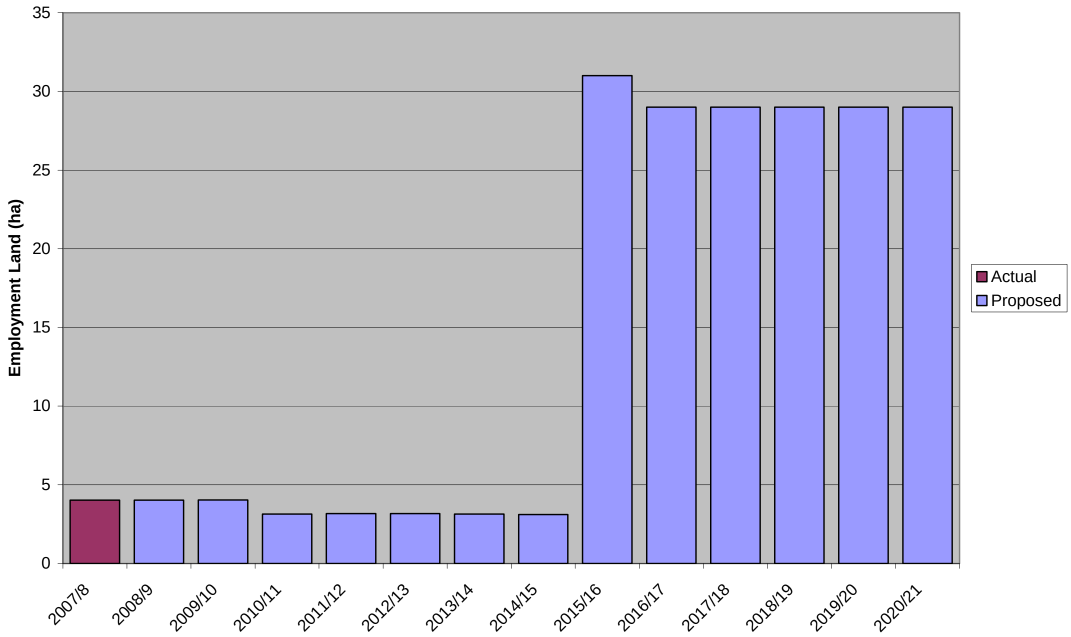


Figure 9.4: Employment Trajectory for Tendring District



The Strategic Allocation for Tendring has been annualised as 425 dwellings per annum, and the trajectory above will exceed this by around 629 dwellings.

9.3 Water Supply

Tendring District is solely supplied by Veolia Water East (VWE). A review of their dWRMP indicates that VWE are confident they can supply demand within the District until at least 2035 (the end of the dWRMP period), although this is based upon a number of assumptions, as outlined in Section 3.1 above. If these assumptions are not met it may limit their ability to supply the required demand. Examples are the reliance upon additional supply from the Ardleigh Reservoir and the change in abstraction ratios from Ardleigh Reservoir between VWE and AWS after 2010.

The dWRMP also places a high importance upon the utilisation of demand management techniques within the District, such as increased metering, customer water efficiency and maintenance of low leakage. In addition the dWRMP relies upon the maintenance of the current demographic and the acceptance of the PR09 price increase.

In terms of development the indicative annual average from the AMR of 430 dwellings per year by 2021 falls well below the 673 per year allowed by the dWRMP. However, two small areas of the VWE supply area extend beyond Tendring District's borders and into Colchester Borough, covering the areas of Dedham and Wivenhoe. A review of this area indicates that no development is planned in Dedham and approximately 200 dwellings are planned in and around Wivenhoe between 2001 and 2021, indicating a rate of 20 dwellings per year and therefore a total of 680 houses during the period of the dWRMP. When added to the predictions for Tendring District this still falls below the 16,820 dwelling allowance accounted for in the dWRMP. If, however, the development scenarios increase, for example as a result of the ongoing review of the RSS, this figure may be exceeded and the conclusions of the dWRMP invalidated.

To determine the water requirements for non residential development VWE commissioned a report detailing commercial demand forecasts over a 30 year period until 2036/7. This indicated an average reduction of 1.0% in commercial water demand per annum, presumably through increased water efficiency measures and metering. As there is relatively little commercial development planed within Tendring District and the majority is related to the Bathside Bay port development, which will not require a significant water supply, the increase in water demand from the new development alongside the falling general commercial demand should result in a negligible impact on the general water supply and resources within the planning period covered by this WCS.

In summary the following water resource activities have been outlined within VWE' dWRMP, dBP and SDS:

However, please note: The following feasible options for addressing water supply in the area have been based on the draft WRMP. This document is now being finalised and the final version should be referenced to ensure that these options are still those preferred by the water company

Table 9.1: Timeline of Preferred Water Resource Activities for Tendring

Activity	2010-2015	2015-2020	2020-2025	2025-2030	2030-2035
Infrastructure Upgrade					
Metering – increased to 90%					
Increased Water Efficiency					
Replacement of Dovercourt Reservoir					
Increased ratio from Ardleigh Res.					
Ardleigh Reservoir Extension					
Bulk transfer					

9.4 Wastewater Collection, Disposal and Quality

Tendring District is serviced by fourteen sewage treatment works, serving thirteen sewage treatment catchments, all of which are contained within Tendring District's boundaries, as shown in Figure 9.5.

Based on the measured DWF values for 2007(JR08), together with the current Consented DWF values, the present day available headroom for all STWs are shown in Table 9.2 below.

Table 9.2: Discharge capacities of STWs in Tendring DC

STW Code	Site Name	Consented DWF (m^3/d)	Measured DWF 2007/JR08 (m^3/d)	Headroom (m^3/d)
BRICST	BRIGHTLINGSEA-CHURCH RD STW	2,160	2,000	160
BRIMST	BRIGHTLINGSEA-MILL ST STW	*No data*	***3***	*No data*
CLACST	CLACTON-HOLLAND HAVEN STW	10,550	7,978	2,572
GBROST	GREAT BROMLEY STW	365	198	167
HDOVST	HARWICH AND DOVERCOURT STW	6,782	5,315	1,467
JAYNST	JAYWICK NEW STW	4,430	5,182	-752
MANNST	MANNINGTREE STW	2,729	***1,691***	***1,038***
SOSYST	ST OSYTH STW	1,600	1,010	590
TENGST	TENDRING GREEN STW	*No data*	***3***	*No data*
THORST	THORRINGTON STW	2,400	1,501	899
WALTST	WALTON ON THE NAZE STW	6,364	3,553	2,811
WIXXST	WIX STW	160	99	61
WRABST	WRABNESS-WHEATSHEAF CLOSE STW	7	***5***	***2***

Note: values in ***bold italics*** are based on calculated values from the JR08 results rather than measured.

This shows that one STW, Jaywick, is currently operating above its consented DWF. Future developments within this STW catchment will therefore require careful consideration.

Of these thirteen, nine receive an increase in discharge from the projected development. The nine potentially affected STWs are:

- Brightlingsea;
- Clacton;
- Jaywick;
- Harwich and Dovercourt;
- Lawford, Manningtree and Mistley;
- St Osyth;
- Thorrington;
- Walton and Frinton; and
- Wix

The results of the projected wastewater analysis for the STWs affected by the current planned development are presented in Table 9.3. This shows whether the headroom at each STW in each year is more than 20% of the consented DWF (Green), between 20% and 0% (Amber) and negative headroom (Red). The nine catchments in which development is already planned are discussed further in the following sections.

Table 9.3: Summary of STW Headroom for affected STWs in Tendring DC – Employment and Residential Development

STW Ref.	Catchment Settlement(s) / Development Area	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BRIMST /BRICST	Brightlingsea														
CLACST	Clacton														
HDOVST	Harwich and Dovercourt														
JAYNST	Jaywick														
MANNST	Lawford/Manningree/Mistley														
SOSYST	St Osyth														
THORST	Thorrington														
WALTST	Frinton and Walton														
WIXXST	Wix														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

This shows three works with a lack of headroom to cope with the projected growth of both housing and employment over the study period and two other works which fall within 20% of the limit of their headroom. However, when only the residential development is considered, only one works display a lack of headroom within the planning period (Jaywick). Three other STWs fall within 20% of the limit of their headroom when only the residential development is considered.

The three works due to exceed their discharge consents as a result of the proposed residential and employment development within the planning period are discussed further below.

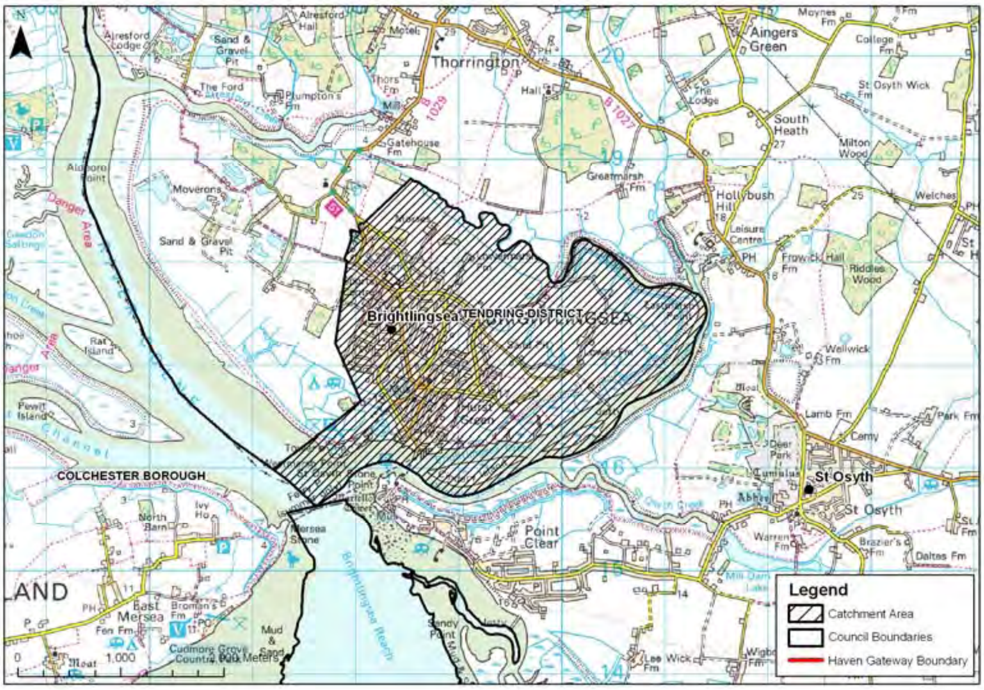
Very limited information was available for this study with which to make an assessment of the capacity of the wastewater infrastructure (sewer pipes, pumping stations etc). However, brief comment was provided by AWS for each of the STW catchments in which a future potential for residential development has been identified. These are discussed within the analysis of individual STWs below and within the discussion of individual development areas.

Of the STWs not discussed individually as no issues have been identified regarding their capacity, Lawford, Manningtree and Mistley, Frinton and Walton, Thorpe Le Soken, and St Osyth have all been identified as having no available capacity within their existing sewer networks. AWS have therefore identified a preference for all new development to be located in proximity to the STWs within these catchments. The Clacton catchment has been identified as having some wastewater infrastructure restrictions with a need for new development to be located towards the west of the catchment.

9.4.1 Brightlingsea STW

Brightlingsea Church Road STW (BRICST) receives discharge from the entire urban area of Brightlingsea town. A second Brightlingsea STW – Mill Street STW (BRIMST) is located to the east of Brightlingsea town and, according to AWS catchment map contains minimal development within its catchment. As flow data is only available for the BRICST STW, it is therefore supposed that the two STWs operate in tandem and, as a result, have been considered together throughout the analysis of this WCS. The catchment areas of these two STWs are shown in Figure 9.6. The current consented DWF for the BRICST works is 2,160 m^3/d.

Figure 9.6: Location of Brightlingsea STW Catchment



Both residential and employment development are planned within the BRICST catchment, totalling 230 dwellings over the planning period at an approximate 15 dwellings per year and 2.7ha of employment land. Although this development is relatively limited the works are already operating within 20% of the consented limit, which currently stands at 2,160 m^3/d, and, when both residential and employment development projections are considered the works are expected to exceed the consented limit by 20012/13, reaching a maximum of 9.4% exceedance by 2020/21 as shown in Figure 9.7 and Table 9.4 below:

Figure 9.7: Brightlingsea STW percentage headroom – residential and employment development

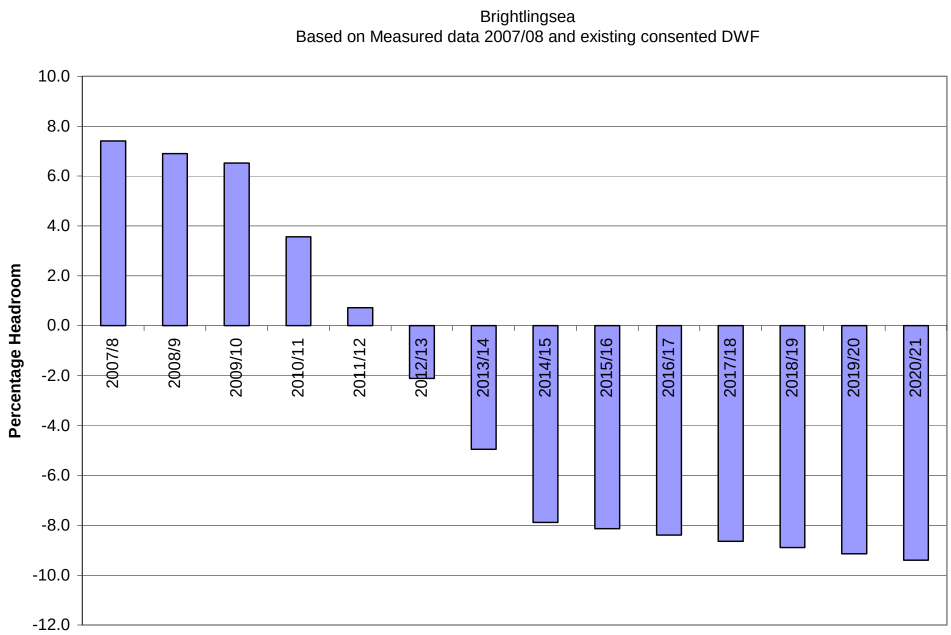


Table 9.4- Headroom availability for the Brightlingsea STW - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BRIMST/ BRICST	Brightlingsea														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

However, when only the residential development is considered the works stay above their consented limit throughout the planning period, reaching a headroom of 3.6% by 2020/21, as illustrated in Figure 9.8 and Table 9.5 below:

Figure 9.8: Brightlingsea STW percentage headroom – residential development only

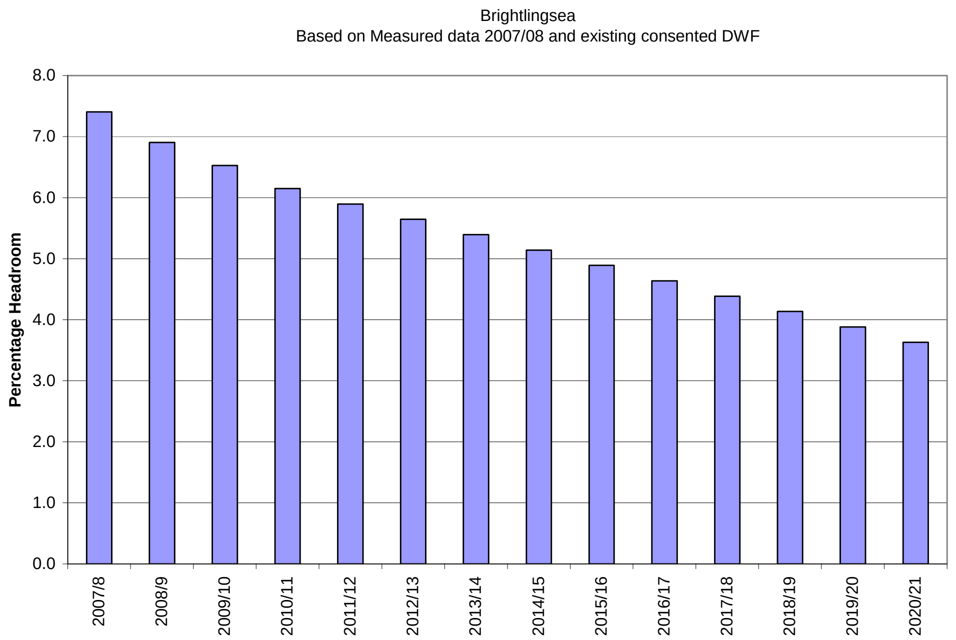


Table 9.5- Headroom availability for the Brightlingsea STW - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BRIMST/ BRICST	Brightlingsea														

Note: Red = no headroom, Amber = 0 to 20% headroom, Green = >20% headroom

There is therefore just enough headroom to accommodate the residential development planned throughout the planning period, but in order to accommodate the employment proposals as well then additional measures need to be employed, such as an increased discharge consent or alternative treatment.

AWS have also stated that there is no spare capacity in the existing sewers. Their preferred location for new development is therefore in proximity to the STW or where the wastewater can be directly discharged to the STW.

Environmental Considerations

Brightlingsea STW (AW2TSE/3684B consented 2006) discharges secondary treated sewage effluent into the Colne estuary (Grid Reference TM 0635 1760). The current consented dry weather flow is 7,600m^3 per day with a total daily volume limited to 2,160m^3. Currently, the discharge shall not exceed:

- 40 milligrammes per litre of BOD with an upper limit of 80 milligrammes per litre; or
- 80 milligrammes per litre of suspended solids.

Sampling at the discharge point is frequently carried out by Anglian Water to assess that the discharge is keeping to the consent limits. The sampling shows that suspended solids are well below the consent level at around 50% of the consented limit.

The current state of the receiving environment

The Brightlingsea STW discharges directly into the Colne Estuary Ramsar and SPA site and Essex Estuaries SAC site. The Colne Estuary SSSI units which are nearest to the discharge point are in ‘unfavourable, declining’ condition and in ‘favourable’ condition. The unit in ‘unfavourable, declining’ condition is in this condition due primarily to coastal squeeze and the resulting erosion. Tidal processes clearly have the biggest influence on the designated site.

Brightlingsea beach, a blue flag beach is 2km downstream of the STW outfall. The award of a Blue Flag beach is based on compliance with 29 criteria covering the aspects of environmental education and information, water quality, environmental management and safety and services. The beach is also designated under the Bathing Water Directive sets a number of microbiological and physico-chemical standards that bathing waters must either comply with ('mandatory' standards) or endeavour to meet ('guideline' standards). In 2008 Brightlingsea beach passed these standards and achieved the more stringent guideline standard (for total and faecal coliforms and faecal streptococci), as well as the mandatory standard.

The Colne Estuary is designated as a shellfish water under the Shellfish Waters Directive. The aim of the EC Shellfish Waters Directive is to protect or improve shellfish waters in order to support shellfish life and growth, therefore contributing to the high quality of shellfish products directly edible by man. It sets physical, chemical and microbiological water quality requirements that designated shellfish waters must either comply with (‘mandatory’ standards) or endeavour to meet (‘guideline’ standards). One of the standards is the level of suspended solids; it states that “a discharge affecting shellfish waters must not cause the suspended solid content of the waters to exceed by more than 30% the content of waters not so affected”.

The impact of development

Modelled discharge flows accounting for all developments suggest the discharge limit will be exceeded in 2012/13 and will continue to into the future. Projected dry weather discharge in 2020/21 is 2,363m^3 per day; this exceeds the current consent by 203m^3 or 9% per day. Therefore in order to accommodate planned growth an increase in consented discharge will be necessary.

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 16.2kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Colchester STW also discharges into the Colne Estuary, approximately 7km upstream of the Brightlingsea STW outfall. Both STW are expected to exceed their consented limits but the potential for these discharges to have a combined effect on the condition of the Colne Estuary and its designated shellfish water status is considered unlikely due to the size and diluting action of the estuary.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Brightlingsea operated to BATNEEC standards then the current consent limits would not be exceeded within the plan period.

The draft Water Framework Directive classifications for the area (Environment Agency, 2009) surrounding the Brightlingsea STW is moderate, the category below good. The standards set for meeting this classification are 1.1mg/l ammonia and 6.5 mg/l BOD within the river.

More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Brightlingsea in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally–designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

<u>Conclusions</u>

There is enough sufficient capacity within the STW to accommodate the residential development but additional investment is required to accommodate the increased flows from the employment development. Investment is also required in this catchment to increase the capacity of the sewer infrastructure and potentially to implement BATNEEC technologies beyond 2012/13 in order to keep the STW effluent within the pollution consent.

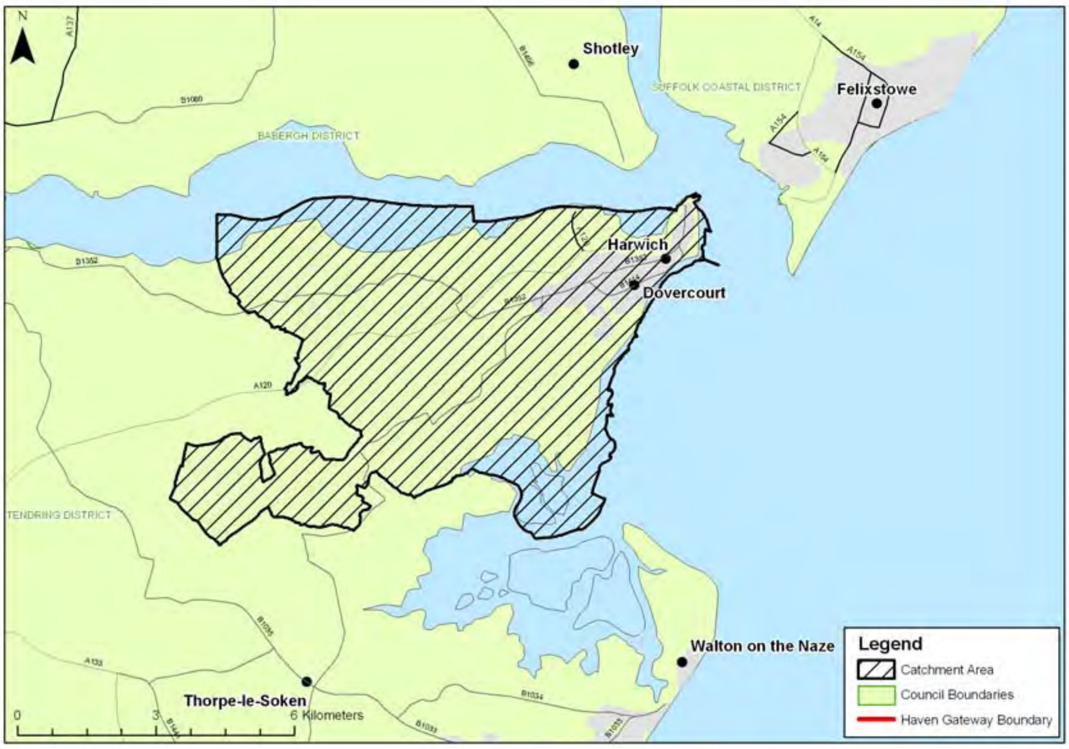
Table 9.6 - Brightlingsea STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent		Consent Increase		
Sanitary Treatment Improvements		Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

9.4.2 Harwich and Dovercourt STW

Harwich and Dovercourt STW receive wastewater from the northeastern corner of Tendring District, including the urban areas of Harwich and Dovercourt. This area is shown in Figure 9.9**:**

Figure 9.9: Location of Harwich and Dovercourt STW Catchment



A fairly large proportion of the residential development planned for Tendring District is located within Harwich and Dovercourt, totalling 1,649 dwellings, and 77% of the employment development is also planned within this catchment, totalling 157ha. The current consented DWF for the works is 6,782m³/d.

Using the measured value in 2007/8 as a starting point for the projected capacity of the works, and the development trajectories outlined in Section 9.2 then the percentage headroom to 2020/21 is shown in the Figure 9.10 and Table 9.7 below:

Figure 9.10: Harwich and Dovercourt STW percentage headroom – residential and employment development

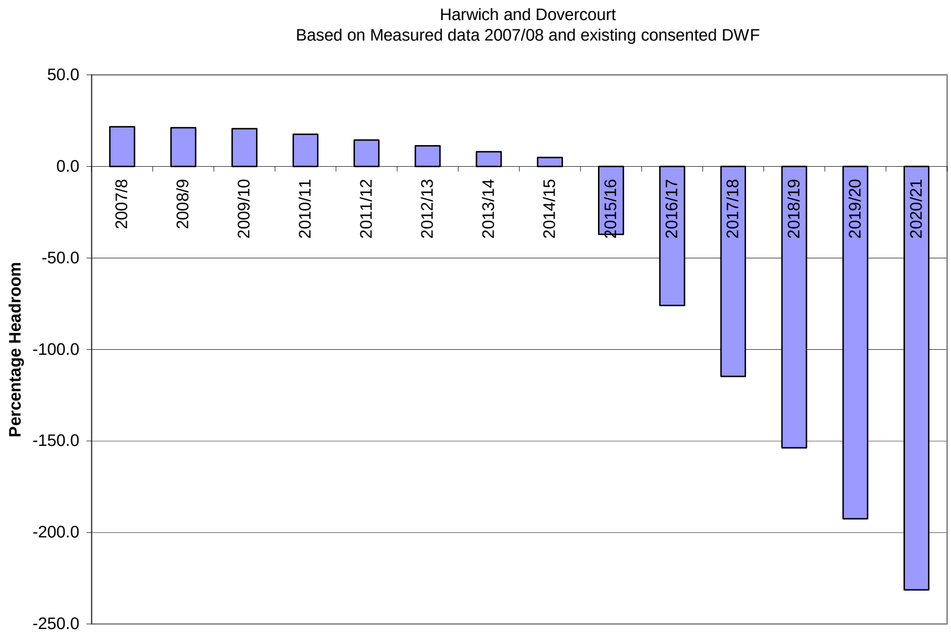


Table 9.7- Harwich and Dovercourt STW headroom availability - residential and employment development

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
HDVOST	Harwich and Dovercourt														

The combined residential and employment development raises the discharge to 22,475m³/d which is over 330% of the current consented DWF. However, removing the employment development, results in the STW remaining above its consented limit, although within 20%, as shown in Figure 9.11 and Table 9.8:

Figure 9.11: Harwich and Dovercourt STW percentage headroom – residential development only

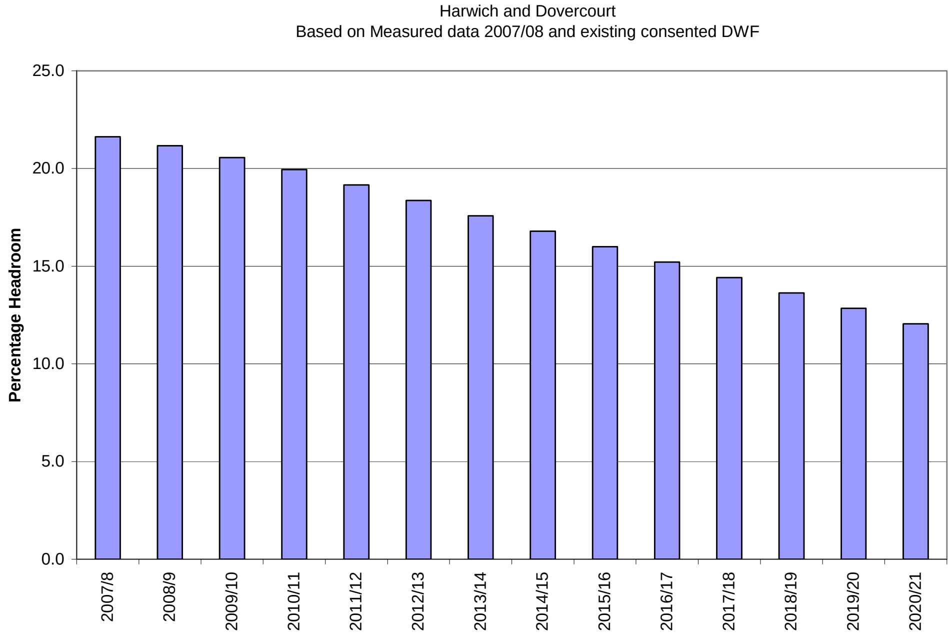


Table 9.8- Harwich and Dovercourt STW headroom availability - residential development only

STW Ref.	Catchment / Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
HDVOST	Harwich and Dovercourt														

However, in their Stage 2 report assessing their STW, AWS state that only "*Since it was built in 1997, the works has only had 1 of its 2 aeration lanes online, so there is capacity for another 50% of Secondary Treatment*". If this is the case and the second aeration lane can become operational, AWS identify that the anticipated growth by 2016 (considered as 950 dwellings within their report, as opposed to 786 identified within this study) will have a minimal impact on the probability of sanitary compliance failure and, as such, no consent charges are anticipated in AMP5.

AWS have expressed a preference for any development within this area to take place to the north of the catchment where wastewater flows can be directed into an 1800mm trunk sewer.

Environmental Considerations

The Harwich and Dovercourt STW (ASETS/12050C, modified December 2005) discharges directly into the tidal River Stour (at Grid Reference TM 2255 3268). The maximum daily volume of discharge is 18,230m^3, with a dry weather flow discharge of 6,782m^3 per day. In the conditions of consent the discharge shall not exceed:

- 60 milligrammes per litre of BOD with an upper limit of 120 milligrammes per litre;
- 50 milligrammes per litre of ammoniacal nitrogen with an upper limit of 100 milligrammes per litre; or
- 120 milligrammes per litre of suspended solids.

Sampling at the discharge point is frequently carried out by Anglian Water to assess that the discharge is keeping to the consent limits. The sampling shows that suspended solids and ammoniacal nitrogen are well below the consent level at around 8% and 40% respectively of the consented limit.

The current state of the receiving environment

The Harwich and Dovercourt STW discharges into the Stour Estuary in an area which is outside the Stour and Orwell Estuaries designated areas. However the designated area is less than 500m away from the discharge point. The SSSI unit that corresponds to this area is currently in unfavourable declining condition due to coastal squeeze, recreational disturbance, water quality and dredging. The area is adjacent to Harwich International Port and water quality issues are likely to arise from there.

The impact of development

Modelled discharge flows accounting for all developments suggest the discharge limit will be exceeded in 2015/16 and will continue to into the future. Projected dry weather discharge in 2020/21 is 22,475m^3 per day; this exceeds the current consent by 15,693m^3 or 331% per day. Therefore in order to accommodate planned growth an increase in consented discharge will be necessary.

If the consented dry weather discharge volume were increased in order to accommodate all development (residential and commercial), at the current consented discharge concentrations this could allow the additional release of up to 784.7kg of ammoniacal nitrogen and 1883kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Where possible the Water Framework Directive objective to ensure no deterioration of watercourses is interpreted by the Environment Agency as meaning that there is no increase in pollutant load.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading of the river. This analysis shows that if Colchester met BATNEEC standard then the current consent limits would not be exceeded within the plan period.

The tidal River Stour has not been assessed in the draft Water Framework Directive classifications (Environment Agency, 2009). More detailed future assessment by the Environment Agency could provide indicative consent (concentration) limits which would be required to achieve these standards, and will further inform decisions as to whether technological solutions will be sufficient to accommodate growth. It will also take a more cumulative view of the receiving environment, assessing the impacts of Harwich and Dovercourt in-combination with other discharges into the same watercourse.

An increase in the consented discharge volume is required, but if accompanied by technological upgrades to limit pollutant load it is unlikely to require assessment under the Habitats Regulations due to the distance from the internationally designated site; however this position would need to be confirmed by seeking specific advice from Natural England.

Conclusions

This catchment has sufficient capacity to accommodate the required residential development flows but additional investment will be required to increase the capacity of the STW from 2015 if both residential and employment flows are to be incorporated. Additional investment may be required to increase the capacity of the sewer network and to improve sanitary treatment (second treatment lane or new BATNEEC technologies) beyond 2015/16.

Table 9.9 - Harwich and Dovercourt STW Summary Conclusions

	2008-2011	**2011-2014**	**2014-2017**	**2017-2021**
Sewage Discharge Consent			Consent Increase	
Sanitary Treatment Improvements			Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

9.4.3 Jaywick STW

Jaywick STW receives wastewater from the urban area of Jaywick in addition to the western third of Clacton on Sea, including the areas of Rush Green and Bocking Elm. The area is shown below in Figure 9.12.

Figure 9.12: Location of Jaywick STW Catchment

Within this area, most notably to the north, a total of 1,408 dwellings are planned. The trajectories indicate that these are to be constructed at an approximate rate of 130 per year, post 2010. No employment development is planned within this area during the planning period. The current consented DWF for the works is 4,430 m^3/d, which is already being exceeded by the current development. AWS also identify in their Stage 2 report that the system as a whole is not coping and has resulted in flooding from the sewers. They also identify that most of the growth is likely to drain to West Road and into a combined sewer overflow which is already noted as being unsatisfactory.

Using the measured value in 2007/8 as a starting point for the projected capacity of the works, and the development trajectories outlined in Section 9.2 then the percentage headroom to 2020/21 is shown in Figure 9.13 and Table 9.10 below:

Figure 9.13: Jaywick STW percentage headroom – residential development only

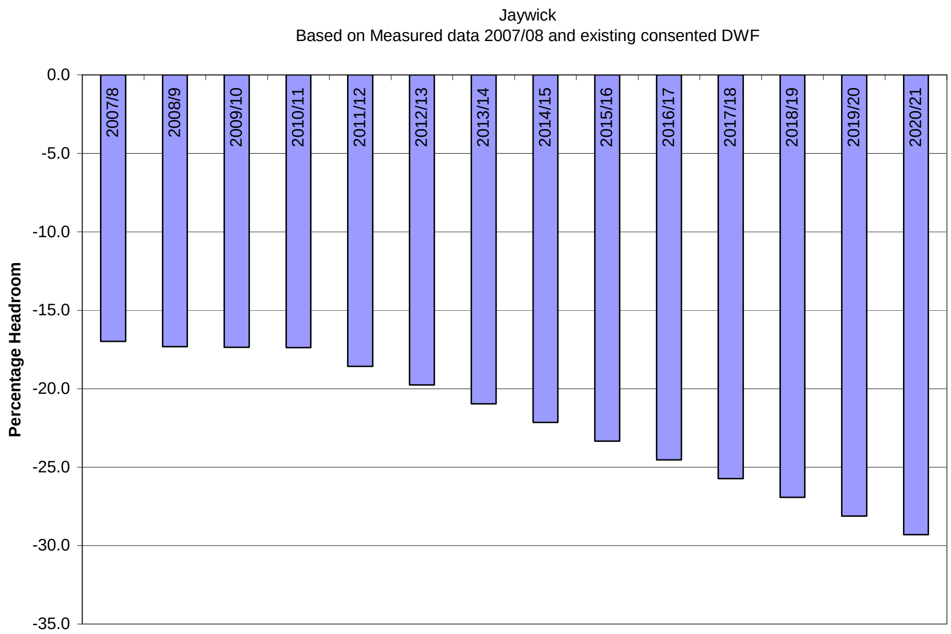


Table 9.10- Jaywick STW headroom availability - residential development only

STW Ref.	Catchment Settlement(s)	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
JAYNST	Jaywick														

At present, it would not appear that AWS are applying for an increase in the consented DWF for this STW.

A sensitivity analysis has therefore been carried out to determine whether either Clacton or St Osyth STW can accommodate the increased residential flow planned for Jaywick. The results are shown in Table 9.11 and indicate that there is capacity within both Clacton STW and, for most of the planning period, St Osyth STW to accommodate the additional flow proposed from Jaywick STW in addition to their own development projections, even when the employment development is considered as well as the residential. St Osyth indicates a lack of consent in the final two years of the planning period in the scenario whereby all of the additional flows from Jaywick are transferred without any assistance from Clacton, as shown in Table 9.11:

Table 9.11 Sensitivity Analysis for Alternative Treatment from Jaywick

a) Clacton receiving all flows from proposed Jaywick Development

	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Residential Only														
Residential + Employment														

b) St Osyth receiving all flows from proposed Jaywick Development

	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Residential Only														
Residential + Employment														

c) Clacton and St Ostyth each receiving half of flow from proposed Jaywick Development

Clacton	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Residential Only														
Residential + Employment														
St Osyth														
Residential Only														
Residential + Employment														

There is also an issue within the sewer system within the Jaywick catchment which is currently operating at capacity. In the current situation any development is therefore best placed in proximity to one of the STWs.

Environmental Considerations

The Jaywick STW (modification AEECS/12400A, December 2005) discharges directly into the North Sea (at Grid Reference TM1374 1219). The maximum daily volume of discharge is 11,518m^3, with a dry weather flow discharge of 4,430m^3 per day. In the conditions of consent the discharge shall not exceed:

- 100 milligrammes per litre of BOD with an upper limit of 250 milligrammes per litre;
- 250 milligrammes per litre of suspended solids;
- 250 micrograms per litre of iron;

- 20 micrograms per litre of Nickel;
- 520 micrograms per litre of zinc;
- 10 micrograms per litre of chromium;
- 280 micrograms per litre of copper;
- 28 micrograms per litre of leads; or
- 1 microgram per litre of cadmium
-

Sampling by Anglian Water at the discharge point indicates that current levels of BOD and suspended solids are well under the consented limits (10% of the consent limit for suspended solids and BOD) and indicate that the necessary level of increased future discharge will not present a significant problem in meeting the required concentrations.

The current state of the receiving environment

The discharge point is 2km from the Essex Estuaries SAC designated site, a coastal site affected primarily by coastal squeeze. As it is a site dominated by tidal influences then the increase in future discharge to the sea will have very little impact due to dilution, and is not expected to have a negative impact on the site.

Jaywick beach is designated under the Bathing Water Directive sets a number of microbiological and physico-chemical standards that bathing waters must either comply with ('mandatory' standards) or endeavour to meet ('guideline' standards). The STW outfall is approximately 500m out to sea from the beach area. In 2008 Brightlingsea beach passed these standards and achieved the more stringent guideline standard (for total and faecal coliforms and faecal streptococci), as well as the mandatory standard. There are further beaches on the Tendring peninsula that may be affected by increases in discharge from Brightlingsea and discharge is to increase then these impacts will need to be investigated.

Impact of development

Modelled discharge volumes are currently exceeding the consented limits and this will continue to increase into the future. Projected dry weather discharge in 2020/21 is 5,408m^3 per day which exceeds the current consent by 973m^3 per day (22%).

If the consented dry weather discharge volume were increased in order to accommodate all development, at the current consented discharge concentrations this could allow the additional release of up to 1,352kg of suspended solids into the river system per day. The BOD of the receiving watercourse may also be affected.

Modelling of predicted future flows was undertaken with the assumptions that BAT or BATNEEC had been applied in order to constrain pollutant loads. This would allow for an increase in discharge whilst avoiding any additional pollutant loading. This analysis shows that if Jaywick operated to BATNEEC standards then the current consent limits would not be exceeded within the plan period. Increases in pollutant metal loads would require additional management; this is likely to be required upstream of the STW itself, and may be progressed through agreements governing discharges to the sewer system. Although an increase in the consented discharge volume is required, it is unlikely that an assessment under the Habitats Regulations will be necessary due to the distance from the internationally designated site; however this position would need to be confirmed by seeking advice from Natural England.

Conclusions

Jaywick STW appears to be already operating beyond its consented capacity. From our analysis there is potential to transfer flows to the neighbouring STWs of Clacton and St Osyth, but more investigation is required to determine whether AWS have already resolved this issue.

No capacity, however, is available within the current sewer network so investment is required to upgrade the system. If flows are to be accommodated at Jaywick them the implementation of BATNEEC technologies may be required throughout the planning period to address possible shortfalls in sanitary treatment.

Table 9.12 - Jaywick STW Summary Conclusions

	2008-2011	2011-2014	2014-2017	2017-2021
Sewage Discharge Consent	Consent Increase / Transfer flows to neighbouring STW			
Sanitary Treatment Improvements	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies	Potentially implement BATNEEC Technologies
Sewer Network/Infrastructure	Improvements required	Improvements required	Improvements required	Improvements required

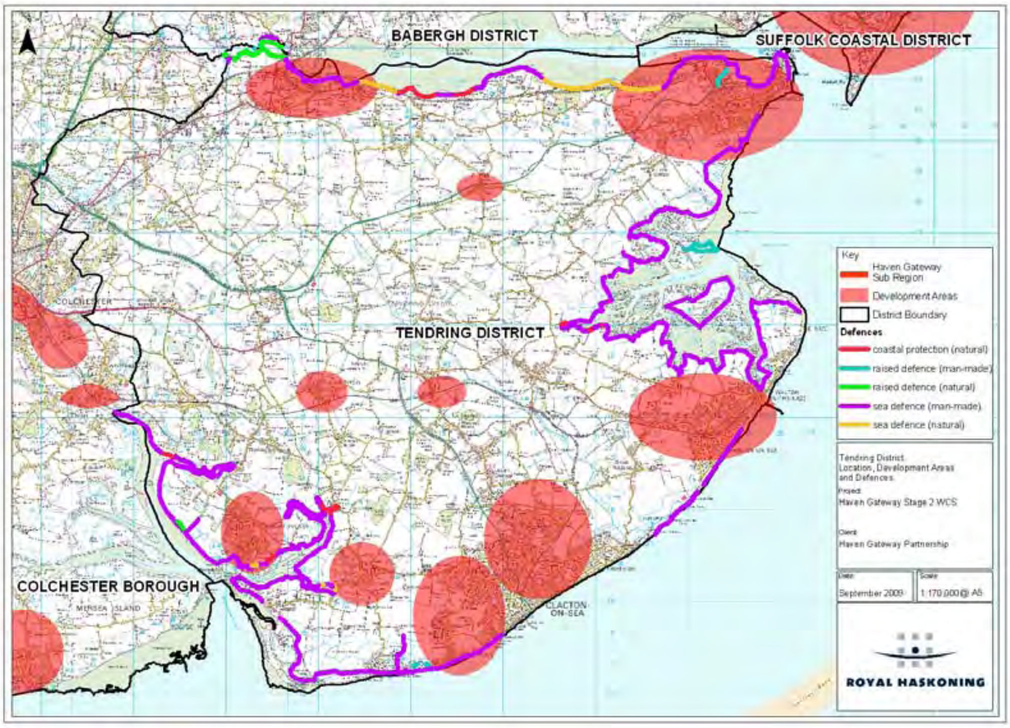
9.5 Flood Risk Management

Tendring District has commissioned a Scoping Study for an SFRA, which was completed in August 2008, and are currently commissioning the production of a Level 1 SFRA for the whole District and a Level 2 SFRA for certain areas, including Clacton, Brightlingsea and Walton on the Naze. A separate Level 2 SFRA was completed for Harwich in August 2008. As with all areas in England and Wales the Environment Agency have produced Flood Zone maps in line with PPS 25 and these have been compared with the proposed development sites to identify key areas of concern. The locations of Flood Zones 2 and 3 within the District are shown on Figure 9.14 (end of Section 9).

Large areas of Tendring District are at risk of fluvial and/or tidal flood risk and are located in Flood Zones 2 and 3, most notably surrounding the coasts and estuaries and affect many of the current developed areas including Brightlingsea, Jaywick, Clacton on Sea, Walton on the Naze, Harwich and Dovercourt and Manningtree. Some of the development areas intersect with these flood zones. The individual development areas will be discussed in more detail in the later sections of this report but individual sites will require site-specific Flood Risk Assessments (FRAs) before development takes place.

The Environment Agency's Flood Zones do not take into account the presence of flood defences. A review of the Environment Agency's NFCDD dataset and the SFRA Scoping Study identifies that much of Tendring's coastline is protected by 'raised' or manmade 'sea' defences, as shown in Figure 9.14, which provide protection to most of the main towns, including Manningtree, Harwich, Walton-on-the-Naze, Frinton-on-Sea, Clacton-on-Sea, Jaywick and Brightlingsea. The Scoping Study also identifies the need for further analysis of defence overtopping in certain locations around the coastline as part of the full SFRA. Once complete, the results will need to be reviewed and considered before development commences.

Figure 9.15: 'Raised' and manmade 'Sea' Defences protecting Tendring District



As identified within the North Essex CFMP that coastal streams within Tendring District, namely Holland Brook and Pickers Ditch can cause flash flooding in the urban areas as they respond rapidly to short duration, high intensity rainfall. This is noted as a particular problem within Clacton-on-Sea.

Surface water flows are an important consideration for any development, although, as much of the development is proposed on Previously Developed Land, in accordance with the guidelines within PPS 3, this should not be as much of a problem as with Greenfield development. However, it is important that any new development does not increase the risk of flooding to existing development downstream through implementation of water management measures, such as SUDS.

Further information regarding groundwater, sewer, historical and surface water flooding will be available once the full SFRA for Tendring has been completed.

The selection of new development sites and the evaluation of existing sites should follow the guidance in PPS25 - Development and Flood Risk and use the Sequential and Exception tests where required. The Level 1 SFRA and Level 2, where available, will assist in the selection of sites in line with these tests.

9.5.1 Source Protection and Groundwater Vulnerability

As part of controlling surface water flooding, options may be considered that use retention or infiltration techniques. Therefore, before development can take place source protection and groundwater vulnerability issues must be appreciated and reviewed.

Source Protection Zones (SPZ) have been identified by the Environment Agency as requiring protection as water sources. As shown in Figure 9.16 (end of Section 9), two Source Protection Zones (SPZs) are located within Tendring District. The majority of the Stour Valley is classified as an SPZ and includes much of Manningtree and Mistley and therefore their associate Development Area. The second SPZ is centred slightly northeast of Great Bentley, with its catchment extending underneath the entire village and surrounding area and as far north as the A120. This therefore affects the Thorrington Development Area. The Environment Agency will not support the use of SUDS which use infiltration techniques on any development sites which overlap the Inner Zone.

An assessment of the vulnerability of groundwater to diffuse sources of pollution has also been supplied by the Environment Agency. Table 9.6 shows the groundwater vulnerability classifications present within Tendring District. Figure 9.17 (end of Section 9) shows the groundwater vulnerability classification map for Tendring District. Although the aquifers are fairly extensive within the District, mainly to the west and north, they are all classified as 'Minor'. These are described as having 'variable permeability', consisting of, in general terms, fractured or potentially fractured rocks which do not have a high primary permeability or they are unconsolidated deposits. Five main soil types are present, which are classified in terms of their vulnerability as described in the following table. H refers to a high vulnerability, I to an intermediate vulnerability and L to a low vulnerability. The numbers refer to the soil type.

Table 9.13: Aquifer Soil Types Present within Tendring District as shown on Figure 9.16

Soil Classification	Description
H1	Soils which readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater.
H2	Deep, permeable, coarse textured soils which readily transmit a wide range of pollutants because of their rapid drainage and low attenuation potential.
HU	Designates a restored mineral working and/or urban areas where soil information is based on fewer observations and therefore classified a worst case vulnerability classification.

I1	Soils which can possibly transmit a wide range of pollutants.
L	Soils of low leaching potential in which pollutants are unlikely to penetrate the soil layer because either water movement is largely horizontal or they have the ability to attenuate diffuse pollutants.

National Rivers Authority Map 1995

The most extensive soil classification within Tendring District is vulnerability type I1, which covers the entire northwestern quarter of the District and large swaths of the southwestern and northeastern quarters. The areas of high vulnerability are located in patches across the central, southern and northeastern areas of the District, with the largest extents located around Clacton on Sea, Brightlingsea, Dovercourt and along the course of the Holland Brook. Soils of low leaching potential are located in patches around the central area of the District. The proximity of these soil types to the Development Areas is discussed in more detail in Sections 9.6.

9.6 Development Areas

The following Development Areas have been determined based upon their classification within the Sewage Treatment Works (STW) catchments, as provided by AWS. They have been classified in this way as the wastewater treatment has been shown to be the most limiting factor to growth within this study. As highlighted in Section 2.4 it was not possible to assess the capacity of the wastewater infrastructure in great detail, which may prove to be a greater limitation in some areas than the treatment works. The brief comments received from AWS have however been incorporated within the analysis of the development areas, but are shown as semi-shaded in the concluding tables to indicate a requirement for additional modelling/analysis at a later date. However, all elements of the Water Cycle will be reviewed for each Development Area in the following sections. The AMR figures for individual development sites have been updated by the Council following their review of the Stage 1 report.

9.6.1 Clacton-on-Sea

The proposed residential development in Clacton-on-Sea is located in the centre and north of the town and in Holland-on-Sea. The employment development is concentrated to the north of the town, towards the suburb of Little Clacton. A total of 1,857 dwellings and 13.2ha of employment land are proposed within this development area between 2008 and 2021, with the majority of the employment development to take place in the next five years.

As discussed above, all the proposed development in this area feeds into the Clacton STW, which, although predicted to reach the final 20% of its consented DWF within the next couple of years, does have enough headroom to accommodate all of this proposed development. In their Stage 2 report, AWS identified that no upgrade or consent changes were required at Clacton STW within AMP5. Although the proposed development is significantly higher than the total included within AWS' review (which allowed for 400 dwellings by 2016), their conclusion still appears valid, although they may wish to update their development scenarios for future projections. The network capacity has not been identified as a particular constraint, but AWS have displayed a preference for the new development to be located towards the west of the catchment where the wastewater can discharge into a new gravity sewer. However, a more detailed analysis may identify additional issues, therefore posing a constraint to development and the requirement for infrastructural upgrades within the planning period. As this STW was not identified as being at risk of exceeding its consented flow, environmental analysis has not been carried out and it is assumed that the STW is currently operating, and will continue to operate below its consented pollutant limit.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Clacton Development Area. However, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

Only a minimal area of this Development Area is located within the Environment Agency's Flood Zones 2 or 3. Although Clacton is protected by sea defences, additional studies regarding the effect of overtopping or breaching of the defences are currently being undertaken as part of the full SFRA. However, it is thought that the proposed developments are located at sufficient distance from the sea front for breaching not to pose a significant risk. The Holland Brook and Picker's Ditch pose a risk of flash flooding within Clacton-on-Sea and therefore impact the development areas, although the risk to individual developments is dependant upon their proximity to these watercourses.

It is therefore not recommended that any development takes place within Clacton-on-Sea until the full SFRA has been completed unless detailed site specific FRAs are undertaken.

Much of Clacton is underlain by a minor aquifer although no source protection zones have been identified in proximity to the development area. Therefore there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the coastal streams, such as Picker's Ditch and Holland Brook must be appreciated.

To summarise the situation in Clacton if no action is taken then the following situation would occur.

Table 9.14- Situation in Clacton-on-Sea Development Area if no action is taken

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	A	A	A	A
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.15 - Activities required in Clacton-on-Sea development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	-	Increase in consent to support employment	Increase in consent to support employment
Flooding	SuDS Site specific FRA Breach analysis in SFRA	SuDS Site specific FRA Breach analysis in SFRA	SuDS Site specific FRA Breach analysis in SFRA	SuDS Site specific FRA Breach analysis in SFRA
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	Location of development towards the west of the catchment or upgrade to sewer network	Location of development towards the west of the catchment or upgrade to sewer network	Location of development towards the west of the catchment or upgrade to sewer network	Location of development towards the west of the catchment or upgrade to sewer network
Water Supply Infrastructure				

9.6.2 Jaywick

Only residential development, totalling 1,364 dwellings between 2008 and 2021, is proposed within the Jaywick Development Area, with the majority of development scheduled to take place between 2008 and 2012. Most of this development is located to the north of the area, within the western extent of Bocking's Elm.

As discussed above, this development is located within the catchment area of the Jaywick STW, which is already operating beyond its current consented DWF. The inclusion of this development into the STW would send it more than 20% over its current consented limit. However, there is capacity within both St Osyth STW and Clacton STW to accommodate part, or all, of the predicted flow from this development area, although by itself St Osyth STW would exceed its consented limit by 2019/20. However, the network has no spare capacity, placing restrictions on the possible location of development within the catchment without an upgrade/extension to the system.

Investment is also required potentially implement BATNEEC technology to the sanitary treatment to maintain pollutant discharges throughout the planning period.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Jaywick Development Area. However, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

According to the Environment Agency's Flood Zone map, although most of Jaywick is located within Flood Zones 2 and 3, the Development Area is sufficiently north to be located out of these flood zones. However, the potential for flash flooding from any minor streams close to the developments would require consideration, usually through a site specific FRA.

Much of the development area is underlain by a minor aquifer although no source protection zones have been identified in proximity. Therefore there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the coastal streams must be appreciated.

To summarise the situation in Jaywick if no action is taken then the following situation would occur.

Table 9.16- Situation in Jaywick Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.17 - Activities required in Jaywick development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	Increase consent or arrange a transfer of flows to another STW	Increase consent or arrange a transfer of flows to another STW	Increase consent or arrange a transfer of flows to another STW	Increase consent or arrange a transfer of flows to another STW
Flooding	SuDS Potential FRA Maintenance of defences	SuDS Potential FRA Maintenance of defences	SuDS Potential FRA Maintenance of defences	SuDS Potential FRA Maintenance of defences
Environment – Water Quality	Potential BATNEEC required	Potential BATNEEC required	Potential BATNEEC required	Potential BATNEEC required
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.
Water Supply Infrastructure				

9.6.3 Harwich and Dovercourt

The majority of the employment development proposed for Tendring District is due to be located in Harwich and Dovercourt as part of the Bathside Bay development. In total 156.6ha of employment land and 1,601 dwellings (2008-2021) are scheduled within this development area with the majority of the employment development forecast after 2011.

As discussed above, all the proposed development within this area feeds into the Harwich and Dovercourt STW, which is forecast to exceed its discharge consent in 2015/16, reaching a discharge in 2020/21 of over 330% above the current consented DWF. However, as much of the employment development is part of the port, this level of discharge is unlikely to be reached as a standardised per Ha discharge has been used in the evaluation. When the employment is completely removed from the trajectories the STW discharge remains at 12% or higher below the consented limit. Although this will require reviewing once the final developments are scheduled, there may not be a need to upgrade the STW or increase the consented DWF to accommodate this development. Due to the identified sewer network capacity restrictions, there is, if no further investment is made to the network, a need to locate the new development to the north of the catchment. Investment may also be required to implement BATNEEC technologies to improve sanitary treatment if discharge levels increase throughout the planning period from 2015/16.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Harwich and Dovercourt Development Area, with the exception of their intention to replace Dovercourt Reservoir. Although this should enable a more reliable water supply service it will not increase the capacity of the supply to the development area. Similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

A large proportion of the Development Area is located within the Environment Agency's Flood Zones 2 and 3, most notably around the Parkeston area of the town and the Bay. As identified in the Level 2 SFRA the existing flood defences provide protection from a 1 in 200 year tidal flood event and most are in a 'Fair' to 'Good' condition. The simulations of defence overtopping due to rising sea levels indicates this should not occur until 2070, which is far beyond the planning period considered here, although the most significant source of flood risk is identified as a North Sea extreme tidal surge event. In addition, the SFRA states that, in the event of a breach occurring, safe access and egress within Harwich is unlikely to be possible. This is therefore an important consideration when planning development within this area.

The SFRA identifies that the Peninsula, A120 Corridor and Refinery areas are all dominated by Flood Zone 3a, limiting the type of development which can take place and that the A120 corridor also contains significant areas of functional floodplain which are only appropriate for water compatible development.

As a result of the high level of fluvial and tidal flood risk identified within this development area it is therefore not recommended that any development takes place without detailed site specific FRAs.

Small parts of Harwich and Dovercourt are underlain by a minor aquifer although no source protection zones have been identified in proximity to the development area. Therefore there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the coastal streams and rivers, such as the Ramsey River must be appreciated.

To summarise the situation in Harwich and Dovercourt if no action is taken then the following situation would occur.

Table 9.18- Situation in Harwich and Dovercourt Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure				
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.19 - Activities required in Harwich and Dovercourt development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	Activation of second aeration lane.	-	Increase consent to support employment	Increase consent to support employment
Flooding	SuDS Site Specific FRA Review of access/ and egress routes in SFRA Maintenance of defences	SuDS Site Specific FRA Review of access/ and egress routes in SFRA Maintenance of defences	SuDS Site Specific FRA Review of access/ and egress routes in SFRA Maintenance of defences	SuDS Site Specific FRA Review of access/ and egress routes in SFRA Maintenance of defences
Environment – Water Quality			BATNEEC required	BATNEEC required
Wastewater Infrastructure	Location of development to the north of the catchment or upgrade to sewer network.	Location of development to the north of the catchment or upgrade to sewer network.	Location of development to the north of the catchment or upgrade to sewer network.	Location of development to the north of the catchment or upgrade to sewer network.
Water Supply Infrastructure				

9.6.4 Frinton-on-Sea and Walton-on-the-Naze

A total of 610 dwellings and 0.4ha of employment land is proposed within the Frinton and Walton Development Area between 2008 and 2021, with all the employment development scheduled to occur between 2011 and 2015.

All the proposed development feeds into the Walton STW, which is predicted to remain more than 39% below its current consented DWF for the entire planning period. The wastewater infrastructure has been identified as having no spare capacity. In the current situation any additional development will therefore need to be located as close to the STW as possible. As the STW is predicted to remain within consent, environmental analysis has not been carried out for this catchment and it is assumed that the STW is currently operating, and will continue to operate below its pollutant consent limit.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Frinton and Walton Development Area.

The north and south of the urban extent of Frinton and Walton is fringed by the Environment Agency's Flood Zones 2 and 3. However, the majority of the development area is located outside these zones. As part of the Level 2 SFRA for Tendring District a Breach analysis assessment will be made of the sea defences through this zone and must therefore be reviewed with reference to the proposed developments, once complete. It is therefore not recommended that any development takes place within the Frinton and Walton Development Area until the full SFRA has been completed unless detailed site specific FRAs are undertaken.

Only the far western tip of the development area, namely Kirby Cross is underlain by a minor aquifer and no source protection zones have been identified in proximity to the development area. Therefore there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the coastal streams must be appreciated.

To summarise the situation in Frinton and Walton if no action is taken then the following situation would occur.

Table 9.20- Situation in Frinton-on-Sea and Walton-on-the-Naze Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future
Red - Action Required
Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.21 - Activities required in Frinton-on-Sea and Walton-on-Naze development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	-	-	-
Flooding	SuDS Site Specific FRA Breach analysis in SFRA. Maintenance of defences.	SuDS Site Specific FRA Breach analysis in SFRA. Maintenance of defences.	SuDS Site Specific FRA Breach analysis in SFRA. Maintenance of defences.	SuDS Site Specific FRA Breach analysis in SFRA. Maintenance of defences.
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.
Water Supply Infrastructure				

9.6.5 Brightlingsea

A total of 196 dwellings and 2.7ha of employment land is scheduled for development within the Brightlingsea development area between 2008 and 2015.

All the proposed development feeds into the Brightlingsea STW, which, when both employment and residential development is considered, is forecast to exceed its current consented DWF from 2012, reaching a maximum exceedance of 9.4% by 2020/21. However when solely residential development is considered the STW remains above its consented limit throughout the planning period. Therefore, there may be a requirement for AWS to apply for an increased consented DWF in order for all the development to take place. The wastewater infrastructure has been identified as having no spare capacity. In the current situation any additional development will therefore need to be located as close to the STW as possible. Investment may also required to implement BATNEEC technologies to improve sanitary treatment from 2015/16.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Brightlingsea Development Area. However, similarly to the wastewater above, the capacity of the supply networks have not discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

The Environment Agency Flood Zones 2 and 3 form a complete ring around the Development Area and impact the south quarter of the town, potentially limiting water-side development. However, Brightlingsea is specified within the SFRA Scoping Study as requiring breach and overtopping analysis as part of the Level 2 SFRA, the results of which will require a review within reference to this WCS once complete.

It is therefore not recommended that any development takes place within Brightlingsea until the full SFRA has been completed unless detailed site specific FRAs are undertaken.

Almost all of the development area is underlain by a minor aquifer, but no source protection zones have been identified in proximity. Therefore there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the surrounding rivers and streams must be appreciated.

To summarise the situation in Brightlingsea if no action is taken then the following situation would occur.

Table 9.22- Situation in Brightlingsea Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.23 - Activities required in Brightlingsea development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	Increase consent to support employment	Increase consent to support employment	Increase consent to support employment
Flooding	SuDS Site Specific FRA Breach analysis in SFRA Maintenance of defences	SuDS Site Specific FRA Breach analysis in SFRA Maintenance of defences	SuDS Site Specific FRA Breach analysis in SFRA Maintenance of defences	SuDS Site Specific FRA Breach analysis in SFRA Maintenance of defences
Environment – Water Quality		Possible BATNEEC required	Possible BATNEEC required	Possible BATNEEC required
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.
Water Supply Infrastructure				

9.6.6 Lawford, Manningtree and Mistley

Between 2008 and 2021 a total of 253 dwellings and 2.6 ha of employment land are planned for development within this area. The residential development is planned at approximately 20 dwellings per year, with a peak of 33 dwellings in 2008/9. All the employment development is scheduled for development by 2010.

All the proposed development is located within the catchment of the Manningtree STW, which is predicted to remain greater than 20% below its current consented DWF of 2,729m³/d throughout the planning period. As a result environmental analysis has not been carried out for this STW and it is assumed that the STW is currently operating, and will continue to operate below its pollutant consent limit. Sewer capacity problems have been identified with the catchment and AWS have highlighted a requirement for new development to be placed as close to the STW as possible. .

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Lawford, Manningtree and Mistley Development Area.

A large proportion of this Development Area, most notably the waterside half of Manningtree and the waterfront of Mistley, is located within the Environment Agency's Flood Zones 2 and 3. It is thought this will impact a number of the development areas. The majority of this Development Area is protected by sea defences and, as such, the SFRA Scoping study recommends that the Industrial Area of Manningtree is reviewed as part of the assessment of breaching and overtopping of flood defences. It is therefore not recommended that any development takes place within this area until the full SFRA has been completed unless detailed site specific FRAs are undertaken.

Much of Lawford and Mistley, and much of Manningtree, are underlain by minor aquifers and the whole of Manningtree and Mistley are designated as being within a source protection zone, including the Inner Zone. There may therefore be restrictions placed upon the implementation of infiltration type SUDS schemes which will need to be reviewed on a site by site basis. The Environment Agency will not support the use of SUDS which use infiltration techniques within the Inner Zone of the SPZ. The proximity of the development to the coastline and coastal streams must also be appreciated with regards to pollution.

To summarise the situation in Lawford, Manningtree and Mistley if no action is taken then the following situation would occur.

Table 9.24- Situation in Lawford, Manningtree and Mistley Development Area if no action is taken

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.25 - Activities required in Lawford, Manningtree and Mistley development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	-	-	-
Flooding	SuDS (restricted) Site Specific FRA Breach analysis in SFRA Maintenance of defences	SuDS (restricted) Site Specific FRA Breach analysis in SFRA Maintenance of defences	SuDS (restricted) Site Specific FRA Breach analysis in SFRA Maintenance of defences	SuDS (restricted) Site Specific FRA Breach analysis in SFRA Maintenance of defences
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.
Water Supply Infrastructure				

9.6.7 Wix

Development is planned around the village of Wix, located to the north of Tendring District close to the A120, totalling 20 dwellings and 0.4ha of employment land between 2008 and 2021.

All this development will feed into Wix's STW, which, due to its small size, has a low current consented DWF of just 160m³/d. As such this consent is rapidly approached as a result of minimal development. However, the trajectories for the planned development remain below this consented limit thoughout the planning period, although it does fall below 20% relatively quickly, in 2009/10, when both residential and employment development are considered and reaches 16.3% in 2016/17. From their brief analysis AWS have not identified any capacity issues within the existing STW catchment. However, this will need more detailed investigation before development takes place. As this STW does not exceed its consent, environmental analysis has not been carried out for this STW and it is assumed that the STW is currently operating, and will continue to operate below its pollutant consent limit.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Wix Development Area. However, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

The Development Area is not located within the Environment Agency's Flood Zones, which initiate just downstream of the village. However, as the watercourse runs through the centre of the village it may pose a flash flooding risk to the proposed development sites. These will require site specific FRA's and a review of the full SFRA which may identify other sources of flood risk within the area.

As only small parts of the development area are underlain by sections of minor aquifer and no source protection zones are located in proximity there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the surrounding rivers and streams must be appreciated.

To summarise the situation in Wix if no action is taken then the following situation would occur.

Table 9.26- Situation in Wix Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	G	G	G	G
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.27 - Activities required in Wix development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	-	-	-
Flooding	SuDS Review of full SFRA Potential FRA if close to channel	SuDS Review of full SFRA Potential FRA if close to channel	SuDS Review of full SFRA Potential FRA if close to channel	SuDS Review of full SFRA Potential FRA if close to channel
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	-	-	-	-
Water Supply Infrastructure				

9.6.8 Thorpe Le Soken

A total of 91 residential properties and no employment development are planned within the Thorpe Le Soken development area, located near the village of Weeley, at a rate of approximately six dwellings per year.

This effluent from this development will be treated at the Clacton STW, discussed in Section 9.6.1 above. As the total development size is relatively small and the proposed yearly increased minimal, it should not pose a problem to the STW. As there are no capacity issues identified within our analysis of Clacton STW, no environmental analysis has been carried out and it is assumed that the STW is currently operating, and will continue to operate below its pollutant consent limit. AWS have identified that there is a history of both internal and external flooding issues within this area, indicating that the sewers are already operating above capacity. Any new development would therefore be best placed around the pumping station and that new developments connect directly to this point.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Thorpe Le Soken Development Area. However, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

A number of coastal streams drain the area around Weeley and feed into the Holland Brook. These all have relatively narrow Environment Agency Flood Zones associated with them and will therefore require the developments to be assessed on a site by site basis through FRA's and a review of the full SFRA which may identify other sources of flood risk within the area

Large parts of this development area are underlain by the minor aquifer and, although a source protection zone is located to the west of Weeley, it does not intersect within this development area. Therefore there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the surrounding rivers and streams must be appreciated.

To summarise the situation in Thorpe Le Soken if no action is taken then the following situation would occur.

Table 9.28- Situation in Thorpe Le Soken Development Area if no action is taken

	2008 - 2011	**2011 - 2014**	**2014 - 2017**	**2017 - 2021**
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.29 - Activities required in Thorpe Le Soken development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	-	Increase in consent to support employment	Increase in consent to support employment
Flooding	SuDS Review of full SFRA Potential FRA if in Flood Zones	SuDS Review of full SFRA Potential FRA if in Flood Zones	SuDS Review of full SFRA Potential FRA if in Flood Zones	SuDS Review of full SFRA Potential FRA if in Flood Zones
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from pumping station.	Increase capacity/ implementation of new sewers to enable development away from pumping station.	Increase capacity/ implementation of new sewers to enable development away from pumping station.	Increase capacity/ implementation of new sewers to enable development away from pumping station.
Water Supply Infrastructure				

9.6.9 St Osyth

A total of 69 dwellings, but no employment development is planned around the settlement of St Osyth, all of which is scheduled to take place in the next couple of years.

The St Ostyth STW has a current consented DWF of 1,600m³/d and with the planned development, is not expected to exceed this consent within the planning period, reaching a limit of 28.1% by 2020/21. As such no environmental analysis has been carried out on this STW and it is assumed that the STW is currently operating, and will continue to operate below its pollutant consent limit. The wastewater infrastructure has been identified as having no spare capacity. In the current situation any additional development would ideally need to be located as close to the STW as possible.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the St Osyth Development Area. However, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

St Osyth Creek flows along the southern and eastern boundaries of St Osyth and Flag Creek along the northwestern side. Both of these have Environment Agency Flood Zones 2 and 3 associated with them. These do not show much overlap with the existing developed area but may impact on the proposed development sites which will need to be assessed on a site by site basis through FRA's and also reviewed in light of the full SFRA which may identify other sources of flood risk within the area.

The whole of St Osyth is underlain by a minor aquifer but no source protection zones have been identified in proximity. Therefore there should not be too many restrictions placed upon the implementation of SUDS schemes, although the proximity to the coastline and the surrounding rivers and streams must be appreciated.

To summarise the situation in St Osyth if no action is taken then the following situation would occur.

Table 9.30 - Situation in St Osyth Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	R	R	R	R
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.31 - Activities required in St Osyth development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	-	-	-
Flooding	SuDS Review of full SFRA Potential FRA if in Flood Zones	SuDS Review of full SFRA Potential FRA if in Flood Zones	SuDS Review of full SFRA Potential FRA if in Flood Zones	SuDS Review of full SFRA Potential FRA if in Flood Zones
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.	Increase capacity/ implementation of new sewers to enable development away from STW.
Water Supply Infrastructure				

9.6.10 Thorrington

A small area of employment development - 0.9ha – is proposed close to the village of Great Bentley within the Thorrington Development Area between 2010 and 2015. No residential development has been identified.

The Thorrington STW has a current consented DWF of 2,400m³/d and is currently operating with headroom of nearly 40%. The proposed development has a minimal affect, reducing the headroom to 33% by the end of the planning period. No environmental analysis has been carried out on this STW and it is assumed that the STW is currently operating, and will continue to operate below its pollutant consent limit. From their brief analysis AWS have not identified any capacity issues within the existing STW catchment. However, this will need more detailed investigation before development takes place.

The dWRMP identifies that sufficient water supply is available for Tendring District as a whole and VWE have not made any reference to specific problems within the Thorrington Development Area. However, similarly to the wastewater above, the capacity of the supply networks have not been discussed within this report and may pose a constraint to development or require infrastructural upgrade within the planning period.

The development is not located within either of the Environment Agency's Flood Zones, although a small stream does flow in a southerly direction to the west of the village. It is therefore recommended that the full SFRA is reviewed when completed to identify whether any other sources of flooding are present in the area and a site specific FRA carried out if deemed necessary.

Thorrington is underlain by the minor aquifer and a source protection zone, including the Inner Zone. There may therefore be restrictions placed upon the implementation of SUDS schemes which will need to be reviewed on a site by site basis. The Environment Agency will not support the use of SUDS schemes which use infiltration techniques within the Inner Zone of a SPZ.

To summarise the situation in Thorrington if no action is taken then the following situation would occur.

Table 9.32- Situation in Thorrington Development Area if no action is taken

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources				
Wastewater Treatment				
Flooding				
Environment – Water Quality				
Wastewater Infrastructure	G	G	G	G
Water Supply Infrastructure				

Note:

Green - OK for development

Amber - Some issues now or in the near future

Red - Action Required

Grey – To be assessed in an update to this study

The activities identified to enable development to continue as planned are:

Table 9.33 - Activities required in Thorrington development area to enable development to continue as planned

	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Water Supply Resources	Demand Management	Demand Management Replacement Dovercourt Reservoir	Demand Management Increased ration from Ardleigh Reservoir	Demand Management Increased ration from Ardleigh Reservoir Ardleigh Reservoir Extension Preparation of bulk transfer from Ely-Ouse-Essex scheme to start 2025
Wastewater Treatment	-	-	-	-
Flooding	SuDS (restricted) Review of full SFRA	SuDS (restricted) Review of full SFRA	SuDS (restricted) Review of full SFRA	SuDS (restricted) Review of full SFRA
Environment – Water Quality	-	-	-	-
Wastewater Infrastructure	-	-	-	-
Water Supply Infrastructure				

9.7 Summary Timeline

The following table shows a summary of the current state of each of the development areas in terms of issues with the areas considered, water supply, wastewater, environment and flooding.

Table 9.34 - Summary Timeline for Tendring District

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Clacton on Sea	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	A	A	A	A
	Water Supply Infrastructure				
Jaywick	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Harwich and Dovercourt	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	A	A	A	A
	Water Supply Infrastructure				
Frinton-on-Sea Walton-on-the-Naze	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Brightlingsea	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Lawford, Manningtree and Mistley	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Wix	Water Supply Resources				

Development Area		2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	G	G	G	G
	Water Supply Infrastructure				
Thorpe Le Soken	Water Supply Resources				
	Wastewater Treatment	(Clacton)	(Clacton)	(Clacton)	(Clacton)
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
St Osyth	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	R	R	R	R
	Water Supply Infrastructure				
Thorrington	Water Supply Resources				
	Wastewater Treatment				
	Flooding				
	Environment – Water Quality				
	Wastewater Infrastructure	G	G	G	G
	Water Supply Infrastructure				

The key activities required to resolve the "red" time periods above are:

Wastewater - Detailed review of development and discharges to establish the required increase in the consented DWF for Jaywick STW, and apply if necessary.
Extension and upgrade/capacity increase of current sewer network

9.8 Constraints to Development

The previous sections detail the issues and in many cases the worse case scenarios with regard to development within the area. This precautionary practice has been adopted to try and ensure that discussion and consultation is undertaken with the relevant authorities and responsible organisations before development takes place.

The main constraints to development and activities required are indicated below.

Water Supply - VWE are confident of maintaining supply provided activities put forward within their WRMP and Business Plans are implemented as programmed.

Wastewater treatment capacity at Jaywick - discharge consent increases required if development continues as proposed. In addition Brightlingsea and Harwich and Dovercourt STWs require an increase in consent to accommodate the combined residential and employment development as planned.

Flooding - ensure appropriate development within potential flood areas. Use PPS25 - Development and Flood Risk sequential and exception tests in these areas such as Sproughton where development sites are close or in existing Flood Zones 2 and 3.

Sanitary treatment capacity at Jaywick, Brightlingsea and Harwich and Dovercourt - investigate available treatment headroom to accept discharge increases. AWS consider levels of investment in improving sanitary treatment processes if required.

Wastewater Infrastructure - undertake additional investigation and modelling with detailed site allocations to establish infrastructure limits. Consider locating development closer to sewage treatment works in all STW catchments (with the exception of Wix, Thorpe Le Soken and Thorrington) in the short term to allow infrastructure improvements to be developed in the future if required.

10 GUIDANCE DOCUMENTS

10.1 Developer Contributions

10.1.1 Introduction

When a local planning authority considers a planning application it should be based on whether it is consistent with the development plan for the area. Where it is not consistent, it is normally refused; however, there are some cases where planning conditions or the use of Planning Obligations will make this acceptable.

A Planning Obligation is the means for a developer to make a contribution where a development causes an impact that needs to be addressed, so it can resolve these impacts in order to make a development acceptable.

There are three basic types of outcomes that can be achieved through using a Planning Obligation; Prescribing, Mitigating and Compensation. A Planning Obligation can prescribe the type of development to be achieved under a planning policy which would otherwise not be acceptable. An example of this is the provision of affordable housing within a housing development. Where a development creates a need for a certain facility, a planning obligation can mitigate for this by providing this facility such as the provision of a new road which is not provided for in the planning application. Planning Obligations can also compensate for the loss or damage that may be caused by a development. For example a public rights of way can be rerouted so that it is not lost.

Overall, a Planning Obligation will enable a contribution from a developer in some form. Without such a payment, the development would be considered unacceptable in planning terms.

10.1.2 National Policy Framework

Planning Policy Statement 1 (PPS1) (OPDM, 2005) identifies a number of areas within Paragraph 26 to address when preparing development plans, which relate to Planning Obligations. These are:

> *(iii) Not impose disproportionate costs, in terms of environmental and social impacts by unnecessarily constraining otherwise beneficial economic or social development.*
>
> *(iv) Have regard to the resources likely to be available for implementation and the costs likely to be incurred, and be realistic about what can be implemented over the period of the plan;*
>
> *(viii) Recognise that the impact of proposed development may adversely affect people who do not benefit directly. Local planning authorities can use planning conditions or obligations to ameliorate such impacts;*

Paragraph 16 also makes reference to ensuring that the “impact of development on the social fabric of communities” is taken account of.

In terms of more specific guidance on this issue, Planning Policy Statement (PPS25) on Development and Flood risk (CLG, 2006) addresses a number of issues in relation to Developer Contributions and flood risk management in Annex G.

Where a development requires flood risk management measures, these are normally expected to be provided by the developer, but this will only be acceptable where they:

- conform with the appropriate flood-risk management policies
- meet the Sequential and Exception Tests and
- do not have a major adverse impact on flood flows or storage

The requirements of the Sequential and Exception Tests are outlined in PPS25. In areas where there is known to be a risk of flooding, the Sequential Test aims to determine the suitability of land for development, using risk-based approach. The overall test aims to locate new development to in areas of the lowest risk of flooding e.g. Zone 1. Where this is not possible, the developments "flood vulnerability" is assessed in terms of its suitability for the other higher flood zones (2-3b).

The Exception Test is applied after the Sequential test and where the Sequential test can't be met e.g. where new development can't be located in a low enough Flood Zone compatible with the vulnerability of the proposed use. The Test is a means of managing flood risk while still allowing needed or essential development required for wider sustainable communities to occur.

Although the funding of such works is normally the responsibility of the developer, where works have already been provided to protect existing development, this may provide opportunities for additional development, but t should not add to flood risk elsewhere.

Where flood risk management measurement works are required they are likely to required under a Section 106 agreement (addressed below), which will cover both the works and their maintenance.

10.1.3 Planning Obligations and Circular 5/05

The main method to make a financial contribution is by a planning obligation; a type of legal agreement which is permitted by Section 106 of the Town and Country Planning Act 1990 (as amended by section 12 (1) of the Planning and Compensation Act 1991).

The basis of a Planning Obligation is that it may or may not be subject to conditions, it may make a restriction or requirement for a given or indefinite period of time. Also it may ensure that money should be paid on the basis of a formula or specific amount, paid periodically by a given or indefinite period of time.

Circular 5/05 therefore supports the use of a formulae and standard charges as part of a framework for negotiating and securing planning obligations. It also supports the used of pooled these contributions:

> *"Where the combined impact of a number of developments creates the need for infrastructure, it may be reasonable for associated developers' contributions to be*

pooled, in order to allow the infrastructure to be secured in a fair and equitable way" (paragraph B21).

Research by Sheffield University (Valuing Planning Obligations in England: Update Study for 2005-06) shows that negotiations tend to occur for the larger developments due to the costs and time involved.

Tests for Planning Obligation

They should only be sought where they meet all of the following tests:

(i) relevant to planning;
(ii) necessary to make the proposed development acceptable in planning terms;
(iii) directly related to the proposed development;
(iv) fairly and reasonably related in scale and kind to the proposed development; and
(v) reasonable in all other respects.
(ODPM Circular 5/05 'Planning Obligations)

Types of Planning Obligation

There are two types of obligation that can be used, which depend on the depending on the difficulty of the issues involved, a "unilateral undertaking" and a bilateral "Section 106 Agreement".

A unilateral undertaking is the more simple form of planning obligation and is only entered into by one party. Generally, they tend to be used where person entering into the undertaking is the landowner, where it only needs to cover straightforward financial contributions and where the local authority's costs are paid by the landowner. *The terms of the agreement are identified by the applicant.*

A Section 106 Agreement" or Planning Agreement is used in more complex and major developments. It involves a legal bilateral agreement between the planning authority and an applicant or developer and sometimes others who have an interest in the land e.g. another local authority.

Those entering such agreements should not be asked to solve existing problems, but they may be asked to make a contribution towards solving an existing problem if the proposed development would make things worse.

10.1.4 Community Infrastructure Levy

As part of the Planning Bill, which is currently going through parliament, the Government has included provisions for a new Community Infrastructure Levy (CIL) to raise investment for vital infrastructure and is seen as an additional funding mechanism rather than replacing any other existing method. This, like it predecessors is based on a standard approach or tariff based system.

Reference to CIL is also included within PPS12. This confirms that, subject to the Parliamentary timetable, the CIL powers are proposed to come into effect by spring

2009.

The purpose of the Community Infrastructure Levy (CIL) is to extend the number of developers that are required to contribute towards infrastructure costs as well as providing more certainty about these costs through a more standardised approach.

Background

Since 2003 the Government has been looking for a new method to gain some of the increased valve that is achieved when a site is given planning permission and developed for the local community through some form of development charge.

The 2004 Planning and Compensation Act made provisions for an “Optional Planning Charge”, but this was never been implemented. This was shortly followed by the Planning-gain Supplement (PGS) which was proposed by the 2004 Barker review of housing supply. However, the 2007 Housing Green Paper outlined the need to consider whether the PGS or other mechanism would raise sufficient funds to provide the infrastructure needed for a development in an equitable way. This was followed by an announcement in the October 2007 Budget that PGS would be deferred and there would be legislation for a new mechanism.

Setting

The Bill enables local authorities to apply CIL on new developments within their area to enable the delivery of the necessary new infrastructure; it should not address existing problems in an area.

The CIL needs to relate to the local development plan and its vision and proposals for development (within the Local Development Framework - LDF) for the area and therefore only those that produce such plans can set this charge, except Minerals and Waste Authorities.

Planning Policy Statement 12 on Local Spatial Planning identifies that the development plan should be accompanied by a mechanism to identify what the local infrastructure requirements are to deliver the plan (Paras 4.8-4.12). This infrastructure needs to be costed and after other means to fund this are accounted for, the remaining gap will form the basis of what needs to come from CIL and especially how much from each user class of development.

It is proposed that the means to charge CIL will come from a “charging schedule” which will be a new document within the LDF and therefore subject to public consultation and scrutiny. Although it will not form part of the development plan, it will be tested at a public inquiry and be binding by an independent person, but the local authority does not have to adopt it if there remained issues; this would be resolved through a new examination.

The schedule is proposed to be based on a standard charge based on a square metre of development or per dwelling. The Government is also proposing, at a national level, to have inflation indices and exemptions, as well as enabling varying geographic rates within an area.

Charging

It is proposed that the amount owed is to be determined when planning consent is given, but payment is due on commencement of the development (as defined in the 1990 Town and Country Planning Act). Payment would be made within a prescribed time, currently 28 days, but the options of instalments is being considered. Phased developments would be treated separately.

With regards to the enforcement of paying the charge, the charging authority will be able to add interest and surcharges to late payers, which will be determined nationally.

Spending

The CIL can only be spent on infrastructure and not for example services for an area. It can be used to fund both local and sub-regional development, which is of benefit to more than one local authority area. Where this is the case, the Regional Spatial Strategy (RSS) should have identified this need. This will enable local authorities to work together and bring together their CIL.

The issue of flood defences is one of a number of different infrastructure requirements identified by the Government as being appropriate for spending CIL on. The Planning Bill indicates that regulations will outline a definition of infrastructure and lists some examples of what this could apply to and flood defences are included in this.

There are also other ways the funds could be used, such as for “forward funding” where another body such as a Development Agency pay for some infrastructure and are paid back from the Levy from the benefiting Local Authorities.

10.1.5 The relationship between the CIL and Planning Obligations

Overall the Government accepts that Planning Obligations are an effective means to address a number of planning-related issues and it will keep it in an amended form, rather than remove it completely, as had been previously proposed. This will enable those local authorities who chose not to operate a CIL in their area, to still use this method, albeit in an amended form.

In terms of amendments, one option being considered is whether community facilities such as medical centre, libraries and schools, as well as necessary transport improvements, should be provided through the CIL. Another is to reduce the range of planning obligations through reducing the criteria of Circular 5/05 or not allowing planning obligations to make use of standard charges.

The Killian Pretty review is currently carrying out a detailed review of the whole process concerning applying for planning permission, which includes how additional improvements can be made to planning obligations.

10.1.6 Regional Policy

The Regional Spatial Strategy (RSS) contains the policy for the sub-region. This plan, which is also known as the East of England Plan and was confirmed in May 2008, provides part of the development plan for all of the Haven Gateway area. The RSS identifies that *"Effective implementation is crucial."(para 14.1)* and developer contributions form one of three funding means to achieve this; the others being government and the voluntary sectors.

Paragraph 14.2 further identifies that implementation will require *"innovative approaches to development finance and contributions"* to meeting resulting community and infrastructure needs from development.

The RSS also identifies the approach to be taken within the Haven Gateway under policy HG4. This identifies that the Haven Gateway Partnership with its partners and other agencies should work together to ensure:

- *appropriate guidance and co-ordination is available to ensure that Local Development Documents for Haven Gateway make complementary contributions towards meeting the objectives of the RSS, with joint working where appropriate: and*
- *implementation and delivery bodies have appropriate strategies and resources to achieve the objectives in the overall vision for the area in HG1 and detailed in the other Haven Gateway policies.*

10.1.7 Conclusion

There is a need to establish how the Haven Gateway Partnership with its partners and other agencies will provide this guidance and co-ordination and what strategies and resources need to be in place to achieve the objectives of the RSS.

This paper has outlined that the method to achieve this from the private sector is through the use of developer contributions. It has specifically outlined the main current mechanism to achieve this, S106 agreements, as well as an emerging mechanism that could also be used alongside this, the Community Infrastructure Levy.

10.2 Planners Guide to SUDS in Haven Gateway

Within new developments, the incorporation of a suitably designed drainage system will be necessary in order to mitigate the risk of surface water and overland flooding both on the site and adjacent areas as well as the risk posed by the overloading of local sewers and watercourses. Such a system should ideally be based upon Sustainable Drainage principles aimed at simulating natural processes and mitigating the impact of polluted surface water runoff upon the environment. Within the design of these systems, appropriate consideration of safe exceedence flows must be made, for example, to account for the predicted impact of climate change and possible blockages. Moreover, full advantage should be made of the opportunities for environmental enhancement posed by the utilisation of these systems. Proposed SUDS schemes should also consider operation and maintenance issues. The system should be robust in design in order to prevent blockages, allow ease of maintenance and reduce long term maintenance costs. Moreover, a suitable maintenance scheme should be proposed although the operation of the system should not be overly reliant upon maintenance being carried out.

It is essential to consider source control within the surface water drainage proposals; techniques which aim to manage the surface water at or close to the receiving surface should be utilised as widely as possible. A number of these techniques, with reference to residential development were outlined in the Appendices of the Stage 1 report. For reference, the same document is included within **Appendix B** of this report. For example, paved surfaces (e.g. car parks and access roads) should be of permeable construction allowing water to be stored prior to discharge. Other areas should ideally be drained using a network of grassed swales which will serve to improve the quality of the surface water and reduce the flow rate, whilst directing it to the attenuation area or discharge point. Furthermore, it is recommended that rainwater re-use schemes be utilised, such as, rainwater harvesting for domestic use, such as toilet flushing, as well as the encouragement of the use of water butts and rainwater storage tanks. Further source control techniques would include the installation of green roofs where practical. Incorporation of such measures would serve to greatly reduce the volume of surface water requiring discharge, reduce water demand, and would also further satisfy the Code for Sustainable Homes.

However, it must be appreciated that any discussions regarding SUDS provision must be commenced early in the development process as it can take a long time decide upon the most appropriate type of SUDS to use on a particular site, how they should be adopted and who is responsible for their maintenance.

10.2.1 The Adoption of SUDS

The maintenance of SUDS systems has been subject to a great deal of discussion over the last few years. At present there is no precedent for the adoption of SUDS – that is no authority or statutory undertaker take ownership of them as a matter of course. This often means that SUDS systems are not maintained by an appropriate authority. Without proper maintenance, their effectiveness diminishes.

There are already a number of good practice case examples where relevant organisations including local authorities, developers and water companies have developed acceptable adoption solutions for developments or development areas. Defra is currently working with its partners to develop an agreed national adoption system for SUDS. Some options for these were tested within the recently completed Defra Integrated Urban Drainage pilots. In the meantime it is good practice for the relevant key stakeholders including developers, water companies, Local Councils and County Council (Highways) to develop agreed bespoke adoption agreements for development areas to enable whole life management of SUDS. The Construction Industry Research and Information Association (CIRIA) has already published guidance that enable maintenance and adoption agreements to be set-up[2].

[2] Interim Code of Practice for Sustainable Drainage Systems, July 2004 (http://www.ciria.org/suds/icop.htm)

As discussed earlier in Section 5.1, Section 106 of the Town and Country Planning Act 1990 allows Planning Authorities to enter into legally binding agreements with the developer in order to offset the cost of the development. This may be in the form of a fee, say as a contribution to a new school, or it could be an agreement, such as a section of the development site is developed as an amenity area and handed to the Local Authority.

The use of the Section 106 agreement has been considered as a method of collecting a financial contribution from developers in order to fund the future maintenance of SUDS schemes. An alternative method of collection could be through the Water Authorities Infrastructure Charge, which is paid in relation to all new properties.

However, before the collection of this money is considered, the following points would need determining:

- Who will ‘adopt’ the SUDS schemes?
- What will happen to developments that are not suitable for SUDS?
- How will the level of fees be set?
- If SUDS are not constructed on a suitable development should the developer be penalised?

These items will require further consideration as SUDS become more commonplace.

10.2.2 SUDS Selection

To determine the applicability of the various SUDS techniques outlined above for a specific site, a number of characteristics for the site in question must first be assessed. This will enable the most appropriate SUDS to be installed. The CIRIA SUDS Manual[3], 2007, outlines five criteria which must be addressed when selecting the most suitable SUDS design for a development, consisting of:

- Land use characteristics;
- Site characteristics;
- Catchment characteristics;
- Quantity and quality performance requirements; and
- Amenity and environmental requirements.

The most important criteria from a planning perspective are the site characteristics and these are discussed in more detail, with reference to the Haven Gateway study area, in the following section.

Site Characteristics

The characteristics discussed are based upon the CIRIA SUDS Manual and include the following:

- Soil Type;
- Groundwater;

[3] The SUDS Manual, CIRIA C697, 2007

- Drainage Area;
- Topography;
- Hydraulic Head;
- Availability of Space; and
- Intended Usage (this is considered a separate criteria within the CIRIA SUDS Manual but has been included here as it also important from a planning perspective).

Soil Type

As detailed in the CIRIA Manual, the function of different SUDS is very dependent on the underlying soils and it is therefore important that the type of soil is established early in the planning process. The most significant feature of the soil type with regards to SUDS is the permeability and therefore the soil infiltration rate (loosely extending from 'sandy', highly permeable soil types in one extreme to 'clay' based, impermeable soil types in the other. Whereas permeable soils can enhance the operation of some practices, enabling collected water to drain away from the surface much more rapidly, other practices are adversely affected, for example those intended to be permanent wetlands or ponds. In addition highly permeable soils may create a negative impact where the development site is located close to contaminated land or has the potential to produce surface runoff with a high pollutant load, which should not be allowed to connect to the groundwater flows. Impermeable soils however will result in a very slow infiltration rate of surface water which is not compatible with SUDS techniques relying upon the passage of water through the soil profile, such as porous pavement or infiltration devices.

Maps of soil type for the Haven Gateway sub-region are available from the National Soil Resources Institute website, http://www.landis.org.uk/soilscapes/. By zooming into the required area, an OS map of the area of interest will be displayed underneath the coloured soil classifications. When selected with the 'identify' tool, the characteristics of the soil type in question will be displayed to the left of the screen, including the drainage and texture. Alternatively a 'Permeability Dataset' is available upon request from the British Geological Survey, details of which can be found at http://www.bgs.ac.uk/discoverymetadata/13603036.html.

Table 5.1: Applicable SUDS techniques based upon soil type

	Permeable	Impermeable
Filter Strips and Swales	✓	✓
Filter drains and Pervious Surfaces	✓	?
Infiltration Devices	✓	✗
Basins, Ponds and Wetlands	?	✓
Green Roofs	✓	✓
Underground Storage	✓	✓
Water Butts	✓	✓

✓ Feasible ✗ Not Feasible **?** Marginal – needs careful consideration

Some of the techniques not considered feasible due to the soil type may be mitigated against. For example, basins, ponds and wetlands may be lined to prevent rapid infiltration into highly permeable soils.

Groundwater

As many SUDS methods utilise the infiltration of surface water into the underlying soil, they interact with the groundwater systems. It is therefore important to consider whether a groundwater supply exists beneath the site (i.e. in the form of a major or minor aquifer), whether the supply is susceptible to pollutants due to the permeability of the overlying substrata, and also the depth of the groundwater table and its susceptibility to flooding.

As outlined in the CIRIA Manual, all infiltration devices require at least 1m of soil depth between the base of the device and the maximum expected groundwater level (the seasonal high). This ensures that the system continues to operate during periods of exceptionally wet weather and reduces the risk of groundwater flooding as a result of the SUDS. This is therefore of greatest concern where SUDS are installed on permeable ground, especially those techniques relying upon the passage of water through the soil profile, such as porous pavement or infiltration devices.

The locations of the major and minor aquifers and their susceptibility to diffuse pollutants are shown on the Groundwater Vulnerability maps. Complete maps are available from the Environment Agency and are included on the Haven Gateway WCS GIS tool. These maps also contain a measure of soil classification outlining the leaching potential of the strata. For sites located above areas of high Groundwater Vulnerability (highly vulnerable aquifers), increased pollutant attenuation measures will need to be employed and straight infiltration systems will not be applicable.

The location of water supply sources and their catchments are contained within the Environment Agency's Source Protection Zone (SPZ) maps, available to view on the Environment Agency's website and in addition will be included on the Haven Gateway WCS GIS tool. Only attenuation systems are applicable in any area located within a SPZ catchment.

Both SPZs and GWV have been addressed in more detail within the District/Borough specific sections of this report (Section 4).

Table 5.2: Applicable SUDS techniques based upon GWV and SPZs

	High Water Table (<1m)	High Vulnerability Catchments	Low Vulnerability Catchments	SPZ Catchments
Filter Strips and Swales	✗	?	✓	?
Filter drains and Pervious Surfaces	✗	✗	✓	✗
Infiltration Devices	✗	✗	✓	✗
Basins, Ponds and Wetlands	✓	?	✓	?
Green Roofs	✓	✓	✓	✓
Underground Storage	✓	?	✓	?
Water Butts	✓	✓	✓	✓

✓ Feasible ✗ Not Feasible **?** Marginal – needs careful consideration

Drainage Area

The area of a catchment draining to a particular SUDS scheme is an important consideration as large flows may overwhelm the ability of the SUDS system to treat the runoff. This is especially prominent where vegetation is used as a filter, for example in swales and filter strips. The CIRIA guidance recommends that areas larger than 2ha should not drain to a single SUDS component. However, large scale basins, ponds and wetlands can be utilised in larger sites (> 5ha), although the most effective mechanism will involve the use of other SUDS mechanisms upstream as part of a SUDS management train. This information should be made available by the developer.

The drainage area of a site in question can be calculated through comparison of the site plans with the topography of the area in order to determine the prominent drainage routes of surface water.

Table 5.3: Applicable SUDS techniques as single components, based upon Drainage Area

	Larger Catchment (>2ha)	Smaller Catchments (<2ha)
Filter Strips and Swales	✗	✓
Filter drains and Pervious Surfaces	?	✓
Infiltration Devices	✗	✓
Basins, Ponds and Wetlands	✓	✓
Green Roofs	✗	✓
Underground Storage	✓	✓
Water Butts	✓	✓

✓ Feasible ✗ Not Feasible **?** Marginal – needs careful consideration

Topography

The gradient of the slope in a development site is an important consideration for SUDS as many cannot operate, or will require modification to function, on steep slopes due to the limited infiltration time provided. For example filter strips and infiltration practices generally require infiltration times that are only achievable on gentler slopes to fulfil their function, however, swales, for example, can be adapted and located along the contours of a slope. It is also difficult to achieve sufficient volumes in ponds/basins located on steeper slopes and the infiltration of water may result in saturation of the slope further down creating slope instability or the re-emergence of stormwater.

In addition, many SUDS designs are limited by low site gradients as they require the surface runoff to reach the system with minimal infiltration en route. On completely flat ground it may prove difficult to encourage the surface water to reach the SUDS systems at all. This is discussed further in the following section regarding the hydraulic head.

Table 5.4: Applicable SUDS techniques based upon Topography

	Steep Gradient (>5%)	Shallow Gradient (0-5%)
Filter Strips and Swales	?	✓
Filter drains and Pervious Surfaces	✗	✓
Infiltration Devices	✗	✓
Basins, Ponds and Wetlands	✗	✓
Green Roofs	✓	✓
Underground Storage	?	✓
Water Butts	✓	✓

✓ Feasible ✗ Not Feasible **?** Marginal – needs careful consideration

Hydraulic Head

As mentioned above, many SUDS schemes require a difference in elevation between the source and the outflow to enable the surface water to reach the required treatment location. The situation in which little, or no, head exists is summarised below. However, where the hydraulic head is low, it can be created artificially through excavation of the site or the installation of embankments, which may enable the use of the techniques identified as 'not feasible' below. Information regarding the hydraulic head should be indicated through a site survey or review of LiDAR data.

Table 5.5: Applicable SUDS techniques based upon Hydraulic Head

	0-1m	1-2m
Filter Strips and Swales	✗	?
Filter drains and Pervious Surfaces	✓	✓
Infiltration Devices	✓	✗
Basins, Ponds and Wetlands	✓	✓
Green Roofs	✓	✓
Underground Storage	✓	✓
Water Butts	✓	✓

✓ Feasible ✗ Not Feasible **?** Marginal – needs careful consideration

Availability of Space

As indicated in the descriptions of the various SUDS techniques, some require more land than others. Inevitably, the area required also increases with the size of the development. In many instances they can be incorporated into the design within open space and playing fields included as part of a development (e.g. as a pond), or areas located within the Flood Zones, which in many cases will not be granted permission for development anyway and can be designed to flood on rare occasions.

Table 5.6: Applicable SUDS techniques based upon the availability of space

	High Space Availability	Low Space Availability
Filter Strips and Swales	✓	✗
Filter drains and Pervious Surfaces	✓	✓
Infiltration Devices	✓	?
Basins, Ponds and Wetlands	✓	?
Green Roofs	✓	✓
Underground Storage	✓	✓
Water Butts	✓	✓

✓ Feasible ✗ Not Feasible **?** Marginal – needs careful consideration

Intended Usage

The intended usage of a site should always be considered alongside the site characteristics mentioned above when selecting SUDS features and should be obtained from the developer for all aspects considered in the site. For example, commercial or industrial uses, which are likely to experience increased pollutant loads, would require more robust SUDS features, such as lined ponds and treatment of the collected water, and application of the Treatment Train concept to ensure adequate pollutant removal. In many cases infiltration systems will not be appropriate without remedial measures and most techniques will require the use of liners. Residential uses, however, can commonly be expected to receive lower pollutant input and lower inflow volumes in comparison, thus allowing smaller and fewer SUDS features to be used. The eight different classifications (ranging from very low density development to contaminated land) are discussed in more detail within the CIRIA Manual. The main classifications are summarised below.

Table 5.7: Applicable SUDS techniques based upon the intended use of the land

	Residential	Commercial	Brownfield	Contaminated Land
Filter Strips and Swales	✓	✓	✓	?
Filter drains and Pervious Surfaces	✓	✓	✓	?
Infiltration Devices	✓	✓	✓	?
Basins, Ponds and Wetlands	✓	✓	✓	?
Green Roofs	✓	✓	✓	✓
Underground Storage	✓	✓	✓	?
Water Butts	✓	✓	✓	✓

✓ Feasible ✗ Not Feasible **?** Marginal – needs careful consideration

11 CONCLUSIONS

11.1 Summary of Current State of Development Areas

The following Table 11.1 contains a summary of the current state of the water cycle within each of the identified development areas within the six local authorities which are within the Haven Gateway sub-region. The table reflects the worst results for each area in each of the four time zones, together with a code indicating which of the three areas, water supply, wastewater or flooding is contributing to the area being either amber or red in terms of development.

As noted in the detailed descriptions for the areas, the analysis takes a precautionary approach and therefore may err on the side of caution. The indication that an area is red or amber does not necessarily preclude its adoption as a development site, rather indicates that there are issues with the water cycle in a particular location that will need to be addressed, and an indication of the severity of the issue. It also identifies that ongoing and detailed discussion will be required in these areas with the related bodies to confirm the issues and establish appropriate development plans to fit within any constraints.

Table 11.1 - Summary of Current State of Development Areas

Local Authority	Development Area	2008 - 2011	2011 - 2014	2014 - 2017	2017 - 2021
Babergh	Hadleigh	WW	WS/WW	WS/WW	WS/WW
	Pinewood		WS	WS	WS
	Sproughton	F/WW	F/WW/WS	F/WW/WS	F/WW/WS
	Shotley	WW	WS/WW	WS/WW	WS/WW
Colchester	North Colchester	WW	WW	WW	WW/WS
	Colchester Town	WW/F	WW/F	WW/F	WW/F/WS
	South Colchester	WW	WW	WW	WW/WS
	East Colchester	WW/F	WW/F	WW/F	WW/F/WS
	Stanway	WW	WW	WW	WW/WS
	Colchester Other				
	Wivenhoe/Rowhedge	WW/F	WW/F	WW/F	WW/F/WS
	Tiptree	WS/WW	WS/WW	WS/WW	WS/WW
	West Mersea	WW	WW	WW	WW/WS
	Marks Tey	WW	WW	WW	WW
	West Bergholt	WW/F	WW/F	WW/F	WW/WS/F
Ipswich	IP-One	F/WW	F/WW/WS	F/WW/WS	F/WW/WS
	Ipswich North	F/WW	F/WW/WS	F/WW/WS	F/WW/WS
	Ipswich East	WW	WW	WW/WS	WW/WS
Mid Suffolk	Great Blakenham and SnOasis	WW\F	WW\\F/WS	F/WS/WW	F/WS/WW
	Felixstowe and the Trimleys	F	F/WS/WW	F/WS/WW	F/WS/WW
	Aldeburgh and Thorpeness	F	F	F	F
	Saxmundham	F/WW	F/WW	F/WW	F/WW
	Kesgrave, Rushmere	WW	WW/WS	WW/WS	WS/WW
	Leiston	F/WW	F/WW	F/WW	F/WW
	Melton	WW/F	WW/WS/F	WW/WS/F	WW/WS/F

	Rendlesham	WW	**WS**/WW	**WS**/WW	**WS**/WW
	Woodbridge and Martlesham	F/**WW**	WS/**WW**/F	**WS**/**WW**/F	**WS**/**WW**/F
Tendring	Clacton on sea	F/WW	F/WS/WW	F/WS/WW	F/WS/WW
	Jaywick	**WW**/F	**WW**/F	**WW**/F/WS	**WW**/F/WS
	Harwich & Dovercourt	F/WW	F/WW	WW/F/WS	WW/F/WS
	Frinton and Walton	F/**WW**	F/**WW**	F/WS/**WW**	F/WS/**WW**
	Brightlingsea	F/**WW**	F/**WW**	**WW**/F/WS	**WW**/F/WS
	Lawford, Manningtree & Mistley	F/**WW**	F/**WW**	F/WS/**WW**	F/WS/**WW**
	Wix		WS	WS	WS
	Thorpe Le Soken	F/**WW**	F/**WW**	F/WS/**WW**	F/WS/**WW**
	St Osyth	F/**WW**	F/**WW**	F/WS/**WW**	F/WS/**WW**
	Thorrington	F	F/WS	WS/F	WS/F

Key:
WS - Water Supply issues
WW - Wastewater issues (inc infrastructure and water quality)
F - Flood Risk Issues
Bold - Issue which derives “Red” state.

Table 11.2 Definition of Colour States

	Water Supply	**Wastewater**	**Flooding**
Green OK for development	Demand management activities may well be required throughout	Adequate headroom for both proposed residential and employment development. No identified infrastructure issues. No identified additional water quality treatment.	No flooding identified, either in Flood Zones or SFRA’s. Also where possible no obvious sources of flooding.
Amber Care required	Action required in the future to maintain supply beyond 2021 or very low requirement	Adequate headroom for planned residential development but inadequate headroom if employment included within the analysis. Also where solution to resolve headroom inadequacy already being put in place (but not fully implemented). Minor infrastructure issues. Water quality improvements required to maintain current pollutant loads using BATNEEC technologies.	Low residual risk of flooding (areas behind adequate defences) or with minor flood issues or localised flooding that could be avoided in site layout.
Red Action needed	Action required to maintain supply during study period.	Inadequate headroom for proposed residential development. Major infrastructure issues. Water quality improvements required to maintain current pollutant loads using BAT technologies or unachievable using current technology.	Areas within Flood Zone 3 with no defences, areas of high risk of flooding.

11.2 Comments on the Summary of the Current State of Development Areas

Adopting the precautionary approach with regard to the assessment of issues with regard to development and the water cycle does show a less than ideal picture with regard to issues associated with future development. The following areas may be skewing the results and need to be considered in more detail in either local studies or future updates to this Water Cycle Study

11.2.1 Employment Land Issues

One of the key areas which has not been considered in excessive detail is the impact of employment development on the wastewater system. Many of the receiving sewage treatment works have adequate capacity to accommodate the proposed residential development but apparently would not be able to accommodate the proposed employment development. There are a number of issues here which need to be considered in future evaluation of the capacities:

- The use of “standardised” effluent discharge rates irrespective of type of development and density on particular allocated areas. AWS are concerned that the values proposed in Stage 1 of this study and used throughout the development of Stage 2 are not wholly representative of the degree of discharge from employment land, and may be a much higher estimate than would be expected.
- Limited information has been obtained to date on how AWS can accommodate or attenuate the discharges from employment land by use of their existing controls, or where existing treatment and consented discharges are available through private operations which could be used to absorb additional employment flow.

Before any employment land development takes place in these areas where there is some limitation in the sewage catchment capacity the issues need to be discussed with AWS and a resolution to the issues obtained so that problems in the future are eliminated or at least managed.

11.2.2 Water Quality and Treatment

The assessment of water quality and treatment was based on the principle of no net increase in pollutant load as a result of changes to the consented discharge. The evaluation therefore considered that any change in consented discharge would require improvement to the treatment process, and that the level of technology would be based on the starting pollution load of the current consent.

There are two perspectives on this, one is that in an ideal world there should be no increase in pollutant load, irrespective of the current performance and consented levels of pollutants (which is the scenario modelled). The second considers that in many locations the current level of treatment is providing pollution levels well below the consented limits, and that there is potentially treatment headroom in the plant which could accommodate additional flows without changing the absolute pollutant load or requiring improvements to the works.

There is no clear answer to which of these scenarios is most appropriate, or to how the Environment Agency would amend any pollution consents at the time of any increase in discharge consents. Therefore, in areas where discharges may need to be increased, discussion with both AWS and the Environment Agency needs to take place as early as possible within the planning process to establish whether the works can maintain pollutant loads below a limit acceptable to the environment.

11.2.3 Wastewater Infrastructure

Information on the sewerage infrastructure has been supplied by AWS as general comments within specific areas and sewage treatment catchments. It is acknowledged that without detailed information on the specific location of development and the quantity and type of development that detailed modelling and assessment of network capacity cannot be accurately provided, neither can specific solutions be proposed to issues in these areas.

As part of the required discussion with AWS it is expected that further modelling of drainage networks and assessments of capacities will direct development into areas where there is existing capacity and refine those areas where infrastructure capacity is an issue for future development and where investment would be required before development commences. In particular Combined Sewer Overflow systems will need very careful consideration as increases in spill volumes and frequencies are likely to be unacceptable to the regulatory authorities.

11.3 Key Activities

There are a number of key activities which have been identified as being required to reduce the number of locations which are, or turn, "red" over the duration of the study period. These have been listed in each of the development area summaries and have been brought together here as many of them consider activity across an area wider than a single local planning authority.

11.3.1 Water Supply

Ensure that the three water supply companies continue to implement their Water Resource Management Plans which will ensure that supplies are secured over the study period. The dWRMP included the following specific activities which if implemented would address the issues potentially arising with water supply over the planning period.

- Demand management activities across the whole sub-region to improve consumption levels.
- Implementation of the proposed transfer of water from Ipswich (PZ60) to Woodbridge (PZ4) - AWS in AMP 5.
- Implementation of the proposed Bucklesham Aquifer Recovery Storage Scheme in Ipswich (PZ60) - AWS in AMP 5.
- Implementation of the proposed Ipswich Discharge reuse Scheme (PZ60) - AWS in AMP 6.
- Implementation of proposed transfer of water from Colchester (PZ 56 to Tiptree (PZ 63) - AWS in AMP 5.

Note that the final WRMP are about to be published and should be used as a final reference in place of the activities identified from the draft plans.

11.3.2 Wastewater Treatment and Infrastructure

General review if infrastructure - primarily in heavy urban areas.
General review of sanitary treatment processes to establish headroom in treatment.
Detailed review of development and discharges to establish the requirements for potential increase consented Dry Weather Flow (DWF) discharge for;

- Melton STW
- Sproughton STW
- Jaywick STW
- Brightlingsea STW

Ongoing close monitoring of discharges at Shotley - towards end of study period.
Implementation of proposed discharge consent increase and process improvements to Colchester STW.

11.3.3 Flood Risk

Ongoing use of FRA’s and SuDS to define appropriate development and mitigation measures and to ensure that flood risk is not made worse by development.
Investigation of the potential for improving flood defences around

- Felixstowe peninsula
- Aldeburgh and Thorpeness

Implementation of Ipswich Flood Defence Management Scheme.
Allocation if development upstream of Ipswich out of functional floodplain.
Appropriate development selection within areas of Sproughton adjacent to the River Gipping.

12 FUTURE UPDATING

12.1 Concept

The Water Cycle Study is not a static document. This report represents a moment in time within a rapidly developing and changing environment. For the Study to maintain its usefulness and to grow, future updates will be essential. Key areas will be to monitor actual developments and revisions to the projections for growth, together with changes to infrastructure and other water related activities. In addition changes to legislation and guidance in the production of Water Cycle Studies may need to be included. Furthermore, additional detail should be considered as and when data is available.

12.2 Data Sources

The updates will need together updated information from, as a minimum, the following stakeholders:

- Local Planning authorities
- Water Companies
- Environment Agency
- Other planning or regulatory bodies

An update of the study needs to reconsider each of the parts of the cycle and how any identified changes will impact on the derived outcomes. It is expected that key changes will be with the proposed development trajectories and how they have actually developed over the year, together with improvements to the wastewater, water supply and flood defences and their impacts on the key development areas.

12.3 Scope for Future Work

There are a number of issues identified within the current Water Cycle Study which will need incorporating into any future update of the study.

- Modelling of the wastewater and water supply infrastructure, if data becomes available.
- Agreement on the discharge rates from employment development and modification of the forecast discharges and resultant potential discharge consent increases.
- In combined sewer systems determining whether development will result in increased wastewater spill frequency, if additional storage capacity will be required or whether there are particular issues with tide-locking of discharges.
- Any adjustments to the development trajectories resulting from the economic downturn
- Review and incorporate the final Water Resource Management plans
- Review the Water Companies' PR09 Final Business Plan submissions
- Review Environment Agency Review of Consents (post September 2009)
- Include the findings from any forthcoming Environment Agency investigations regarding contamination of Bathing Waters and the revised Bathing Water Directive.

- Update Flood Risk section when Tendring District, Babergh District and Ipswich Borough SFRAs are finalised and approved.

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Appendix A
Development Trajectory Data

BABERGH DISTRICT TRAJECTORIES

RAW DATA – RESIDENTIAL

N.B None of the STWs within Babergh District treat effluent from development outside the District boundaries. Similarly, all the effluent produced by the proposed residential development within Babergh District will be treated by the STWs within its boundaries.

Babergh District Residential Trajectories - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CHANST	Pinewood(S.Ipswich)	0	0	0	0	0	0	0	0	0	10	30	30	30	20	24	24	24	24	24	24	24
HADLST	Hadleigh	0	0	0	0	0	0	0	10	23	55	55	55	0	0	40	40	40	40	40	40	40
SHOTST	Shotley	0	0	0	0	0	0	0	10	30	50	120	110	75	0	65	65	65	65	65	65	65
SPRCST	Sproughton	0	0	0	0	0	0	0	0	0	0	0	15	10	5	10	10	10	10	10	10	10
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**53**	**115**	**205**	**210**	**115**	**25**	**139**	**139**	**139**	**139**	**139**	**139**	**139**

No adjustment has been made to these values for any transient holiday population.

RAW DATA – EMPLOYMENT

N.B None of the STWs within Babergh District treat effluent from development outside the District boundaries. However, Cliff Quay STW is located in Ipswich Borough, but receives effluent produced by some of the proposed development within Babergh District. The following tables consider the development within this STW catchment that are located within Babergh District, but also consider the development located within the STW catchment within the neighbouring Districts. For clarification values which include developments located outside Babergh District are shown in Italics.

Babergh District Employment Trajectories – Hectares (ha) - Babergh Areas ONLY

Development	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Pinewood(S.Ipswich)	CHANST	0	0	0	0	0	0	0	2.5	2.5	2.5	0	0	0	0	0	1.5	1.5	1.5	1.5	1.5	1.5
Capel	GWENST	0	0	0	0	0	0	0	0	0	0	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.45	0.3
Hadleigh	HADLST	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.44	0.44	0.44	0.44	0.44	0.44
Shotley	SHOTST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sproughton	SPRCST	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2.84	2.84	2.84	2.84	1.84	1.84
Sproughton	CLQYST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.9	6.9	6.9	6.9	6.9	6.9
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3.5**	**3.5**	**2.5**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**12.18**	**12.18**	**12.18**	**12.18**	**11.13**	**10.98**

Babergh District Employment Trajectories, Grouped by STW – Hectares (ha) includes development within catchment but outside of Babergh

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CHANST	Pinewood(S.Ipswich)	0	0	0	0	0	0	0	2.5	2.5	2.5	0	0	0	0	0	1.5	1.5	1.5	1.5	1.5	1.5
GWENST	Capel	0	0	0	0	0	0	0	0	0	0	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.45	0.3
HADLST	Hadleigh	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.44	0.44	0.44	0.44	0.44	0.44
SHOTST	Shotley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SPRCST	Sproughton	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2.84	2.84	2.84	2.84	1.84	1.84
CLQYST*	Cliff Quay (Ipswich)	0	0	0	0	0	0	0	15.65	15.62	15.509	7.21	7.02	7.02	7.02	7.1	11.44	11.44	11.44	11.44	11.44	11.44
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19.15**	**19.12**	**18.009**	**8.81**	**8.62**	**8.62**	**8.62**	**8.7**	**16.72**	**16.72**	**16.72**	**16.72**	**15.67**	**15.52**

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Babergh District.*

STW CAPACITIES - RESIDENTIAL

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population'*
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day

Babergh District DWF Calculations – Residential Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CHANST	Pinewood(S.Ipswich)	5200	3229	1971	37.9	3229	1971	37.9	3232.9	1967.1	37.8	3244.5	1955.5	37.6	3256.2	1943.8	37.4	3267.9	1932.15	37.2	3275.6	1924.4	37.0
HADLST	Hadleigh	1877	1566	311	16.6	1574.9	302.06	16.1	1596.3	280.7	15.0	1617.7	259.33	13.8	1639	237.96	12.7	1639	237.962	12.7	1639	237.96	12.7
SHOTST	Shotley	662	***358***	304	45.9	369.66	292.35	44.2	389.08	272.92	41.2	435.7	226.3	34.2	478.44	183.57	27.7	507.57	154.428	23.3	507.57	154.43	23.3
SPRCST	Sproughton	238	242	-4	-1.7	242	-4	-1.7	242	-4	-1.7	242	-4	-1.7	247.83	-9.827	-4.1	251.71	-13.7125	-5.8	253.66	-15.66	-6.6
CLQYST*	Cliff Quay (Ipswich)	34213	24624	9589	28.0	25198	9015.2	26.4	25593	8619.7	25.2	26023	8190.4	23.9	26445	7768.1	22.7	26863	7349.69	21.5	27268	6945.3	20.3

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CHANST	Pinewood(S.Ipswich)	5200	3284.9	1915.1	36.8	3294.3	1905.7	36.6	3303.6	1896.4	36.5	3312.9	1887.1	36.3	3322.2	1877.8	36.1	3331.6	1868.44	35.9	3340.9	1859.11	35.8
HADLST	Hadleigh	1877	1654.6	222.42	11.8	1670.1	206.88	11.0	1685.7	191.34	10.2	1701.2	175.8	9.4	1716.7	160.26	8.5	1732.3	144.722	7.7	1747.8	129.182	6.9
SHOTST	Shotley	662	532.83	129.18	19.5	558.08	103.92	15.7	583.33	78.67	11.9	608.58	53.417	8.1	633.84	28.165	4.3	659.09	2.9125	0.4	684.34	-22.34	-3.4
SPRCST	Sproughton	238	257.54	-19.54	-8.2	261.43	-23.43	-9.8	265.31	-27.31	-11.5	269.2	-31.19	-13.1	273.08	-35.08	-14.7	276.97	-38.965	-16.4	280.85	-42.85	-18.0
CLQYST*	Cliff Quay (Ipswich)	34213	27681	6532.3	19.1	28039	6174.5	18.0	28388	5825.2	17.0	28737	5476	16.0	29086	5126.7	15.0	29436	4777.43	14.0	29785	4428.17	12.9

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Babergh District.*

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** (Predicted employment area ***x*** design flow for industrial domestic effluent) **+** (Predicted employment area ***x*** design flow for industrial trade effluent) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day
Predicted employment area = Figures in table of '*Employment Trajectories Grouped by STW*'
Design flow for industrial domestic effluent = 46.656m³/ha developable land/day
Design flow for industrial trade effluent = 58.752m³/ha developable land/day

Babergh District DWF Calculations – Residential and Employment Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CHANST	Pinewood(S.Ipswich)	5200	3229	1971	37.9	3492.5	1707.5	32.836	3759.9	1440.1	27.7	3771.6	1428.4	27.5	3783.2	1416.8	27.2	3794.9	1405.11	27.0	3802.7	1397.3	26.9
HADLST	Hadleigh	1877	1566	134	7.9	1574.9	125.06	7.3567	1596.3	103.7	6.1	1723.1	-23.08	-1.4	1849.9	-149.9	-8.8	1955.3	-255.262	-15.0	2060.7	-360.7	-21.2
SHOTST	Shotley	662	***358***	304	45.9	369.66	292.35	44.161	389.08	272.92	41.2	435.7	226.3	34.2	478.44	183.57	27.7	507.57	154.428	23.3	507.57	154.43	23.3
SPRCST	Sproughton	238	242	-4	-1.7	347.41	-109.4	-45.97	347.41	-109.4	-46.0	347.41	-109.4	-46.0	353.24	-115.2	-48.4	357.12	-119.121	-50.1	359.06	-121.1	-50.9
CLQYST*	Cliff Quay (Ipswich)	34213	22280	11933	34.9	24624	9589	28.0	26844	7368.7	21.5	28875	5338.4	15.6	30064	4149.2	12.1	31226	2986.9	8.7	32384	1828.52	5.3

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CHANST	Pinewood(S.Ipswich)	5200	3812	1388	26.7	3979.4	1220.6	23.5	4146.9	1053.1	20.3	4314.3	885.71	17.0	4481.7	718.27	13.8	4649.2	550.836	10.6	4816.6	383.4	7.4
HADLST	Hadleigh	1877	2181.6	-481.6	-28.3	2243.5	-543.5	-32.0	2305.5	-605.5	-35.6	2367.4	-667.4	-39.3	2429.3	-729.3	-42.9	2491.2	-791.22	-46.5	2553.1	-853.135	-50.2
SHOTST	Shotley	662	532.83	129.18	19.5	558.08	103.92	15.7	583.33	78.67	11.9	608.58	53.417	8.1	633.84	28.165	4.3	659.09	2.9125	0.4	684.34	-22.34	-3.4
SPRCST	Sproughton	238	362.95	-124.9	-52.5	666.19	-428.2	-179.9	969.44	-731.4	-307.3	1272.7	-1035	-434.7	1575.9	-1338	-562.2	1773.8	-1535.8	-645.3	1971.6	-1733.59	-728.4
CLQYST*	Cliff Quay (Ipswich)	34,213	34690	-477.2	-1.4	36254	-2041	-6.0	37809	-3596	-10.5	39364	-5151	-15.1	40919	-6706	-19.6	42474	-8261.4	-24.1	44030	-9816.57	-28.7

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Babergh District.*

COLCHESTER BOROUGH TRAJECTORIES

RAW DATA – RESIDENTIAL

N.B None of the STWs within Colchester Borough treat effluent from development outside the Borough boundaries. Similarly, all the effluent produced by the proposed development within Colchester Borough will be treated by the STWs within its boundaries.

Colchester District Residential Trajectories - Dwellings by Growth Area

Growth Area	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Town Centre and Fringe	COLCHST	220	48	218	242	255	207	259	366	181	166	178	80	242	191	110	83	40	90	90	47	40
North Growth Area	COLCHST	0	93	392	701	778	454	752	749	409	433	512	517	640	403	322	295	451	515	515	472	315
East Growth Area	COLCHST	0	0	160	18	161	225	209	69	217	180	121	76	141	160	285	395	379	230	254	120	0
South Growth Area	COLCHST	0	0	0	0	0	133	177	251	181	354	360	357	238	235	200	207	133	146	70	0	0
Stanway Growth Area	COLCHST	38	76	0	16	20	54	48	82	13	100	100	100	100	100	100	0	50	110	110	145	145
Colchester Town - other areas	COLCHST	220	235	385	160	300	0	106	86	100	100	100	100	25	0	0	0	0	0	0	0	0
Tiptree	TIPTST	92	92	73	78	47	13	5	10	11	17	0	0	31	50	129	50	50	0	0	0	0
West Mersea	WMERST	0	21	13	12	19	31	28	34	28	14	0	0	19	50	11	0	0	0	0	0	0
Wivenhoe and Rowhedge	COLCHST	22	72	37	55	58	40	25	12	49	50	140	110	55	55	55	55	55	0	0	0	0
Marks Tey	COPFST		9	6	5	10	4	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0
West Bergholt	WBERST		13	0	7	7	3	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Great Horkesley	WBERST	0	0	0	0	0	0	0	30	30	30	35	35	0	0	0	0	0	0	0	0	0
Other Villages	FINGST	0	0	0	0	0	0	0	0	22	3	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**592**	**566**	**980**	**916**	**1277**	**899**	**1250**	**1243**	**1060**	**1281**	**1368**	**1295**	**1265**	**1013**	**1062**	**962**	**1078**	**1001**	**949**	**737**	**460**

Colchester District Residential Trajectories - Dwellings by STW Catchment

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COLCHST	Colchester	500	431	888	814	1194	848	1217	1169	981	1220	1333	1260	1159	913	922	912	1028	1001	949	737	460
COPFST	Marks Tey	0	9	6	5	10	4	0	0	0	0	0	0	36	0	0	0	0	0	0	0	0
TIPTST	Tiptree	92	92	73	78	47	13	5	10	11	17	0	0	31	50	129	50	50	0	0	0	0
WBERST	West Bergholt and Great Horkesley	0	13	0	7	7	3	0	30	30	30	35	35	20	0	0	0	0	0	0	0	0
WMERST	West Mersea	0	21	13	12	19	31	28	34	28	14	0	0	19	50	11	0	0	0	0	0	0
FINGST	Other Villages (PYE)	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**592**	**566**	**980**	**916**	**1277**	**899**	**1250**	**1243**	**1060**	**1281**	**1368**	**1295**	**1265**	**1013**	**1062**	**962**	**1078**	**1001**	**949**	**737**	**460**

These trajectories have been adjusted to account for the transient holiday population. Anglian Water Services provided the Holiday Population Equivalence figures, which were subsequently adjusted to provide an estimate of increased dwelling numbers (based upon household size of 2.1) and added to the trajectory figures shown above:

Colchester District Residential Trajectories Adjusted for Holiday Population - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COLCHST	Colchester	500	431	888	814	1194	848	1217	1169	981	1220	1333	1260	1159	913	922	912	1028	1001	949	737	460
COPFST	Marks Tey	0	9	6	5	10	4	0	0	0	0	0	0	36	0	1	0	0	0	0	0	1
TIPTST	Tiptree	92	92	73	78	47	13	5	10	11	17	0	0	31	50	129	50	50	0	0	0	0
WBERST	West Bergholt and Great Horkesley	0	13	0	7	7	3	0	30	30	30	35	35	20	0	0	0	0	0	0	0	0
WMERST	West Mersea	0	21	13	12	19	31	28	34	29	15	1	2	20	51	12	1	2	1	1	1	2
FINGST	Other Villages (PYE)	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**592**	**566**	**980**	**916**	**1277**	**899**	**1250**	**1243**	**1061**	**1282**	**1369**	**1297**	**1266**	**1014**	**1064**	**963**	**1080**	**1002**	**950**	**738**	**463**

RAW DATA – EMPLOYMENT

N.B None of the STWs within Colchester Borough treat effluent from development outside the Borough boundaries. Similarly, all the effluent produced by the proposed development within Colchester Borough will be treated by the STWs within its boundaries.

Colchester Borough Employment Trajectories – Hectares (ha) - note no data available for 2000/1 to 2006/7

Development	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Whitehall Road	COLCST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	1.2	1.2	1.2	1.2	1.19
Cuckoo Farm	COLCST	0	0	0	0	0	0	0	0	0	0	2	3.56	3.56	3.56	3.56	3.56	0	0	0	0	0
Tollgate, Stanway	COLCST	0	0	0	0	0	0	0	0	0	0	3.79	3.79	3.79	0	0	0	0	0	0	0	0
London Road, Stanway	COLCST	0	0	0	0	0	0	0	0	0	0	0.95	0.95	0.95	0.95	0.95	0	0	0	0	0	0
Unv. Research Pk	COLCST	0	0	0	0	0	0	0	0	0	0	1.3	1.3	1.3	1.3	1.37	0	0	0	0	0	0
Severalls BP	COLCST	0	0	0	0	0	0	0	0.55	0.55	0.6	0	0	0	0	0	0	0	0	0	0	0
Crown Interchange	COLCST	0	0	0	0	0	0	0	0.54	0.54	0.54	0	0	0	0	0	0	0	0	0	0	0
Maldon Rd	COLCST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.14	0.14	0.14	0.14	0.14	0.11
Paxman Street unallocated	COLCST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.46	0.46	0.46	0.46	0.46	0.45
Boxted Rd Hosp unallocated	COLCST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.77	1.77	1.77	1.77	1.77	1.76
Site 30, South of St Peters Street	COLCST	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0
Site 26, Middlesboorough Area	COLCST	0	0	0	0	0	0	0	0	0	0	0	0	0.35	0.35	0	0	0	0	0	0	0
Site 19, Stane Park	COLCST	0	0	0	0	0	0	0	0	0	0.5	2.1	2.1	2.1	0	0	0	0	0	0	0	0
Site 17, Westside Centre	COPFST	0	0	0	0	0	0	0	0	0	0	0.25	0	0	0	0	0	0	0	0	0	0
Site 20, Wyvern Farm	COPFST	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0.8	0.9	0	0	0	0	0	0
Kelvedon Rd	TIPST	0	0	0	0	0	0	0	0	0	0	0	0				0.85	0.85	0.85	0.85	0.85	0.83
Tower House	TIPST	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0.33	0.33	0.33	0.33	0.32	0	0	0
Rushmere Cl	WMERST	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.19**	**1.09**	**1.64**	**10.45**	**11.7**	**13.18**	**7.29**	**7.11**	**8.31**	**4.75**	**4.74**	**4.42**	**4.42**	**4.34**

Colchester Borough Employment Trajectories, Grouped by STW – Hectares (ha)

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
COLCHST	Colchester	0	0	0	0	0	0	0	1.09	1.09	1.64	10.2	11.7	12.05	6.16	5.88	7.13	3.57	3.57	3.57	3.57	3.51
COPFST	Marks Tey	0	0	0	0	0	0	0	0	0	0	0.25	0	0.8	0.8	0.9	0	0	0	0	0	0
TIPTST	Tiptree	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0.33	0.33	1.18	1.18	1.17	0.85	0.85	0.83
WBERST	West Bergholt and Great Horkesley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WMERST	West Mersea	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
FINGST	Other Villages (PYE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1.19**	**1.09**	**1.64**	**10.45**	**11.7**	**13.18**	**7.29**	**7.11**	**8.31**	**4.75**	**4.74**	**4.42**	**4.42**	**4.34**

STW CAPACITIES - RESIDENTIAL

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day

Colchester Borough DWF Calculations – Residential Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
COLCST	Colchester	29,284	30296	-1012	-3.5	30677	-1393	-4.8	31151	-1867	-6.4	31669	-2385	-8.1	32158	-2874	-9.8	32609	-3324.74	-11.4	32963	-3679	-12.6
COPFST	Copford	1,300	1474	-174	-13.4	1474	-174	-13.4	1474	-174	-13.4	1474	-174	-13.4	1474	-174	-13.4	1488	-187.986	-14.5	1488	-188	-14.5
TIPTST	Tiptree	2400	1940	460	19.2	1944.3	455.73	19.0	1950.9	449.12	18.7	1950.9	449.12	18.7	1950.9	449.12	18.7	1962.9	437.079	18.2	1982.3	417.65	17.4
WBERST	West Bergholt	1430	825	605	42.3	836.66	593.35	41.5	848.31	581.69	40.7	861.91	568.09	39.7	875.51	554.5	38.8	883.28	546.725	38.2	883.28	546.73	38.2
WMERST	West Mersea	2900	1510	1390	47.9	1521.3	1378.7	47.5	1527.1	1372.9	47.3	1527.5	1372.5	47.3	1528.3	1371.7	47.3	1536	1363.97	47.0	1555.8	1344.2	46.4
FINGST	Other Villages (PYE)	367	336	31	8.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
COLCST	Colchester	29,284	33322	-4038	-13.8	33676	-4392	-15.0	34075	-4791	-16.4	34464	-5180	-17.7	34833	-5549	-18.9	35119	-5835.2	-19.9	35298	-6013.94	-20.5
COPFST	Copford	1,300	1488.4	-188.4	-14.5	1488.4	-188.4	-14.5	1488.4	-188.4	-14.5	1488.4	-188.4	-14.5	1488.4	-188.4	-14.5	1488.4	-188.37	-14.5	1488.8	-188.763	-14.5
TIPTST	Tiptree	2400	2032.5	367.54	15.3	2051.9	348.11	14.5	2071.3	328.69	13.7	2071.3	328.69	13.7	2071.3	328.69	13.7	2071.3	328.687	13.7	2071.3	328.687	13.7
WBERST	West Bergholt	1430	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.725	38.2	883.28	546.725	38.2
WMERST	West Mersea	2900	1560.5	1339.5	46.2	1560.9	1339.1	46.2	1561.7	1338.3	46.1	1562.1	1337.9	46.1	1562.4	1337.6	46.1	1562.8	1337.16	46.1	1563.6	1336.39	46.1
FINGST	Other Villages (PYE)	367	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4

STW CAPACITIES - RESIDENTIAL and EMPLOYMENT

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses **x** Average number of people per house) **x** design flow for residential development per capita) **+** (average infiltration per capita **x** (Predicted number of houses **x** Average number of people per house)) **+** (Predicted employment area **x** design flow for industrial domestic effluent) **+** (Predicted employment area **x** design flow for industrial trade effluent) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day
Predicted employment area = Figures in table of '*Employment Trajectories Grouped by STW*'
Design flow for industrial domestic effluent = 46.656m³/ha developable land/day
Design flow for industrial trade effluent = 58.752m³/ha developable land/day

Colchester Borough DWF Calculations – Residential and Employment Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
COLCST	Colchester	29,284	20,345	8939	30.5	30296	-1012	-3.5	30792	-1508	-5.1	31439	-2155	-7.4	33032	-3748	-12.8	34755	-5471	-18.7	36475	-7191.11	-24.6
COPFST	Copford	1,300	844	456	35.1	1474	-174	-13.4	1474	-174	-13.4	1474	-174	-13.4	1500.4	-200.4	-15.4	1500.4	-200.4	-15.4	1598.7	-298.664	-23.0
TIPTST	Tiptree	2400	1714	686	28.6	1940	460	19.2	1944.3	455.73	19.0	1950.9	449.12	18.7	1950.9	449.12	18.7	1950.9	449.12	18.7	1997.7	402.294	16.8
WBERST	West Bergholt	1430	932	498	34.8	825	605	42.3	836.66	593.35	41.5	848.31	581.69	40.7	861.91	568.09	39.7	875.51	554.5	38.8	883.28	546.725	38.2
WMERST	West Mersea	2900	1368	1532	52.8	1510	1390	47.9	1521.3	1378.7	47.5	1527.1	1372.9	47.3	1527.5	1372.5	47.3	1528.3	1371.7	47.3	1536	1363.97	47.0
FINGST	Other Villages (PYE)	367	249	118	32.2	336	31	8.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
COLCST	Colchester	29,284	38457	-9173	-31.3	39563	-10279	-35.1	40339	-11055	-37.7	41104	-11820	-40.4	41849	-12565	-42.9	42511	-13227	-45.2	43060	-13776.2	-47.0
COPFST	Copford	1,300	1778.2	-478.2	-36.8	1778.2	-478.2	-36.8	1778.2	-478.2	-36.8	1778.2	-478.2	-36.8	1778.2	-478.2	-36.8	1778.2	-478.25	-36.8	1778.6	-478.635	-36.8
TIPTST	Tiptree	2400	2136.8	263.18	11.0	2280.6	119.38	5.0	2424.4	-24.43	-1.0	2547.8	-147.8	-6.2	2637.4	-237.4	-9.9	2727	-326.95	-13.6	2814.4	-414.439	-17.3
WBERST	West Bergholt	1430	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.73	38.2	883.28	546.725	38.2	883.28	546.725	38.2
WMERST	West Mersea	2900	1560.5	1339.5	46.2	1560.9	1339.1	46.2	1561.7	1338.3	46.1	1562.1	1337.9	46.1	1562.4	1337.6	46.1	1562.8	1337.16	46.1	1563.6	1336.39	46.1
FINGST	Other Villages (PYE)	367	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4	339.89	27.115	7.4

IPSWICH BOROUGH TRAJECTORIES

RAW DATA – RESIDENTIAL

Development in Ipswich part of the Ipswich Policy Area - The developments feed into Cliff Quay STW which also receives discharges from Babergh, Mid Suffolk and Suffolk Coastal Councils The following tables consider the development within this STW catchment that are located within Ipswich Borough, but also considers the development located within the STW catchment within the neighbouring Districts. For clarification the developments located outside Ipswich Borough are shown in Italics.

Ipswich Borough Residential Trajectories - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	*SnOasis*	*0*	*0*	*0*	*0*	*0*	*0*	*116*	*139*	*139*	*139*	*143*	*143*	*143*	*143*	*143*	*20*	*20*	*20*	*20*	*20*	*20*
CLQYST	*Cliff Quay (Kesgrave, Rushmere)*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*400*	*157*	*197*	*192*	*174*	*164*	*128*	*150*	*131*	*109*	*109*	*109*	*109*	*109*
CLQYST	Various (Ipswich)	347	468	566	720	782	985	1233	1722	1181	682	770	770	770	770	770	770	770	770	770	770	770
	TOTALS (Ipswich Only)	**347**	**468**	**566**	**720**	**782**	**985**	**1233**	**1722**	**1181**	**682**	**770**	**770**	**770**	**770**	**770**	**770**	**770**	**770**	**770**	**770**	**770**
	TOTALS (inc all Cliff Quay)	**347**	**468**	**566**	**720**	**782**	**985**	**1349**	**2261**	**1477**	**1018**	**1105**	**1087**	**1077**	**1041**	**1063**	**921**	**899**	**899**	**899**	**899**	**899**

No adjustment has been made to these values for any transient holiday population.

RAW DATA – EMPLOYMENT

Ipswich Employment Trajectories ONLY – Hectares (ha)

Development	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Bath Street	**CLQYST**	0	0	0	0	0	0	0	1.47	1.47	1.48	0	0	0	0	0	0	0	0	0	0	0
Cliff Quay	**CLQYST**	0	0	0	0	0	0	0	1.4	1.4	1.4	0.62	0.5	0.5	0.5	0.5	0	0	0	0	0	0
Bell Terminal	**CLQYST**	0	0	0	0	0	0	0	3.78	3.77	3.77	0	0	0	0	0	0	0	0	0	0	0
Other sites	**CLQYST**	0	0	0	0	0	0	0	2.07	2.07	2.069	0	0	0	0	0	0	0	0	0	0	0
White House Ind Est	**CLQYST**	0	0	0	0	0	0	0	0.2	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0
Eastway BP	**CLQYST**	0	0	0	0	0	0	0	0.67	0.67	0.66	0	0	0	0	0	0	0	0	0	0	0
Hadleigh Road Ind Est	**CLQYST**	0	0	0	0	0	0	0	0.48	0.48	0.47	1.57	1.5	1.5	1.5	1.5	0	0	0	0	0	0
Greenwich Cl, Landseer Rd, Cliff Q, Sandy Hill, Raeburn Rd	**CLQYST**	0	0	0	0	0	0	0	1.24	1.24	1.24	1.34	1.34	1.34	1.34	1.32	0	0	0	0	0	0
Ransomes	**CLQYST**	0	0	0	0	0	0	0	4.1	4.1	4	2.92	2.92	2.92	2.92	2.92	0	0	0	0	0	0
Cranes	**CLQYST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.79	2.79	2.79	2.79	2.79	2.79
Elton Park	**CLQYST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.55	0.55	0.55	0.55	0.55	0.55
Dales Road	**CLQYST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1
Norsk Hydro	**CLQYST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.1	1.1	1.1	1.1	1.1	1.1

Ipswich Borough Employment Trajectories, Grouped by STW – Hectares (ha) - includes development within catchment but outside of Ipswich Borough

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST*	Ipswich (Cliff Quay)	0	0	0	0	0	0	0	15.65	15.62	15.509	7.21	7.02	7.02	7.02	7.1	11.44	11.44	11.44	11.44	11.44	11.44
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15.65**	**15.62**	**15.509**	**7.21**	**7.02**	**7.02**	**7.02**	**7.1**	**11.44**	**11.44**	**11.44**	**11.44**	**11.44**	**11.44**

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Ipswich Borough*

STW CAPACITIES - RESIDENTIAL

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population'*
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day

Ipswich Borough DWF Calculations – Residential Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CLQYST*	Cliff Quay	34213	**24624**	9589	28.0	25198	9015.2	26.4	25593	8619.7	25.2	26023	8190.4	23.9	26445	7768.1	22.7	26863	7349.69	21.5	27268	6945.3	20.3

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CLQYST*	Cliff Quay	34213	27681	6532.3	19.1	28039	6174.5	18.0	28388	5825.2	17.0	28737	5476	16.0	29086	5126.7	15.0	29436	4777.43	14.0	29785	4428.17	12.9

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Ipswich Borough.*

STW CAPACITIES - RESIDENTIAL and EMPLOYMENT

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses **x** Average number of people per house) **x** design flow for residential development per capita) **+** (average infiltration per capita **x** (Predicted number of houses **x** Average number of people per house)) **+** (Predicted employment area **x** design flow for industrial domestic effluent) **+** (Predicted employment area **x** design flow for industrial trade effluent) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day
Predicted employment area = Figures in table of '*Employment Trajectories Grouped by STW*'
Design flow for industrial domestic effluent = 46.656m³/ha developable land/day
Design flow for industrial trade effluent = 58.752m³/ha developable land/day

Ipswich Borough DWF Calculations – Residential and Employment Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CLQYST*	Cliff Quay	34213	22280	11933	34.9	24624	9589	28.0	26844	7368.7	21.5	28875	5338.4	15.6	30064	4149.2	12.1	31226	2986.9	8.7	32384	1828.52	5.3

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CLQYST*	Cliff Quay	34,213	34690	-477.2	-1.4	36254	-2041	-6.0	37809	-3596	-10.5	39364	-5151	-15.1	40919	-6706	-19.6	42474	-8261.4	-24.1	44030	-9816.57	-28.7

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Ipswich Borough*

MID SUFFOLK DISTRICT TRAJECTORIES

RAW DATA – RESIDENTIAL

Development in Mid Suffolk is part of the Ipswich Policy Area - The developments feed into Cliff Quay STW which also receives discharges from Babergh, Ipswich and Suffolk Coastal Councils The following tables consider the development within this STW catchment that are located within Mid SuffolkDistrict, but also consider the development located within the STW catchment within the neighbouring Districts. For clarification the developments located outside Mid Suffolk District are shown in Italics.

Mid Suffolk District Residential Trajectories - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST	SnOasis	0	0	0	0	0	0	116	139	139	139	143	143	143	143	143	20	20	20	20	20	20
CLQYST	*Cliff Quay (Kesgrave, Rushmere)*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*400*	*157*	*197*	*192*	*174*	*164*	*128*	*150*	*131*	*109*	*109*	*109*	*109*	*109*
CLQYST	*Various (Ipswich)*	*347*	*468*	*566*	*720*	*782*	*985*	*1233*	*1722*	*1181*	*682*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*
	TOTALS (Mid Suffolk Only)	0	0	0	0	0	0	116	139	139	139	143	143	143	143	143	20	20	20	20	20	20
	TOTALS (inc all Cliff Quay)	**347**	**468**	**566**	**720**	**782**	**985**	**1349**	**2261**	**1477**	**1018**	**1105**	**1087**	**1077**	**1041**	**1063**	**921**	**899**	**899**	**899**	**899**	**899**

No adjustment has been made to these values for any transient holiday population.

RAW DATA – EMPLOYMENT

Mid Suffolk District Employment Trajectories – Hectares (ha)

Development	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Snoasis	CLQYST	0	0	0	0	0	0	0	0	0	0	0.26	0.26	0.26	0.26	0.29	0	0	0	0	0	0
Orion Business Park, Gt. Blakenham	CLQYST	0	0	0	0	0	0	0	0	0	0	0.5	0.5	0.5	0.5	0.57	0	0	0	0	0	0
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.76**	**0.76**	**0.76**	**0.76**	**0.86**	**0**	**0**	**0**	**0**	**0**	**0**

Mid Suffolk District Employment Trajectories, Grouped by STW – Hectares (ha) - includes development within catchment but outside of Mid Suffolk

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
CLQYST*	Ipswich (Cliff Quay)	0	0	0	0	0	0	0	15.65	15.62	15.509	7.21	7.02	7.02	7.02	7.1	11.44	11.44	11.44	11.44	11.44	11.44
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15.65**	**15.62**	**15.509**	**7.21**	**7.02**	**7.02**	**7.02**	**7.1**	**11.44**	**11.44**	**11.44**	**11.44**	**11.44**	**11.44**

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Mid Suffolk District.*

<u>STW CAPACITIES - RESIDENTIAL</u>

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day

Mid Suffolk District DWF Calculations – Residential Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CLQYST*	Cliff Quay	34213	**24624**	9589	28.0	25198	9015.2	26.4	25593	8619.7	25.2	26023	8190.4	23.9	26445	7768.1	22.7	26863	7349.69	21.5	27268	6945.3	20.3

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
CLQYST*	Cliff Quay	34213	27681	6532.3	19.1	28039	6174.5	18.0	28388	5825.2	17.0	28737	5476	16.0	29086	5126.7	15.0	29436	4777.43	14.0	29785	4428.17	12.9

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Mid Suffolk District.*

STW CAPACITIES - EMPLOYMENT

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses **x** Average number of people per house) **x** design flow for residential development per capita) **+** (average infiltration per capita **x** (Predicted number of houses **x** Average number of people per house)) **+** (Predicted employment area **x** design flow for industrial domestic effluent) **+** (Predicted employment area **x** design flow for industrial trade effluent) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m^3/capita/day
Average infiltration per capita = 0.04m^3/capita/day
Predicted employment area = Figures in table of '*Employment Trajectories Grouped by STW*'
Design flow for industrial domestic effluent = 46.656m^3/ha developable land/day
Design flow for industrial trade effluent = 58.752m^3/ha developable land/day

Mid Suffolk District DWF Calculations – Residential and Employment Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%
CLQYST*	Cliff Quay	34213	22280	11933	34.9	24624	9589	28.0	26844	7368.7	21.5	28875	5338.4	15.6	30064	4149.2	12.1	31226	2986.9	8.7	32384	1828.52	5.3

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%
CLQYST*	Cliff Quay	34,213	34690	-477.2	-1.4	36254	-2041	-6.0	37809	-3596	-10.5	39364	-5151	-15.1	40919	-6706	-19.6	42474	-8261.4	-24.1	44030	-9816.57	-28.7

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Mid Suffolk District.*

SUFFOLK COASTAL DISTRICT TRAJECTORIES

RAW DATA – RESIDENTIAL

N.B None of the STWs within Suffolk Coastal District treat effluent from development outside the District boundaries. However, Cliff Quay STW is located in Ipswich Borough, but receives effluent produced by some of the proposed development within Suffolk Coastal District. The following tables consider the development within this STW catchment that are located within Suffolk Coastal District, but also consider the development located within the STW catchment within the neighbouring Districts. For clarification the developments located outside Suffolk Coastal District are shown in Italics.

Suffolk Coastal District Residential Trajectories - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
ALDEST and TNESST	Aldeburgh and Thorpeness	0	0	0	0	0	0	0	37	15	18	18	16	15	12	14	12	10	10	10	10	10
ALDNST	Alderton	0	0	0	0	0	0	0	2	1	1	1	1	1	1	1	1	1	1	1	1	1
BENHST	Benhall (Saxmundham)	0	0	0	0	0	0	0	127	49	62	60	52	52	40	48	41	34	34	35	35	35
BLAXST	Blaxhall	0	0	0	0	0	0	0	5	2	3	3	2	2	2	2	2	1	1	1	1	1
CLQYST	Cliff Quay (Kesgrave, Rushmere)	0	0	0	0	0	0	0	400	157	197	192	174	164	128	150	131	109	109	109	109	109
CLQYST	*Various (Ipswich)*	*347*	*468*	*566*	*720*	*782*	*985*	*1233*	*1722*	*1181*	*682*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*
CLQYST	*SnOasis (Mid Suffolk)*	*0*	*0*	*0*	*0*	*0*	*0*	*116*	*139*	*139*	*139*	*143*	*143*	*143*	*143*	*143*	*20*	*20*	*20*	*20*	*20*	*20*
FELIST	Felixstowe and The Trimleys	0	0	0	0	0	0	0	27	11	14	13	12	11	8	10	8	7	7	7	7	7
GEDGST	Gedgrave (Orford)	0	0	0	0	0	0	0	3	1	2	2	1	1	1	1	1	1	1	1	1	1
GRUNST	Grundisburgh	0	0	0	0	0	0	0	7	3	4	4	3	3	2	2	2	2	2	2	2	2
HOLLST	Hollesley	0	0	0	0	0	0	0	6	3	3	3	3	2	2	2	2	2	2	2	2	2
KIRTST	Kirton	0	0	0	0	0	0	0	5	2	2	2	2	2	2	2	2	1	1	1	1	1
LEISST	Leiston	0	0	0	0	0	0	0	34	13	17	16	15	14	11	13	11	9	9	9	9	9
LEVIST	Levington	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MELTST	Melton	0	0	0	0	0	0	0	42	16	21	20	18	17	13	16	14	11	11	11	11	11
NACTST	Nacton	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OTLYST	Otley	0	0	0	0	0	0	0	8	3	4	4	3	3	3	3	3	2	2	2	2	2
RENDST	Rendlesham	0	0	0	0	0	0	0	88	34	43	41	38	35	27	33	27	23	23	23	23	23
SDBNST	Sudbourne	0	0	0	0	0	0	0	2	1	1	1	1	1	1	1	1	1	1	1	1	1
TUDLST	Tuddenham	0	0	0	0	0	0	0	5	2	2	2	2	2	2	2	2	1	1	1	1	1
WIMKST	Wickham Market	0	0	0	0	0	0	0	3	1	2	2	2	1	1	1	1	1	1	1	1	1
WODDST	Woodbridge and Martlesham	0	0	0	0	0	0	0	54	21	25	26	23	22	16	20	18	14	14	14	14	14
	TOTALS (*Suffolk Coastal only*)	**0**	**423**	**571**	**456**	**347**	**902**	**1150**	**857**	**337**	**423**	**412**	**370**	**350**	**274**	**323**	**281**	**232**	**232**	**233**	**233**	**233**
	TOTALS (*inc all CLQYST from outside Suffolk Coastal*)	**347**	**468**	**566**	**720**	**782**	**985**	**1349**	**2718**	**1657**	**1244**	**1325**	**1283**	**1263**	**1187**	**1236**	**1071**	**1022**	**1022**	**1023**	**1023**	**1023**

These trajectories have been adjusted to account for the transient holiday population. Anglian Water Services provided the Holiday Population Equivalence figures, which were subsequently adjusted to provide an estimate of increased dwelling numbers (based upon household size of 2.1) and added to the trajectory figures shown above:

Suffolk Coastal District Residential Trajectories Adjusted for Holiday Population - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
ALDEST and TNESST	Aldeburgh and Thorpeness	0	0	0	0	0	0	0	41	17	20	20	18	17	13	15	13	11	11	11	11	11
ALDNST	Alderton	0	0	0	0	0	0	0	3	1	1	1	1	1	1	1	1	1	1	1	1	1
BENHST	Benhall (Saxmundham)	0	0	0	0	0	0	0	140	55	69	67	58	58	45	53	46	38	38	39	39	39
BLAXST	Blaxhall	0	0	0	0	0	0	0	5	2	3	3	3	2	2	2	2	1	1	2	1	1
CLQYST	Cliff Quay (Kesgrave, Rushmere)	0	0	0	0	0	0	0	400	157	197	192	174	164	128	150	131	109	109	109	109	109
CLQYST	*Various (Ipswich)*	*347*	*468*	*566*	*720*	*782*	*985*	*1233*	*1722*	*1181*	*682*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*	*770*
CLQYST	*SnOasis (Mid Suffolk)*	*0*	*0*	*0*	*0*	*0*	*0*	*116*	*139*	*139*	*139*	*143*	*143*	*143*	*143*	*143*	*20*	*20*	*20*	*20*	*20*	*20*
FELIST	Felixstowe and The Trimleys	0	0	0	0	0	0	0	29	12	15	14	13	12	9	11	9	8	8	8	8	8
GEDGST	Gedgrave (Orford)	0	0	0	0	0	0	0	3	1	2	2	2	1	1	1	1	1	1	1	1	2
GRUNST	Grundisburgh	0	0	0	0	0	0	0	7	3	4	4	3	3	2	2	2	2	2	2	2	2
HOLLST	Hollesley	0	0	0	0	0	0	0	6	3	4	3	3	2	2	2	3	2	2	2	2	3
KIRTST	Kirton	0	0	0	0	0	0	0	5	2	2	2	2	2	2	2	2	1	1	1	1	1
LEISST	Leiston	0	0	0	0	0	0	0	36	14	18	17	16	15	12	14	12	10	10	10	10	10
LEVIST	Levington	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MELTST	Melton	0	0	0	0	0	0	0	42	16	21	20	18	17	13	16	14	11	11	11	11	11
NACTST	Nacton	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OTLYST	Otley	0	0	0	0	0	0	0	8	3	4	4	3	3	3	3	3	2	2	2	2	2
RENDST	Rendlesham	0	0	0	0	0	0	0	88	34	43	41	38	35	27	33	27	23	23	23	23	23
SDBNST	Sudbourne	0	0	0	0	0	0	0	2	1	1	1	1	1	1	1	1	1	1	1	1	1
TUDLST	Tuddenham	0	0	0	0	0	0	0	5	2	2	2	2	2	2	2	2	1	1	1	1	1
WIMKST	Wickham Market	0	0	0	0	0	0	0	3	1	2	2	2	1	1	1	1	1	1	1	1	1
WODDST	Woodbridge and martlesham	0	0	0	0	0	0	0	55	22	26	27	24	23	16	21	18	15	14	15	14	15
	TOTALS (*Suffolk Coastal only*)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**880**	**348**	**436**	**424**	**383**	**361**	**282**	**332**	**290**	**240**	**239**	**242**	**240**	**243**
	TOTALS (*inc all CLQYST from outside Suffolk Coastal)*	**347**	**468**	**566**	**720**	**782**	**985**	**1349**	**2741**	**1668**	**1257**	**1337**	**1296**	**1274**	**1195**	**1245**	**1080**	**1030**	**1029**	**1032**	**1030**	**1033**

RAW DATA – EMPLOYMENT

N.B None of the STWs within Suffolk Coastal District treat effluent from development outside the District boundaries. However, Cliff Quay STW is located in Ipswich Borough, but receives effluent produced by some of the proposed development within Suffolk Coastal District. The following tables consider the development within this STW catchment that are located within Suffolk Coastal District, but also consider the development located within the STW catchment within the neighbouring Districts. For clarification the developments located outside Suffolk Coastal District are shown in Italics.

Suffolk Coastal District Employment Trajectories – Hectares (ha)

Development	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Aldeburgh and Thorpeness	**ALDEST and TNESST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Various	**ALDNST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carlton Park	**BENHST**	0	0	0	0	0	0	0	1.06	1.06	1.06	0.98	1	1	1	1	0	0	0	0	0	0
Rendham Road	**BENHST**	0	0	0	0	0	0	0	1.62	1.6	1.6	0	0	0	0	0	0	0	0	0	0	0
Snape Maltings, Tunstall	**BLAXST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.83	0.84	0.84	0.84	0.84	0.83
Small Sites (Kesgrave and Rushmere)	**CLQYST**	0	0	0	0	0	0	0	0.24	0.22	0.22	0	0	0	0	0	0	0	0	0	0	0
Snoasis	***CLQYST***	0	0	0	0	0	0	0	0	0	0	*0.26*	*0.26*	*0.26*	*0.26*	*0.29*	0	0	0	0	0	0
Orion Business Park, Gt. Blakenham	***CLQYST***	0	0	0	0	0	0	0	0	0	0	*0.5*	*0.5*	*0.5*	*0.5*	*0.57*	0	0	0	0	0	0
Bath Street	***CLQYST***	0	0	0	0	0	0	0	*1.47*	*1.47*	*1.48*	0	0	0	0	0	0	0	0	0	0	0
Cliff Quay	***CLQYST***	0	0	0	0	0	0	0	*1.4*	*1.4*	*1.4*	*0.62*	*0.5*	*0.5*	*0.5*	*0.5*	0	0	0	0	0	0
Bell Terminal	***CLQYST***	0	0	0	0	0	0	0	*3.78*	*3.77*	*3.77*	0	0	0	0	0	0	0	0	0	0	0
Other sites	***CLQYST***	0	0	0	0	0	0	0	*2.07*	*2.07*	*2.069*	0	0	0	0	0	0	0	0	0	0	0
White House Ind Est	***CLQYST***	0	0	0	0	0	0	0	*0.2*	*0.2*	*0.2*	0	0	0	0	0	0	0	0	0	0	0
Eastway BP	***CLQYST***	0	0	0	0	0	0	0	*0.67*	*0.67*	*0.66*	0	0	0	0	0	0	0	0	0	0	0
Hadleigh Road Ind Est	***CLQYST***	0	0	0	0	0	0	0	*0.48*	*0.48*	*0.47*	*1.57*	*1.5*	*1.5*	*1.5*	*1.5*	0	0	0	0	0	0
Greenwich Cl, Landseer Rd, Cliff Q, Sandy Hill, Raeburn Rd	***CLQYST***	0	0	0	0	0	0	0	*1.24*	*1.24*	*1.24*	*1.34*	*1.34*	*1.34*	*1.34*	*1.32*	0	0	0	0	0	0
Ransomes	***CLQYST***	0	0	0	0	0	0	0	*4.1*	*4.1*	*4*	*2.92*	*2.92*	*2.92*	*2.92*	*2.92*	0	0	0	0	0	0
Cranes	***CLQYST***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*2.79*	*2.79*	*2.79*	*2.79*	*2.79*	*2.79*
Elton Park	***CLQYST***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*0.55*	*0.55*	*0.55*	*0.55*	*0.55*	*0.55*
Dales Road	***CLQYST***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Norsk Hydro	***CLQYST***	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*	*1.1*
Scotts Site	***CLQYST***	0	0	0	0	0	0	0	*0*	*0*	*0*	0	0	0	0	0	0	0	0	0	0	0
Babergh	***CLQYST***	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*6.9*	*6.9*	*6.9*	*6.9*	*6.9*	*6.9*
Bridge Rd	**FELIST**	0	0	0	0	0	0	0	0	0	0	0.16	0.14	0.14	0.14	0.14	0	0	0	0	0	0
Trinity Ave	**FELIST**	0	0	0	0	0	0	0	10.4	10.4	10.36	11.39	11.3	11.3	11.3	11.3	0	0	0	0	0	0
Bus Station	**FELIST**	0	0	0	0	0	0	0	0	0	0	0.37	0.38	0.38	0.38	0.38	0	0	0	0	0	0
Carr Road	**FELIST**	0	0	0	0	0	0	0	0.36	0.36	0.36	2.52	2.5	2.5	2.5	2.5	0	0	0	0	0	0
Port	**FELIST**	0	0	0	0	0	0	0	0	0	0	71.06	71.06	71.06	71.06	71.06	0	0	0	0	0	0
Small sites	**FELIST**	0	0	0	0	0	0	0	0.2	0.2	0.18	0	0	0	0	0	0	0	0	0	0	0
Various	**GEDGST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grundisburgh	**GRUNST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Various	**HOLLST**	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0
Various	**KIRTST**	0	0	0	0	0	0	0	0.2	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0
Masterlords	**LEISST**	0	0	0	0	0	0	0	0.35	0.35	0.33	1.17	1.13	1.13	1.13	1.13	0	0	0	0	0	0
Eastlands	**LEISST**	0	0	0	0	0	0	0	0.56	0.56	0.57	1.19	1.1	1.1	1.1	1	0	0	0	0	0	0
Abbey Road	**LEISST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.36	0.4	0.4	0.4	0.4	0.4
Levington Park	**LEVIST**	0	0	0	0	0	0	0	0.38	0.38	0.38	0.43	0.43	0.43	0.43	0.43	0	0	0	0	0	0
Small sites	**MELTST**	0	0	0	0	0	0	0	0.04	0.04	0.03	0	0	0	0	0	0	0	0	0	0	0
Wilford bridge	**MELTST**	0	0	0	0	0	0	0	1.18	1.18	1.18	1.36	1.35	1.35	1.35	1.35	0	0	0	0	0	0
Ransomes Europark	**NACTST**	0	0	0	0	0	0	0	4.8	4.8	4.7	0.9	0.69	0.9	0.9	0.9	0	0	0	0	0	0
Small sites	**NACTST**	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0

Development	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Clopton Commercial Pk	**OTLYST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.45	1.5	1.5	1.5	1.5	1.5
Former RAF Bentwaters	**RENDST**	0	0	0	0	0	0	0	0	0	0	4.39	4.39	4.39	4.39	4.39	0	0	0	0	0	0
Various	**SDBNST**	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuddenham	**TUDLST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Border Cot Lane	**WIMKST**	0	0	0	0	0	0	0	0.02	0.02	0.02	0.42	0.39	0.39	0.39	0.39	0	0	0	0	0	0
Small Sites	**WIMKST**	0	0	0	0	0	0	0	0.02	0.01	0.01	0	0	0	0	0	0	0	0	0	0	0
Melton Road	**WODDST**	0	0	0	0	0	0	0	1.26	1.26	1.26	1.52	1.51	1.51	1.51	1.51	0	0	0	0	0	0
Tide Mill Way	**WODDST**	0	0	0	0	0	0	0	0.15	0.14	0.14	0.18	0.16	0.16	0.16	0.16	0	0	0	0	0	0
Lime Kiln Way	**WODDST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.29	0.27	0.27	0.27	0.27	0.27
Sandy Lane, Martlesham	**WODDST**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.65	0.6	0.6	0.6	0.6	0.6
Martlesham Heath	**WODDST**	0	0	0	0	0	0	0	1.41	1.4	1.4	5.89	5.85	5.85	5.85	5.85	0	0	0	0	0	0
Suffolk Inn Pk	**WODDST**	0	0	0	0	0	0	0	4.56	4.55	4.55	8.34	8.2	8.2	8.2	8.2	0	0	0	0	0	0
Small sites	**WODDST**	0	0	0	0	0	0	0	0.17	0.16	0.16	0	0	0	0	0	0	0	0	0	0	0
	TOTALS (*Suffolk Coastal only*)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**30.02**	**30.29**	**29.81**	**112.27**	**111.58**	**111.79**	**111.79**	**111.69**	**3.58**	**3.61**	**3.61**	**3.61**	**3.61**	**3.6**
	TOTALS *(inc all CLQYST from outside Suffolk Coastal)*	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**45.43**	**45.69**	**45.099**	**119.48**	**118.6**	**118.81**	**118.81**	**118.79**	**15.02**	**15.05**	**15.05**	**15.05**	**15.05**	**15.04**

Suffolk Coastal District Employment Trajectories, Grouped by STW – Hectares (ha)

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
ALDEST and TNESST	Aldeburgh and Thorpeness	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALDNST	Alderton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BENHST	Benhall (Saxmundham)	0	0	0	0	0	0	0	2.68	2.66	2.66	0.98	1	1	1	1	0	0	0	0	0	0
BLAXST	Blaxhall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.83	0.84	0.84	0.84	0.84	0.83
CLQYST*	All Development in Suffolk Coastal, Babergh, Ipswich and Mid Suffolk	0	0	0	0	0	0	0	15.65	15.62	15.509	7.21	7.02	7.02	7.02	7.1	11.44	11.44	11.44	11.44	11.44	11.44
FELIST	Felixstowe and The Trimleys	0	0	0	0	0	0	0	10.96	10.96	10.9	85.5	85.38	85.38	85.38	85.38	0	0	0	0	0	0
GEDGST	Gedgrave (Orford)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRUNST	Grundisburgh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HOLLST	Hollesley	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0
KIRTST	Kirton	0	0	0	0	0	0	0	0.2	0.2	0.3	0	0	0	0	0	0	0	0	0	0	0
LEISST	Leiston	0	0	0	0	0	0	0	0.91	0.91	0.9	2.36	2.23	2.23	2.23	2.13	0.36	0.4	0.4	0.4	0.4	0.4
LEVIST	Levington	0	0	0	0	0	0	0	0.38	0.38	0.38	0.43	0.43	0.43	0.43	0.43	0	0	0	0	0	0
MELTST	Melton	0	0	0	0	0	0	0	1.22	1.22	1.21	1.36	1.35	1.35	1.35	1.35	0	0	0	0	0	0
NACTST	Nacton	0	0	0	0	0	0	0	5.8	5.8	5.7	0.9	0.69	0.9	0.9	0.9	0	0	0	0	0	0
OTLYST	Otley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.45	1.5	1.5	1.5	1.5	1.5
RENDST	Rendlesham	0	0	0	0	0	0	0	0	0	0	4.39	4.39	4.39	4.39	4.39	0	0	0	0	0	0
SDBNST	Sudbourne	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0
TUDLST	Tuddenham	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WIMKST	Wickham Market	0	0	0	0	0	0	0	0.04	0.03	0.03	0.42	0.39	0.39	0.39	0.39	0	0	0	0	0	0
WODDST	Woodbridge and Martlesham	0	0	0	0	0	0	0	7.55	7.51	7.51	15.93	15.72	15.72	15.72	15.72	0.94	0.87	0.87	0.87	0.87	0.87
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**45.43**	**45.69**	**45.099**	**119.48**	**118.6**	**118.81**	**118.81**	**118.79**	**15.02**	**15.05**	**15.05**	**15.05**	**15.05**	**15.04**

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Suffolk Coastal District.*

STW CAPACITIES - RESIDENTIAL

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses **x** Average number of people per house) **x** design flow for residential development per capita) **+** (average infiltration per capita **x** (Predicted number of houses **x** Average number of people per house)) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day

Suffolk Coastal District DWF Calculations – Residential Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
ALDEST and TNESST	Aldeburgh and Thorpeness	1196	841	355	29.7	847.60	348.40	29.1	855.37	340.63	28.5	863.14	332.86	27.8	870.14	325.86	27.2	876.74	319.26	26.7	881.79	314.21	26.3
ALDNST	Alderton	82	52	30	36.6	52.39	29.61	36.1	52.78	29.22	35.6	53.17	28.83	35.2	53.55	28.45	34.7	53.94	28.06	34.2	54.33	27.67	33.7
BENHST	Benhall (Saxmundham)	1500	919	581	38.7	940.37	559.63	37.3	967.17	532.83	35.5	993.20	506.80	33.8	1015.74	484.26	32.3	1038.27	461.73	30.8	1055.75	444.25	29.6
BLAXST	Blaxhall	159	52	107	67.3	52.78	106.22	66.8	53.94	105.06	66.1	55.11	103.89	65.3	56.27	102.73	64.6	57.05	101.95	64.1	57.83	101.17	63.6
CLQYST*	Cliff Quay (Kesgrave, Rushmere)	34,213	24624	9589	28.0	25198	9015.2	26.4	25593	8619.7	25.2	26023	8190.4	23.9	26445	7768.1	22.7	26863	7349.69	21.5	27268	6945.3	20.3
FELIST	Felixstowe and The Trimleys	9,229	6356	2873	31.1	6360.66	2868.34	31.1	6366.49	2862.51	31.0	6371.93	2857.07	31.0	6376.98	2852.02	30.9	6381.64	2847.36	30.9	6385.14	2843.86	30.8
GEDGST	Gedgrave (Orford)	140	157	-17	-12.1	157.39	-17.39	-12.4	158.17	-18.17	-13.0	158.94	-18.94	-13.5	159.72	-19.72	-14.1	160.11	-20.11	-14.4	160.50	-20.50	-14.6
GRUNST	Grundisburgh	200	288	-88	-44.0	289.17	-89.17	-44.6	290.72	-90.72	-45.4	292.27	-92.27	-46.1	293.44	-93.44	-46.7	294.60	-94.60	-47.3	295.38	-95.38	-47.7
HOLLST	Hollesley	1,400	334	1066	76.1	335.17	1064.83	76.1	336.72	1063.28	75.9	337.89	1062.12	75.9	339.05	1060.95	75.8	339.83	1060.17	75.7	340.60	1059.40	75.7
KIRTST	Kirton	370	149	221	59.7	149.78	220.22	59.5	150.55	219.45	59.3	151.33	218.67	59.1	152.11	217.89	58.9	152.89	217.12	58.7	153.66	216.34	58.5
LEISST	Leiston	1,400	585	815	58.2	590.44	809.56	57.8	597.43	802.57	57.3	604.04	795.96	56.9	610.25	789.75	56.4	616.08	783.92	56.0	620.74	779.26	55.7
LEVIST	Levington	22	36	-14	-63.6	36.39	-14.39	-65.4	36.78	-14.78	-67.2	37.17	-15.17	-68.9	37.55	-15.55	-70.7	37.94	-15.94	-72.5	38.33	-16.33	-74.2
MELTST	Melton	950	987	-37	-3.9	993.22	-43.22	-4.5	1001.37	-51.37	-5.4	1009.14	-59.14	-6.2	1016.14	-66.14	-7.0	1022.74	-72.74	-7.7	1027.79	-77.79	-8.2
NACTST	Nacton	N/A	15	*no data*	*no data*	15.39	*no data*	*no data*	15.78	*no data*	*no data*	16.17	*no data*	*no data*	16.55	*no data*	*no data*	16.94	*no data*	*no data*	17.33	*no data*	*no data*
OTLYST	Otley	159	57	102	64.2	58.17	100.83	63.4	59.72	99.28	62.4	61.27	97.73	61.5	62.44	96.56	60.7	63.60	95.40	60.0	64.77	94.23	59.3
RENDST	Rendlesham	646	258	387.5	60.0	271.21	374.29	58.0	287.91	357.59	55.4	303.84	341.66	52.9	318.61	326.89	50.6	332.20	313.30	48.5	342.69	302.81	46.9
SDBNST	Sudbourne	50	42	8	16.0	42.39	7.61	15.2	42.78	7.22	14.4	43.17	6.83	13.7	43.55	6.45	12.9	43.94	6.06	12.1	44.33	5.67	11.3
TUDLST	Tuddenham	288	198	90	31.3	198.78	89.22	31.0	199.55	88.45	30.7	200.33	87.67	30.4	201.11	86.89	30.2	201.89	86.12	29.9	202.66	85.34	29.6
WIMKST	Wickham Market	580	307	273	47.1	307.39	272.61	47.0	308.17	271.83	46.9	308.94	271.06	46.7	309.72	270.28	46.6	310.11	269.89	46.5	310.50	269.50	46.5
WODDST	Woodbridge and Martlesham	4,800	2288	2512	52.3	2296.55	2503.45	52.2	2306.65	2493.35	51.9	2317.14	2482.86	51.7	2326.46	2473.54	51.5	2335.40	2464.60	51.3	2341.61	2458.39	51.2

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
ALDEST and TNESST	Aldeburgh and Thorpeness	1196	887.62	308.38	25.8	892.67	303.33	25.4	896.94	299.06	25.0	901.22	294.78	24.6	905.49	290.51	24.3	909.76	286.24	23.9	914.04	281.96	23.6
ALDNST	Alderton	82	54.72	27.28	33.3	55.11	26.89	32.8	55.50	26.50	32.3	55.89	26.12	31.8	56.27	25.73	31.4	56.66	25.34	30.9	57.05	24.95	30.4
BENHST	Benhall (Saxmundham)	1500	1076.34	423.66	28.2	1094.21	405.79	27.1	1108.98	391.02	26.1	1123.74	376.26	25.1	1138.89	361.11	24.1	1154.04	345.96	23.1	1169.19	330.81	22.1
BLAXST	Blaxhall	159	58.60	100.40	63.1	59.38	99.62	62.7	59.77	99.23	62.4	60.16	98.84	62.2	60.94	98.06	61.7	61.32	97.68	61.4	61.71	97.29	61.2
CLQYST*	Cliff Quay (Kesgrave, Rushmere)	34,213	27681	6532.3	19.1	28039	6174.5	18.0	28388	5825.2	17.0	28737	5476	16.0	29086	5126.7	15.0	29436	4777.43	14.0	29785	4428.17	12.9
FELIST	Felixstowe and The Trimleys	9,229	6389.41	2839.59	30.8	6392.91	2836.09	30.7	6396.02	2832.98	30.7	6399.12	2829.88	30.7	6402.23	2826.77	30.6	6405.34	2823.66	30.6	6408.45	2820.55	30.6
GEDGST	Gedgrave (Orford)	140	160.89	-20.88	-14.9	161.27	-21.27	-15.2	161.66	-21.66	-15.5	162.05	-22.05	-15.8	162.44	-22.44	-16.0	162.83	-22.83	-16.3	163.60	-23.60	-16.9
GRUNST	Grundisburgh	200	296.16	-96.16	-48.1	296.94	-96.94	-48.5	297.71	-97.71	-48.9	298.49	-98.49	-49.2	299.27	-99.27	-49.6	300.04	-100.04	-50.0	300.82	-100.82	-50.4
HOLLST	Hollesley	1,400	341.38	1058.62	75.6	342.55	1057.45	75.5	343.32	1056.68	75.5	344.10	1055.90	75.4	344.88	1055.12	75.4	345.66	1054.35	75.3	346.82	1053.18	75.2
KIRTST	Kirton	370	154.44	215.56	58.3	155.22	214.78	58.0	155.60	214.40	57.9	155.99	214.01	57.8	156.38	213.62	57.7	156.77	213.23	57.6	157.16	212.84	57.5
LEISST	Leiston	1,400	626.18	773.82	55.3	630.84	769.16	54.9	634.73	765.27	54.7	638.61	761.39	54.4	642.50	757.50	54.1	646.38	753.62	53.8	650.27	749.73	53.6
LEVIST	Levington	22	38.72	-16.72	-76.0	39.11	-17.11	-77.8	39.50	-17.50	-79.5	39.89	-17.89	-81.3	40.27	-18.27	-83.1	40.66	-18.66	-84.8	41.05	-19.05	-86.6
MELTST	Melton	950	1034.01	-84.01	-8.8	1039.45	-89.45	-9.4	1043.72	-93.72	-9.9	1047.99	-97.99	-10.3	1052.27	-102.27	-10.8	1056.54	-106.54	-11.2	1060.82	-110.82	-11.7
NACTST	Nacton	N/A	17.72	*no data*	*no data*	18.11	*no data*	*no data*	18.50	*no data*	*no data*	18.89	*no data*	*no data*	19.27	*no data*	*no data*	19.66	*no data*	*no data*	20.05	*no data*	*no data*
OTLYST	Otley	159	65.94	93.06	58.5	67.10	91.90	57.8	67.88	91.12	57.3	68.66	90.35	56.8	69.43	89.57	56.3	70.21	88.79	55.8	70.99	88.01	55.4
RENDST	Rendlesham	646	355.51	289.99	44.9	366.00	279.50	43.3	374.94	270.56	41.9	383.87	261.63	40.5	392.81	252.69	39.1	401.75	243.76	37.8	410.68	234.82	36.4
SDBNST	Sudbourne	50	44.72	5.28	10.6	45.11	4.89	9.8	45.50	4.50	9.0	45.89	4.11	8.2	46.27	3.73	7.5	46.66	3.34	6.7	47.05	2.95	5.9
TUDLST	Tuddenham	288	203.44	84.56	29.4	204.22	83.78	29.1	204.60	83.40	29.0	204.99	83.01	28.8	205.38	82.62	28.7	205.77	82.23	28.6	206.16	81.84	28.4
WIMKST	Wickham Market	580	310.89	269.12	46.4	311.27	268.73	46.3	311.66	268.34	46.3	312.05	267.95	46.2	312.44	267.56	46.1	312.83	267.17	46.1	313.22	266.78	46.0
WODDST	Woodbridge and Martlesham	4,800	2349.77	2450.23	51.0	2356.76	2443.24	50.9	2362.59	2437.41	50.8	2368.03	2431.97	50.7	2373.86	2426.14	50.5	2379.30	2420.70	50.4	2385.13	2414.88	50.3

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Suffolk Coastal District.*

STW CAPACITIES - RESIDENTIAL and EMPLOYMENT

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** (Predicted employment area ***x*** design flow for industrial domestic effluent) **+** (Predicted employment area ***x*** design flow for industrial trade effluent) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population'*
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day
Predicted employment area = Figures in table of '*Employment Trajectories Grouped by STW*'
Design flow for industrial domestic effluent = 46.656m³/ha developable land/day
Design flow for industrial trade effluent = 58.752m³/ha developable land/day

Suffolk Coastal District DWF Calculations – Residential and Employment Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
ALDEST and TNESST	Aldeburgh and Thorpeness	1196	841	355	29.7	847.60	348.40	29.1	855.37	340.63	28.5	863.14	332.86	27.8	870.14	325.86	27.2	876.74	319.26	26.7	881.79	314.21	26.3
ALDNST	Alderton	82	**52**	30	36.6	52.39	29.61	36.1	52.78	29.22	35.6	53.17	28.83	35.2	53.55	28.45	34.7	53.94	28.06	34.2	54.33	27.67	33.7
BENHST	Benhall (Saxmundham)	1500	**919**	581	38.7	1220.75	279.25	18.6	1527.94	-27.94	-1.9	1657.27	-157.27	-10.5	1785.21	-285.21	-19.0	1913.16	-413.16	-27.5	2036.05	-536.05	-35.7
BLAXST	Blaxhall	159	**52**	107	67.3	52.78	106.22	66.8	53.94	105.06	66.1	55.11	103.89	65.3	56.27	102.73	64.6	57.05	101.95	64.1	57.83	101.17	63.6
CLQYST*	Cliff Quay (Kesgrave, Rushmere)	34,213	**24624**	9589	28.0	26844	7368.7	21.5	28875	5338.4	15.6	30064	4149.2	12.1	31226	2986.9	8.7	32384	1828.52	5.3	33529	684.13	2.0
FELIST	Felixstowe and The Trimleys	9,229	**6356**	2873	31.1	7515.93	1713.07	18.6	8670.71	558.29	6.0	17688.5	-8459.53	-91.7	26693.3	-17464.3	-189.2	35697.7	-26468.7	-286.8	44700.9	-35471.9	-384.4
GEDGST	Gedgrave (Orford)	140	**157**	-17	-12.1	157.39	-17.39	-12.4	158.17	-18.17	-13.0	158.94	-18.94	-13.5	159.72	-19.72	-14.1	160.11	-20.11	-14.4	160.50	-20.50	-14.6
GRUNST	Grundisburgh	200	**288**	-88	-44.0	289.17	-89.17	-44.6	290.72	-90.72	-45.4	292.27	-92.27	-46.1	293.44	-93.44	-46.7	294.60	-94.60	-47.3	295.38	-95.38	-47.7
HOLLST	Hollesley	1,400	**334**	1066	76.1	377.33	1022.67	73.0	378.88	1021.12	72.9	380.05	1019.95	72.9	381.21	1018.79	72.8	381.99	1018.01	72.7	382.77	1017.23	72.7
KIRTST	Kirton	370	**149**	221	59.7	170.86	199.14	53.8	203.26	166.74	45.1	204.04	165.97	44.9	204.81	165.19	44.6	205.59	164.41	44.4	206.37	163.63	44.2
LEISST	Leiston	1,400	**585**	815	58.2	686.36	713.64	51.0	788.22	611.78	43.7	1043.59	356.41	25.5	1284.86	115.14	8.2	1525.75	-125.75	-9.0	1765.47	-365.47	-26.1
LEVIST	Levington	22	36	-14	-63.6	76.44	-54.44	-247.5	116.89	-94.89	-431.3	162.60	-140.60	-639.1	208.31	-186.31	-846.9	254.03	-232.03	-1054.7	299.74	-277.74	-1262.5
MELTST	Melton	950	**987**	-37	-3.9	1121.81	-171.81	-18.1	1257.52	-307.52	-32.4	1408.64	-458.64	-48.3	1557.93	-607.93	-64.0	1706.84	-756.84	-79.7	1854.19	-904.19	-95.2
NACTST	Nacton	N/A	15	*no data*	*no data*	626.75	*no data*	*no data*	1227.97	*no data*	*no data*	1323.22	*no data*	*no data*	1396.34	*no data*	*no data*	1491.60	*no data*	*no data*	1586.86	*no data*	*no data*
OTLYST	Otley	159	**57**	102	64.2	58.17	100.83	63.4	59.72	99.28	62.4	61.27	97.73	61.5	62.44	96.56	60.7	63.60	95.40	60.0	64.77	94.23	59.3
RENDST	Rendlesham	646	**258**	387.5	60.0	271.21	374.29	58.0	287.91	357.59	55.4	766.58	-121.08	-18.8	1244.09	-598.59	-92.7	1720.43	-1074.93	-166.5	2193.66	-1548.16	-239.8
SDBNST	Sudbourne	50	42	8	16.0	42.39	7.61	15.2	42.78	7.22	14.4	43.17	6.83	13.7	43.55	6.45	12.9	43.94	6.06	12.1	44.33	5.67	11.3
TUDLST	Tuddenham	288	198	90	31.3	198.78	89.22	31.0	199.55	88.45	30.7	200.33	87.67	30.4	201.11	86.89	30.2	201.89	86.12	29.9	202.66	85.34	29.6
WIMKST	Wickham Market	580	**307**	273	47.1	310.55	269.45	46.5	314.49	265.51	45.8	359.54	220.46	38.0	401.42	178.58	30.8	442.92	137.08	23.6	484.42	95.58	16.5
WODDST	Woodbridge and Martlesham	4,800	**2288**	2512	52.3	3088.16	1711.84	35.7	3889.88	910.12	19.0	5579.52	-779.52	-16.2	7245.85	-2445.85	-51.0	8911.80	-4111.80	-85.7	10575.0	-5775.03	-120.3

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%	m^3 / day	m^3 / day	%
ALDEST and TNESST	Aldeburgh and Thorpeness	1196	887.62	308.38	25.8	892.67	303.33	25.4	896.94	299.06	25.0	901.22	294.78	24.6	905.49	290.51	24.3	909.76	286.24	23.9	914.04	281.96	23.6
ALDNST	Alderton	82	54.72	27.28	33.3	55.11	26.89	32.8	55.50	26.50	32.3	55.89	26.12	31.8	56.27	25.73	31.4	56.66	25.34	30.9	57.05	24.95	30.4
BENHST	Benhall (Saxmundham)	1500	2162.04	-662.04	-44.1	2179.92	-679.92	-45.3	2194.68	-694.68	-46.3	2209.44	-709.44	-47.3	2224.59	-724.59	-48.3	2239.74	-739.74	-49.3	2254.90	-754.90	-50.3
BLAXST	Blaxhall	159	58.60	100.40	63.1	146.87	12.13	7.6	235.80	-76.80	-48.3	324.73	-165.73	-104.2	414.05	-255.05	-160.4	502.98	-343.98	-216.3	590.86	-431.86	-271.6
CLQYST*	Cliff Quay (Kesgrave, Rushmere)	34,213	34690	-477.2	-1.4	36254	-2041	-6.0	37809	-3596	-10.5	39364	-5151	-15.1	40919	-6706	-19.6	42474	-8261.4	-24.1	44030	-9816.57	-28.7
FELIST	Felixstowe and The Trimleys	9,229	53704.9	-44475.9	-481.9	53708.4	-44479.4	-482.0	53711.5	-44482.5	-482.0	53714.6	-44485.6	-482.0	53717.7	-44488.7	-482.1	53720.8	-44491.8	-482.1	53723.9	-44494.9	-482.1
GEDGST	Gedgrave (Orford)	140	160.89	-20.88	-14.9	161.27	-21.27	-15.2	161.66	-21.66	-15.5	162.05	-22.05	-15.8	162.44	-22.44	-16.0	162.83	-22.83	-16.3	163.60	-23.60	-16.9
GRUNST	Grundisburgh	200	296.16	-96.16	-48.1	296.94	-96.94	-48.5	297.71	-97.71	-48.9	298.49	-98.49	-49.2	299.27	-99.27	-49.6	300.04	-100.04	-50.0	300.82	-100.82	-50.4
HOLLST	Hollesley	1,400	383.54	1016.46	72.6	384.71	1015.29	72.5	385.49	1014.51	72.5	386.26	1013.74	72.4	387.04	1012.96	72.4	387.82	1012.18	72.3	388.98	1011.02	72.2
KIRTST	Kirton	370	207.14	162.86	44.0	207.92	162.08	43.8	208.31	161.69	43.7	208.70	161.30	43.6	209.09	160.91	43.5	209.47	160.53	43.4	209.86	160.14	43.3
LEISST	Leiston	1,400	1995.43	-595.43	-42.5	2038.04	-638.04	-45.6	2084.09	-684.09	-48.9	2130.14	-730.14	-52.2	2176.18	-776.18	-55.4	2222.23	-822.23	-58.7	2268.28	-868.28	-62.0
LEVIST	Levington	22	345.46	-323.46	-1470.3	345.85	-323.85	-1472.0	346.23	-324.23	-1473.8	346.62	-324.62	-1475.6	347.01	-325.01	-1477.3	347.40	-325.40	-1479.1	347.79	-325.79	-1480.9
MELTST	Melton	950	2002.71	-1052.71	-110.8	2008.15	-1058.15	-111.4	2012.42	-1062.42	-111.8	2016.69	-1066.69	-112.3	2020.97	-1070.97	-112.7	2025.24	-1075.24	-113.2	2029.51	-1079.51	-113.6
NACTST	Nacton	N/A	1682.11	*no data*	*no data*	1682.50	*no data*	*no data*	1682.89	*no data*	*no data*	1683.28	*no data*	*no data*	1683.67	*no data*	*no data*	1684.05	*no data*	*no data*	1684.44	*no data*	*no data*
OTLYST	Otley	159	65.94	93.06	58.5	219.94	-60.94	-38.3	378.83	-219.83	-138.3	537.72	-378.72	-238.2	696.61	-537.61	-338.1	855.50	-696.50	-438.0	1014.39	-855.39	-538.0
RENDST	Rendlesham	646	2669.22	-2023.72	-313.5	2679.71	-2034.21	-315.1	2688.64	-2043.14	-316.5	2697.58	-2052.08	-317.9	2706.52	-2061.02	-319.3	2715.45	-2069.95	-320.7	2724.39	-2078.89	-322.1
SDBNST	Sudbourne	50	44.72	5.28	10.6	45.11	4.89	9.8	45.50	4.50	9.0	45.89	4.11	8.2	46.27	3.73	7.5	46.66	3.34	6.7	47.05	2.95	5.9
TUDLST	Tuddenham	288	203.44	84.56	29.4	204.22	83.78	29.1	204.60	83.40	29.0	204.99	83.01	28.8	205.38	82.62	28.7	205.77	82.23	28.6	206.16	81.84	28.4
WIMKST	Wickham Market	580	525.92	54.08	9.3	526.31	53.69	9.3	526.69	53.31	9.2	527.08	52.92	9.1	527.47	52.53	9.1	527.86	52.14	9.0	528.25	51.75	8.9
WODDST	Woodbridge and Martlesham	4,800	12240.2	-7440.20	-155.0	12346.2	-7546.28	-157.2	12443.8	-7643.81	-159.2	12540.9	-7740.96	-161.3	12638.4	-7838.49	-163.3	12735.6	-7935.63	-165.3	12833.1	-8033.17	-167.4

**NB, the totals for Cliff Quay STW include all the development located within the Cliff Quay catchment and not just those located within Suffolk Coastal District.*

TENDRING DISTRICT TRAJECTORIES

RAW DATA – RESIDENTIAL

N.B None of the STWs within Tendring District treat effluent from development outside the District boundaries. Similarly, all the effluent produced by the proposed development within Tendring District will be treated by the STWs within its boundaries.

Tendring District Residential Trajectories - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BRIMST/BRICST	Brightlingsea								34	26	20	20	13	13	13	13	13	13	13	13	13	13
CLACST	Clacton								143	107	145	145	146	146	146	146	146	146	146	146	146	146
GBROST	Great Bromley								0	0	0	0	0	0	0	0	0	0	0	0	0	0
HDOVST	Harwich and Dovercourt								93	71	100	100	133	133	133	133	133	133	133	133	133	133
JAYNST	Jaywick								44	34	0	0	133	133	133	133	133	133	133	133	133	133
MANNST	Lawford, Manningree and Mistley								43	33	10	10	20	20	20	20	20	20	20	20	20	20
SOSYST	St Osyth								65	49	10	10	0	0	0	0	0	0	0	0	0	0
THORST	Thorrington								0	0	6	6	0	0	0	0	0	0	0	0	0	0
WALTST	Frinton and Walton								66	50	50	50	46	46	46	46	46	46	46	46	46	46
WIXXST	Wix								7	6	7	7	0	0	0	0	0	0	0	0	0	0
	TOTALS		**459**	**407**	**253**	**420**	**557**	**556**	**495**	**376**	**348**	**348**	**491**	**491**	**491**	**491**	**491**	**491**	**491**	**491**	**491**	**491**

These trajectories have been adjusted to account for the transient holiday population. Anglian Water Services provided the Holiday Population Equivalence figures, which were subsequently adjusted to provide an estimate of increased dwelling numbers (based upon household size of 2.1) and added to the trajectory figures shown above:

Tendring District Residential Trajectories Adjusted for Holiday Population - Dwellings

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BRIMST/BRICST	Brightlingsea								35	28	21	21	14	14	14	14	14	14	14	14	14	14
CLACST	Clacton								155	126	159	157	157	157	157	157	157	157	157	157	157	157
GBROST	Great Bromley								0	0	0	0	0	0	0	0	0	0	0	0	0	0
HDOVST	Harwich and Dovercourt								99	80	107	106	138	138	138	138	138	138	138	138	138	138
JAYNST	Jaywick								47	39	4	3	136	136	136	136	136	136	136	136	136	136
MANNST	Lawford, Manningree and Mistley								44	34	11	11	21	21	21	21	21	21	21	21	21	20
SOSYST	St Osyth								87	84	35	32	21	21	21	21	21	21	21	21	21	21
THORST	Thorington								0	0	6	6	0	0	0	0	0	0	0	0	0	0
WALTST	Frinton and Walton								75	63	60	59	54	54	54	54	54	54	54	54	54	54
WIXXST	Wix								8	6	7	7	0	1	0	0	0	0	1	0	0	0
	TOTALS		**459**	**407**	**253**	**420**	**557**	**556**	**558**	**465**	**415**	**407**	**554**	**555**	**554**	**554**	**554**	**554**	**555**	**554**	**554**	**553**

RAW DATA – EMPLOYMENT

N.B None of the STWs within Tendring District treat effluent from development outside the District boundaries. Similarly, all the effluent produced by the proposed development within Tendring District will be treated by the STWs within its boundaries.

Tendring District Employment Trajectories – Hectares (ha)

Development	STW	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Fiveways	BRIMST/BRICST	0	0	0	0	0	0	0	0	0	0	0.38	0.38	0.38	0.38	0.37	0	0	0	0	0	0
Morses Lane Ind Est	BRIMST/BRICST	0	0	0	0	0	0	0	0	0	0	0.15	0.15	0.15	0.15	0.18	0	0	0	0	0	0
Oakwood & Gorse Lane Estate	CLACST	0	0	0	0	0	0	0	3.02	3.02	3.03	0	0	0	0	0	0	0	0	0	0	0
Centenary Way	CLACST	0	0	0	0	0	0	0	0	0	0	0.8	0.83	0.83	0.83	0.83	0	0	0	0	0	0
Frating	GBROST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.5	4.5	4.5	4.5	4.5	4.5
Station Road, Parkeston	HDOVST	0	0	0	0	0	0	0	0	0	0	1.2	1.2	1.2	1.2	1.2	0	0	0	0	0	0
NE Stanton Europark	HDOVST	0	0	0	0	0	0	0	0	0	0	0.33	0.33	0.33	0.33	0.31	0	0	0	0	0	0
Bathside Bay	HDOVST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	20	20	20	20	20
Pond Hall Farm	HDOVST	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.5	4.5	4.5	4.5	4.5	4.5
Lawford Ind Est	MANNST	0	0	0	0	0	0	0	0.88	0.88	0.87	0	0	0	0	0	0	0	0	0	0	0
Great Bentley	THORST	0	0	0	0	0	0	0	0	0	0	0.18	0.18	0.18	0.18	0.22	0	0	0	0	0	0
Kirkby Cross	WALTST	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.07	0	0	0	0	0	0	0
Paskell's Timber Yard	WIXXST	0	0	0	0	0	0	0	0.12	0.12	0.13	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4.02**	**4.02**	**4.03**	**3.14**	**3.17**	**3.17**	**3.14**	**3.11**	**31**	**29**	**29**	**29**	**29**	**29**

Tendring District Employment Trajectories, Grouped by STW – Hectares (ha)

STW Ref.	Settlement(s)	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	2006/7	2007/8	2008/9	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
BRIMST/BRICST	Brightlingsea	0	0	0	0	0	0	0	0	0	0	0.53	0.53	0.53	0.53	0.55	0	0	0	0	0	0
CLACST	Clacton	0	0	0	0	0	0	0	3.02	3.02	3.03	0.8	0.83	0.83	0.83	0.83	0	0	0	0	0	0
GBROST	Great Bromley	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.5	4.5	4.5	4.5	4.5	4.5
HDOVST	Harwich and Dovercourt	0	0	0	0	0	0	0	0	0	0	1.53	1.53	1.53	1.53	1.51	26.5	24.5	24.5	24.5	24.5	24.5
MANNST	Lawford, Manningree and Mistley	0	0	0	0	0	0	0	0.88	0.88	0.87	0	0	0	0	0	0	0	0	0	0	0
THORST	Thorrington	0	0	0	0	0	0	0	0	0	0	0.18	0.18	0.18	0.18	0.22	0	0	0	0	0	0
WALTST	Frinton and Walton	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.07	0	0	0	0	0	0	0
WIXXST	Wix	0	0	0	0	0	0	0	0.12	0.12	0.13	0	0	0	0	0	0	0	0	0	0	0
	TOTALS	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4.02**	**4.02**	**4.03**	**3.14**	**3.17**	**3.17**	**3.14**	**3.11**	**31**	**29**	**29**	**29**	**29**	**29**

STW CAPACITIES - RESIDENTIAL

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day

Tendring District DWF Calculations – Residential Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
BRIMST/BRICST	Brightlingsea	2160	2000	160	7.4	2010.9	149.12	6.9	2019	140.96	6.5	2027.2	132.81	6.1	2032.6	127.37	5.9	2038.1	121.927	5.6	2043.5	116.49	5.4
CLACST	Clacton	10,550	7978	2572	24.4	8027	2523	23.9	8088.7	2461.3	23.3	8149.7	2400.3	22.8	8210.7	2339.3	22.2	8271.7	2278.29	21.6	8332.7	2217.3	21.0
GBROST	Great Bromley	365	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8
HDOVST	Harwich and Dovercourt	6,782	5315	1467	21.6	5346.1	1435.9	21.2	5387.6	1394.4	20.6	5428.8	1353.2	20.0	5482.4	1299.6	19.2	5536.1	1245.94	18.4	5589.7	1192.3	17.6
JAYNST	Jaywick	4,430	5182	-752	-17.0	5197.2	-767.2	-17.3	5198.7	-768.7	-17.4	5199.9	-769.9	-17.4	5252.7	-822.7	-18.6	5305.5	-875.543	-19.8	5358.4	-928.4	-21.0
MANNST	Lawford, Manningree and Mistley	2,729	1691	1038	38.0	1704.2	1024.8	37.6	1708.5	1020.5	37.4	1712.8	1016.2	37.2	1720.9	1008.1	36.9	1729.1	999.927	36.6	1737.2	991.77	36.3
SOSYST	St Osyth	1600	1010	590	36.9	1042.6	557.37	34.8	1056.2	543.77	34.0	1068.7	531.34	33.2	1076.8	523.18	32.7	1085	515.02	32.2	1093.1	506.86	31.7
THORST	Thorrington	2400	1501	899	37.5	1501	899	37.5	1503.3	896.67	37.4	1505.7	894.34	37.3	1505.7	894.34	37.3	1505.7	894.338	37.3	1505.7	894.34	37.3
WALTST	Frinton and Walton	6,364	3553	2811	44.2	3577.5	2786.5	43.8	3600.8	2763.2	43.4	3623.7	2740.3	43.1	3644.7	2719.3	42.7	3665.7	2698.34	42.4	3686.6	2677.4	42.1
WIXXST	Wix	160	99	61	38.1	101.33	58.669	36.7	104.05	55.95	35.0	106.77	53.23	33.3	106.77	53.23	33.3	107.16	52.8415	33.0	107.16	52.842	33.0

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
BRIMST/BRICST	Brightlingsea	2160	2049	111.05	5.1	2054.4	105.61	4.9	2059.8	100.17	4.6	2065.3	94.732	4.4	2070.7	89.293	4.1	2076.1	83.854	3.9	2081.6	78.415	3.6
CLACST	Clacton	10,550	8393.7	2156.3	20.4	8454.7	2095.3	19.9	8515.7	2034.3	19.3	8576.7	1973.3	18.7	8637.7	1912.3	18.1	8698.7	1851.33	17.5	8759.7	1790.34	17.0
GBROST	Great Bromley	365	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8
HDOVST	Harwich and Dovercourt	6,782	5643.3	1138.7	16.8	5696.9	1085.1	16.0	5750.5	1031.5	15.2	5804.1	977.88	14.4	5857.7	924.27	13.6	5911.3	870.652	12.8	5965	817.039	12.0
JAYNST	Jaywick	4,430	5411.2	-981.2	-22.1	5464.1	-1034	-23.3	5516.9	-1087	-24.5	5569.7	-1140	-25.7	5622.6	-1193	-26.9	5675.4	-1245.4	-28.1	5728.2	-1298.23	-29.3
MANNST	Lawford, Manningree and Mistley	2,729	1745.4	983.61	36.0	1753.5	975.45	35.7	1761.7	967.29	35.4	1769.9	959.13	35.1	1778	950.98	34.8	1786.2	942.818	34.5	1794	935.048	34.3
SOSYST	St Osyth	1600	1101.3	498.7	31.2	1109.5	490.54	30.7	1117.6	482.39	30.1	1125.8	474.23	29.6	1133.9	466.07	29.1	1142.1	457.91	28.6	1150.2	449.752	28.1
THORST	Thorrington	2400	1505.7	894.34	37.3	1505.7	894.34	37.3	1505.7	894.34	37.3	1505.7	894.34	37.3	1505.7	894.34	37.3	1505.7	894.338	37.3	1505.7	894.338	37.3
WALTST	Frinton and Walton	6,364	3707.6	2656.4	41.7	3728.6	2635.4	41.4	3749.6	2614.4	41.1	3770.6	2593.4	40.8	3791.5	2572.5	40.4	3812.5	2551.48	40.1	3833.5	2530.5	39.8
WIXXST	Wix	160	107.16	52.842	33.0	107.16	52.842	33.0	107.16	52.842	33.0	107.55	52.453	32.8	107.55	52.453	32.8	107.55	52.453	32.8	107.55	52.453	32.8

STW CAPACITIES - EMPLOYMENT

The volume of DWF headroom have been calculated using the following formula:

((Predicted number of houses ***x*** Average number of people per house) ***x*** design flow for residential development per capita) **+** (average infiltration per capita ***x*** (Predicted number of houses ***x*** Average number of people per house)) **+** (Predicted employment area ***x*** design flow for industrial domestic effluent) **+** (Predicted employment area ***x*** design flow for industrial trade effluent) **+** Calculated or Measured DWF for the previous year

Predicted number of houses = Figures in table of '*Housing Trajectory plus Holiday Population*'
Average number of people per house = 2.1
Design flow for residential development per capita = 0.145m³/capita/day
Average infiltration per capita = 0.04m³/capita/day
Predicted employment area = Figures in table of '*Employment Trajectories Grouped by STW*'
Design flow for industrial domestic effluent = 46.656m³/ha developable land/day
Design flow for industrial trade effluent = 58.752m³/ha developable land/day

Tendring District DWF Calculations – Residential and Employment Development

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2007/8			2008/9			2009/10			2010/11			2011/12			2012/13			2013/14		
			Measured DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculated DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
BRIMST/BRICST	Brightlingsea	2160	2000	160	7.4	2010.9	149.12	6.9	2019	140.96	6.5	2083.1	76.939	3.6	2144.4	15.634	0.7	2205.7	-45.6717	-2.1	2267	-107	-5.0
CLACST	Clacton	10,550	7978	2572	24.4	8345.3	2204.7	20.9	8726.4	1823.6	17.3	8871.8	1678.2	15.9	9020.2	1529.8	14.5	9168.7	1381.27	13.1	9317.2	1232.8	11.7
GBROST	Great Bromley	365	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8	198	167	45.8
HDOVST	Harwich and Dovercourt	6,782	5315	1467	21.6	5346.1	1435.9	21.2	5387.6	1394.4	20.6	5590.1	1191.9	17.6	5805	977.01	14.4	6019.9	762.121	11.2	6234.8	547.23	8.1
JAYNST	Jaywick	4,430	5182	-752	-17.0	5197.2	-767.2	-17.3	5198.7	-768.7	-17.4	5199.9	-769.9	-17.4	5252.7	-822.7	-18.6	5305.5	-875.543	-19.8	5358.4	-928.4	-21.0
MANNST	Lawford, Manningree and Mistley	2,729	1691	1038	38.0	1797	932.03	34.2	1892.9	836.05	30.6	1897.2	831.78	30.5	1905.4	823.62	30.2	1913.5	815.463	29.9	1921.7	807.3	29.6
SOSYST	St Osyth	1600	1010	590	36.9	1042.6	557.37	34.8	1056.2	543.77	34.0	1068.7	531.34	33.2	1076.8	523.18	32.7	1085	515.02	32.2	1093.1	506.86	31.7
THORST	Thorrington	2400	1501	899	37.5	1501	899	37.5	1503.3	896.67	37.4	1524.6	875.36	36.5	1543.6	856.39	35.7	1562.6	837.418	34.9	1581.6	818.44	34.1
WALTST	Frinton and Walton	6,364	3553	2811	44.2	3577.5	2786.5	43.8	3600.8	2763.2	43.4	3634.2	2729.8	42.9	3665.8	2698.2	42.4	3697.3	2666.71	41.9	3725.6	2638.4	41.5
WIXXST	Wix	160	99	61	38.1	113.98	46.02	28.8	130.4	29.598	18.5	133.12	26.878	16.8	133.12	26.878	16.8	133.51	26.4895	16.6	133.51	26.49	16.6

STW Ref.	Catchment	Consented Dry Weather Flow (CDWF)	2014/15			2015/16			2016/17			2017/18			2018/19			2019/20			2020/21		
			Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room	Calculat-ed DWF	DWF Head-room	DWF Head-room
			m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%	m³ / day	m³ / day	%
BRIMST/BRICST	Brightlingsea	2160	2330.4	-170.4	-7.9	2335.8	-175.8	-8.1	2341.3	-181.3	-8.4	2346.7	-186.7	-8.6	2352.1	-192.1	-8.9	2357.6	-197.59	-9.1	2363	-203.024	-9.4
CLACST	Clacton	10,550	9465.7	1084.3	10.3	9526.7	1023.3	9.7	9587.7	962.32	9.1	9648.7	901.32	8.5	9709.7	840.33	8.0	9770.7	779.333	7.4	9831.7	718.339	6.8
GBROST	Great Bromley	365	198	167	45.8	672.34	-307.3	-84.2	1146.7	-781.7	-214.2	1621	-1256	-344.1	2095.3	-1730	-474.1	2569.7	-2204.7	-604.0	3044	-2679.02	-734.0
HDOVST	Harwich and Dovercourt	6,782	6447.5	334.45	4.9	9294.5	-2512	-37.0	11931	-5149	-75.9	14567	-7785	-114.8	17203	-10421	-153.7	19839	-13057	-192.5	22475	-15693	-231.4
JAYNST	Jaywick	4,430	5411.2	-981.2	-22.1	5464.1	-1034	-23.3	5516.9	-1087	-24.5	5569.7	-1140	-25.7	5622.6	-1193	-26.9	5675.4	-1245.4	-28.1	5728.2	-1298.23	-29.3
MANNST	Lawford, Manningree and Mistley	2,729	1929.9	799.15	29.3	1938	790.99	29.0	1946.2	782.83	28.7	1954.3	774.67	28.4	1962.5	766.51	28.1	1970.6	758.354	27.8	1978.4	750.584	27.5
SOSYST	St Osyth	1600	1101.3	498.7	31.2	1109.5	490.54	30.7	1117.6	482.39	30.1	1125.8	474.23	29.6	1133.9	466.07	29.1	1142.1	457.91	28.6	1150.2	449.752	28.1
THORST	Thorrington	2400	1604.7	795.25	33.1	1604.7	795.25	33.1	1604.7	795.25	33.1	1604.7	795.25	33.1	1604.7	795.25	33.1	1604.7	795.254	33.1	1604.7	795.254	33.1
WALTST	Frinton and Walton	6,364	3746.6	2617.4	41.1	3767.6	2596.4	40.8	3788.6	2575.4	40.5	3809.6	2554.4	40.1	3830.5	2533.5	39.8	3851.5	2512.48	39.5	3872.5	2491.5	39.1
WIXXST	Wix	160	133.51	26.49	16.6	133.51	26.49	16.6	133.51	26.49	16.6	133.9	26.101	16.3	133.9	26.101	16.3	133.9	26.101	16.3	133.9	26.101	16.3

Appendix B
SuDS for Use in Development

CONTENTS

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1 CRITERIA FOR SUDS TECHNIQUES FOR RESIDENTIAL DEVELOPMENTS

SUDS techniques for housing must meet a number of criteria before being considered for general use:

- the drainage triangle – meeting quantity, quality and amenity objectives
- the management train – techniques used in series to improve quantity and quality

prevention
↓
source control
↓
site control
↓
regional control

1.1 Quantity

- minimise impermeable surfaces by good planning of development layout
- control at source to reduce extra runoff
- limit peak discharge to an agreed allowable runoff rate
- attenuate excess water to an agreed storm return period (normally 1 in 100 year with allowances for climate change)
- low flow routes for frequent storms and first part of volume of rare storms through treatment stage
- high flow routes for extreme events with overland flood routes

1.2 Quality:

- prevent pollution by good planning of development layout and site management
- treatment stages, usually a minimum of one for housing
- appropriate technique to treat runoff from roads and pavements
- ‘source control’ preferred to control silt and pollution
- ‘first flush’ treatment for all roads and pavements

1.3 Amenity:

- techniques should maximise opportunities for amenity including environmental and bio-diversity where possible
- techniques should protect amenity

2 SUDS TECHNIQUES FOR RESIDENTIAL DEVELOPMENTS

2.1 General

There are four generally established methods of control related to SUDS other than in/off line storage provided in underground tanks or oversized pipes:

- filter strips and swales
- filter drains and permeable surfaces
- infiltration devices
- basins, ponds and wetlands

The use of appropriate and easily understood and maintained control devices, especially inlets and outlets, is required in housing where supervision during design life will be difficult and maintenance often can be neglected or limited.

2.2 Filter strips and swales

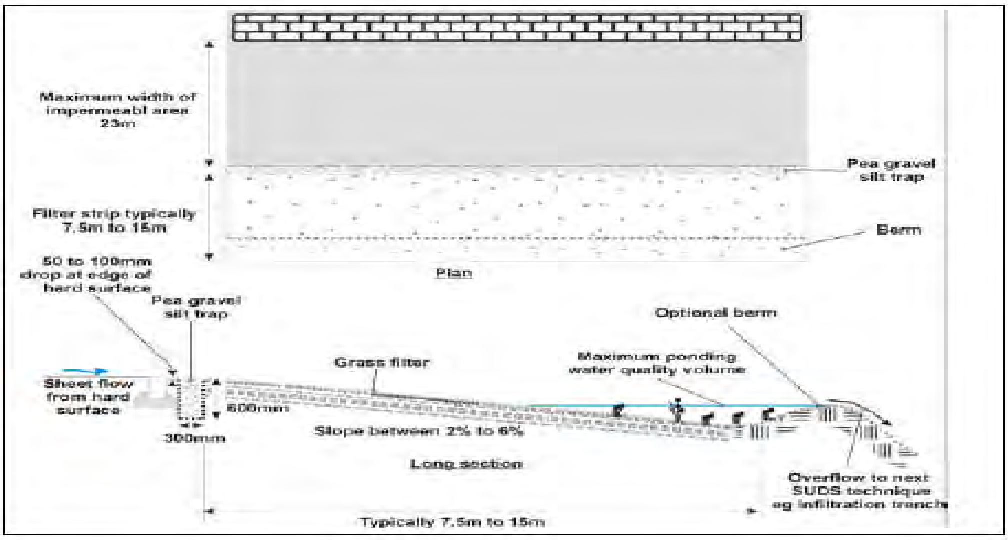
2.2.1 Filter strips

Filter strips are gently sloping grass or other vegetated surfaces that drain water evenly from impermeable surfaces. They are particularly useful for protecting infiltration devices, such as filter drains from silt.

USE: Filter strips should be used wherever possible to collect water and protect filter drains.

MAINTENANCE: Monthly inspections and mowing as required but at least twice a year

Grassed filter strip (CIRIA 2004)



Example details of a filter strip (CIRIA 2004)

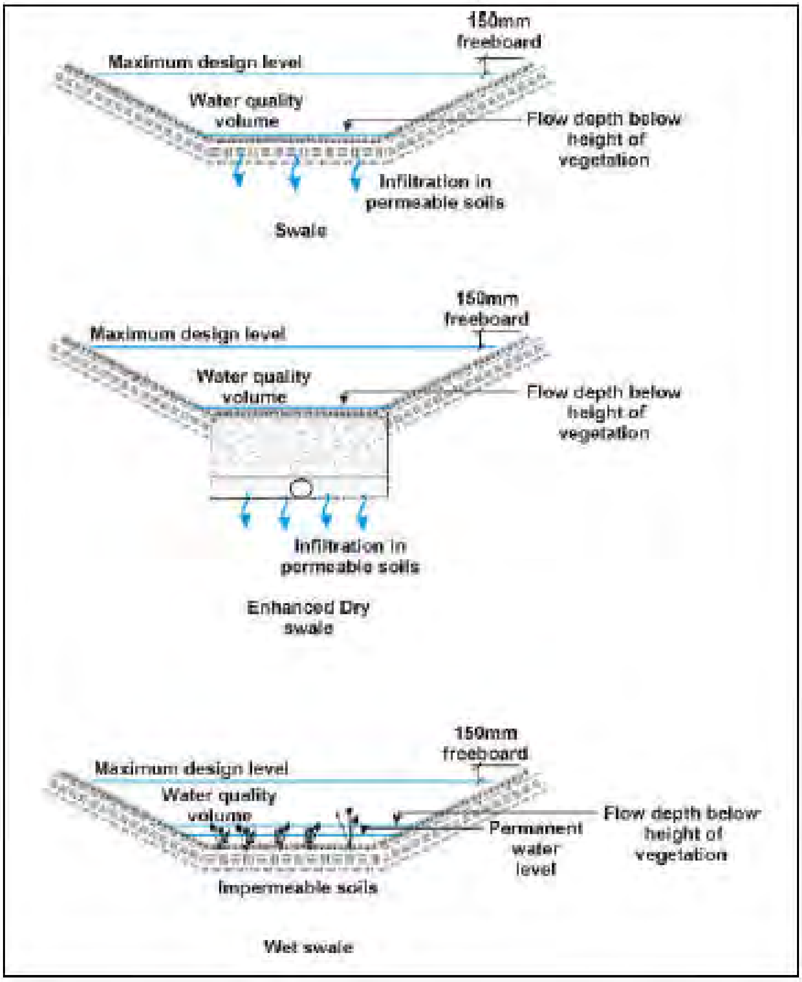
2.2.2 Swales

Swales are shallow channels that are designed to convey, infiltrate, store and treat runoff. Although swales are typically broad and shallow they can be designed to be space efficient and are simple to construct and manage. New designs with permeable under-drainage have been shown to work effectively in all but the heaviest storm events.

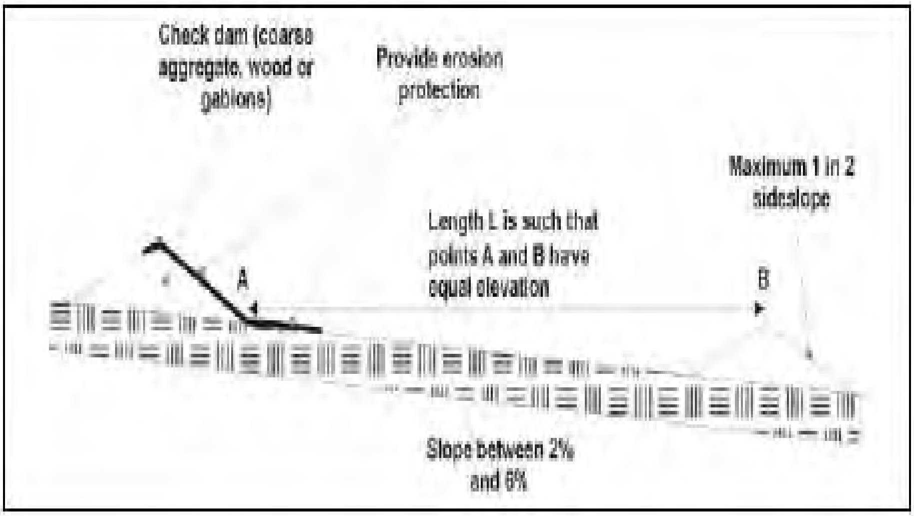
USE: Swales should be used in all but the most dense urban situations. They are cost effective, resilient in use and simple to maintain. They can be planted and designed for amenity.

MAINTENANCE: Monthly inspections; mowing as required but at least twice year

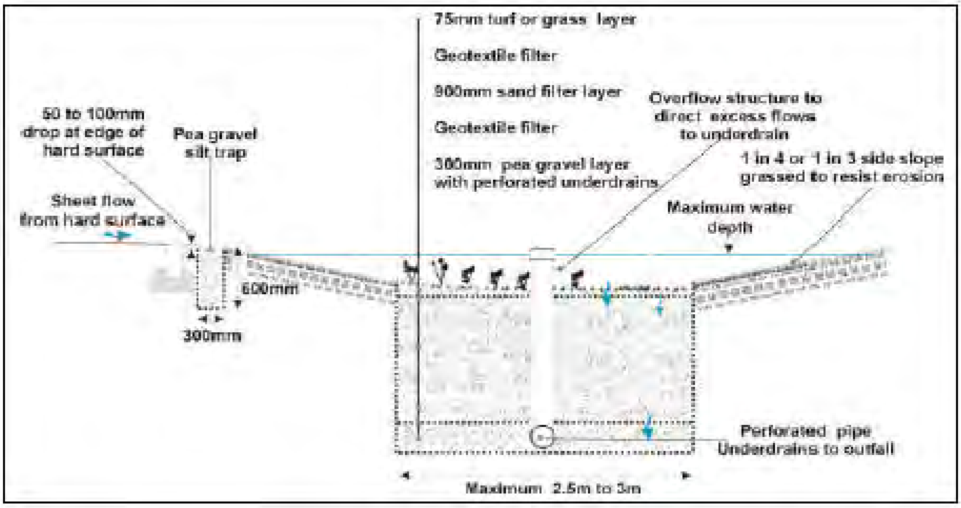
Swale in a housing development, Scotland (CIRIA 2004)



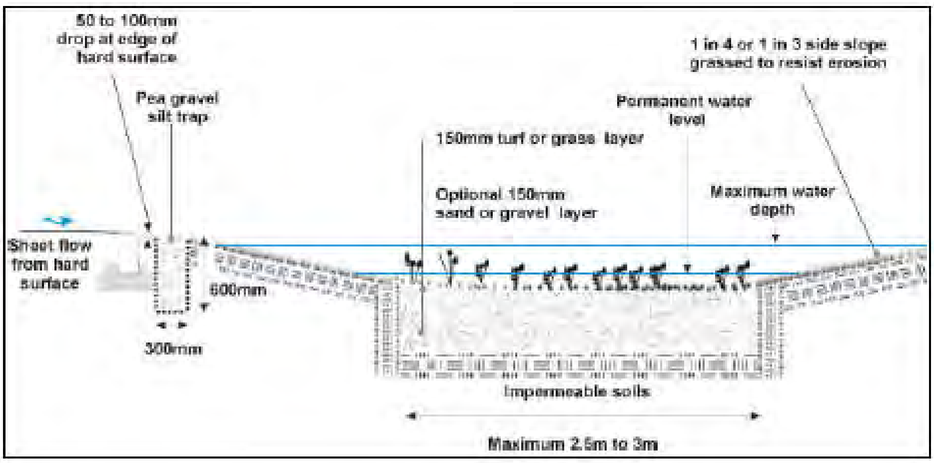
Types of swales (CIRIA 2004)



Check dams within swales (CIRIA 2004)



Example details for a dry swale (CIRIA 2004)



Example details for a wet swale (CIRIA 2004)

2.3 Filter drains and pervious surfaces

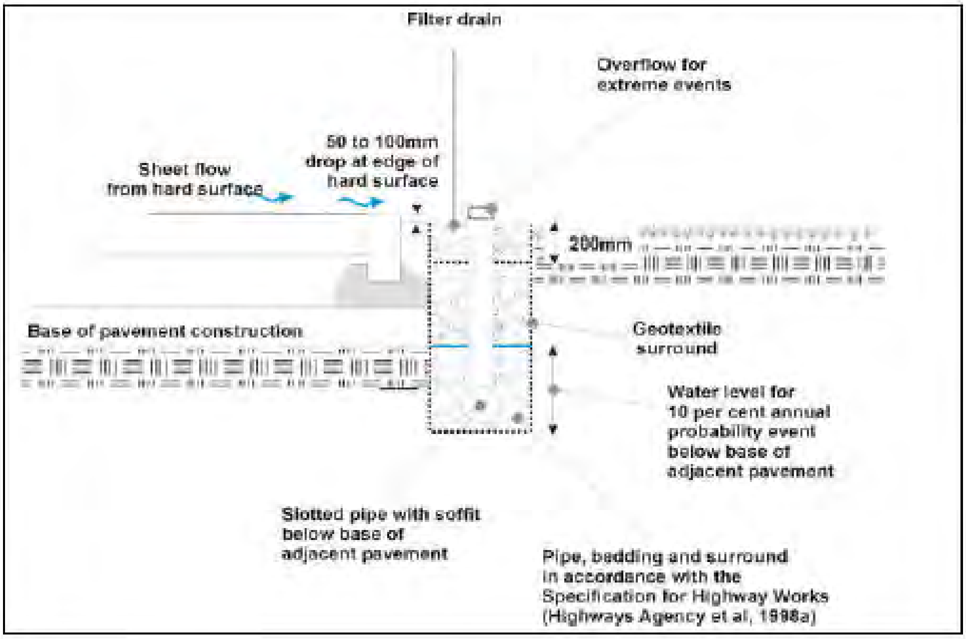
2.3.1 Filter Drains

Filter drains are linear devices that drain water from impermeable surfaces in a diffuse manner. They are trenches filled with permeable material into which runoff is collected, stored and conveyed. Filter drains are similar to the familiar ‘french drain’ and are currently used to drain car parks, residential drives, paths and patios. They are increasingly being used to drain roads, particularly motorways and main trunk roads although risk of stone scatter has caused some concerns if used in narrow verges.

USE: Filter drains can be used in most low to medium density housing but care is required to anticipate the blocking by silt. Therefore they should be constructed late in the programme and protected during construction and thereafter. A filter strip is the ideal long-term protection. Construction should include a removable surface layer for simple reinstatement.

MAINTENANCE: Monthly inspections; replace clogged material as required (typically 10 years or greater depending on their location and silt load)

Filter drain (CIRIA 2004)



Example details of a filter drain (CIRIA 2004)

2.3.2 Pervious Surfaces

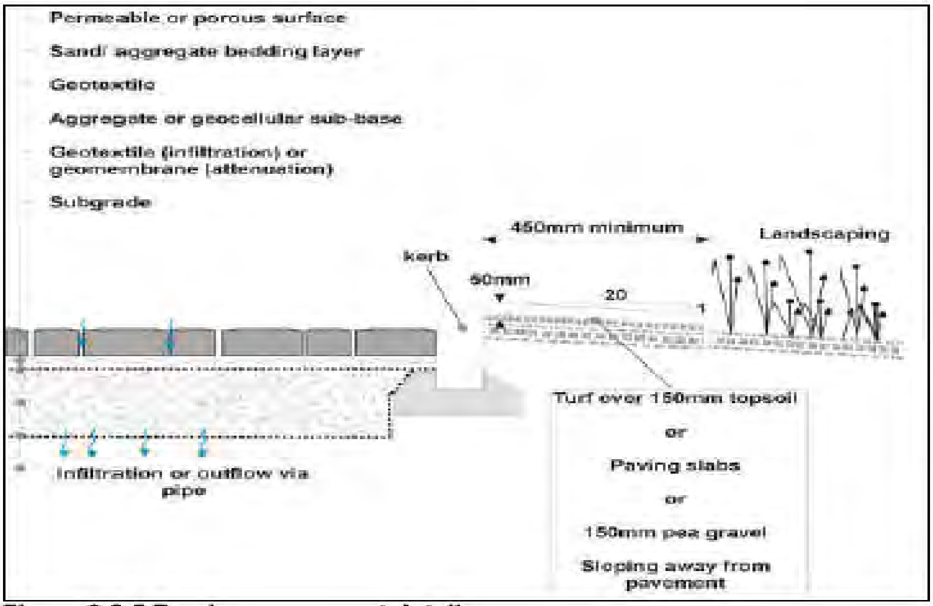
Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer. They have a volume of permeable material below ground to store and infiltrate surface water and include grass, reinforced grass, gravelled areas, permeable blocks and porous surfaces (e.g. porous concrete or porous asphalt). There are pervious solutions for many situations but the permeable block pavement is particularly appropriate for urban situations where space is limited. However, care is needed if adjacent soft landscaped areas are also drained onto pervious surfaces due to the increased risk of clogging by silt/ sand. There is also a management requirement that must be undertaken to ensure the pavement remains effective over time. Where these simple requirements can be accommodated, pervious pavement can be a particularly useful technique.

USE: Pervious solutions can be used in most sites but especially useful on urban sites (e.g. car parks, roads, footpaths and other hard landscaped areas) where space is limited.

MAINTENANCE: Monthly inspections for clogging and water ponding, and vacuum sweeping twice a year. It is anticipated that over a period of time 15 – 40 years the surface will need to be taken up, the filter fabric and accumulated silt removed and pervious pavement replaced to reinstate its function.

Examples of permeable pavement (Formpave)

Examples of permeable pavement (Uni-Ecoloc in conjunction with Uni-Coloc)



Pervious pavement details (CIRIA 2004)

Swale and a pervious pavement (CIRIA 2004)

2.4 Infiltration Devices

Infiltration devices drain water directly into the ground. They include soakaways, infiltration trenches and infiltration basins as well as swales, filter drains and ponds. Infiltration devices work by enhancing the natural capacity of the ground to store and drain water.

The effectiveness of infiltration devices depend on the 'infiltration potential' of the soil, protection from silt and avoiding compaction of the ground during construction.

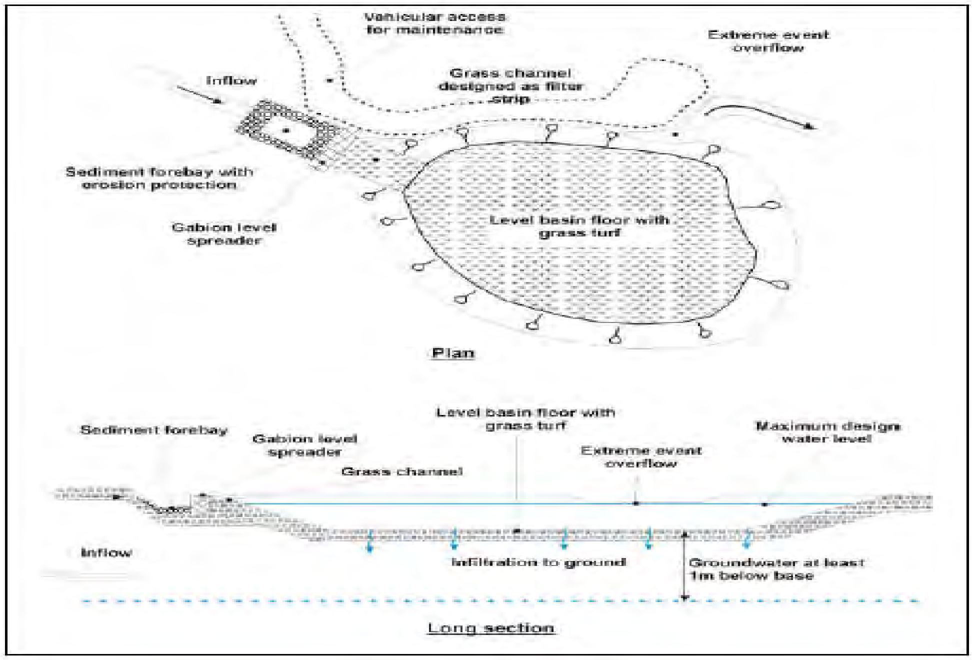
Soakaways have been used traditionally in housing where ground conditions are suitable but are usually forgotten in a few years. Neglected maintenance may cause problems due to deteriorated infiltration capacity of the devices and surrounding soil. Simple and identifiable infiltration devices are required where they can be used effectively within housing developments.

There are new techniques available which combine the features of a swale and an infiltration surface, which may be appropriate for housing areas. They are called 'bio-retention' swales or areas.

USE: Where sediment load is low (e.g. roofs and housing courts) and ground is permeable.

MAINTENANCE: At least six monthly inspections of silt traps and pre-treatment devices including removal of sediment as required. Annual check of observation well, to ensure emptying and no clogging.

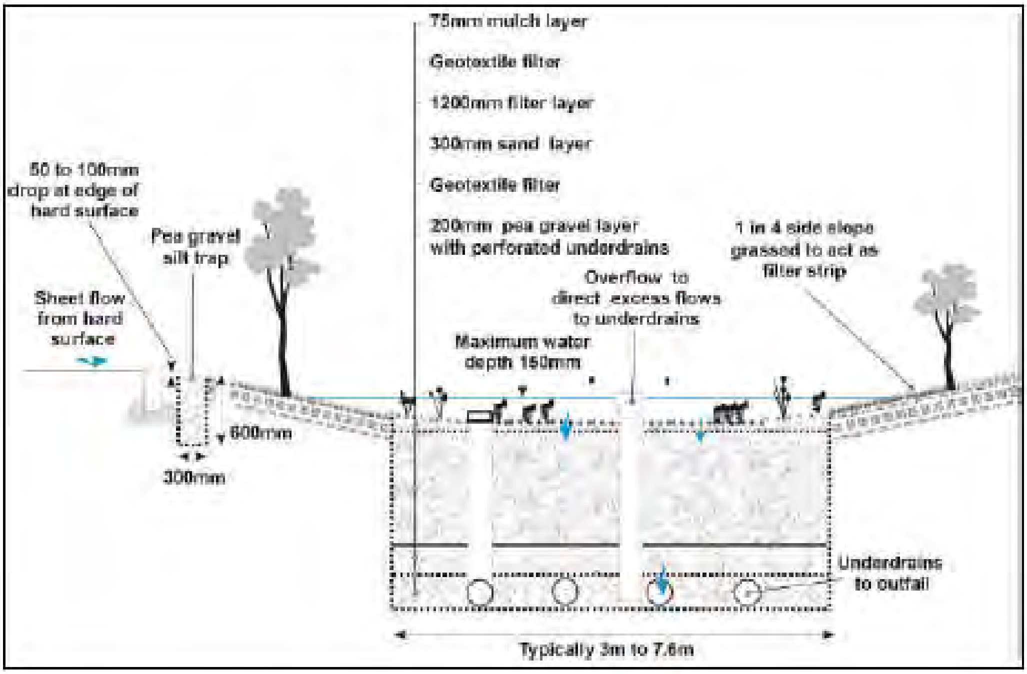
Infiltration basin (CIRIA 2004)



Example details of an infiltration basin (CIRIA 2004)

Bio-swale (25 Portland Oregon Omnimax)

Bio-swale (26 Ecotruct Bld)



Example detail of a bio-retention swale (CIRIA 2004)

2.5 Basins, ponds and wetlands

There are no distinct boundaries between the various types of basins but are characterised by the length of time water is held and whether some water is retained for amenity and treatment functions:

- Detention basins – temporarily store water until the flood has passed, normally dry
- Extended detention basins – temporarily store water and allow settlement of solids, normally dry
- Retention basins/ wet ponds – hold water back for treatment of pollution and are permanently wet ponds with rooted aquatic vegetation.
- Wetlands – are shallow ponds and marshland areas which are covered almost entirely in aquatic vegetation.

USE: Within sites where sufficient space is available and site topography is suitable for the use of basins and ponds. Public open spaces within housing offer opportunities to store runoff, collect silt and begin treatment of diffuse pollution. They can be designed as multi-functional spaces with wetland areas for wildlife, visual interest and biological treatment. It is possible in some situations to transfer part of the storage requirements to public open spaces under Local Authority ownership, particularly if the SUDS features contribute to general amenity and have financial provision for maintenance.

MAINTENANCE: Different requirements depending on basin type.

Extended detention basin (CIRIA 2004)

Swale integrated into landscape and retention pond (CIRIA 2004)

2.6 New Techniques

2.6.1 General

There are some new techniques which are the result of technical innovation. Examples include:

- Green roofs
- Underground storage
- Water butts

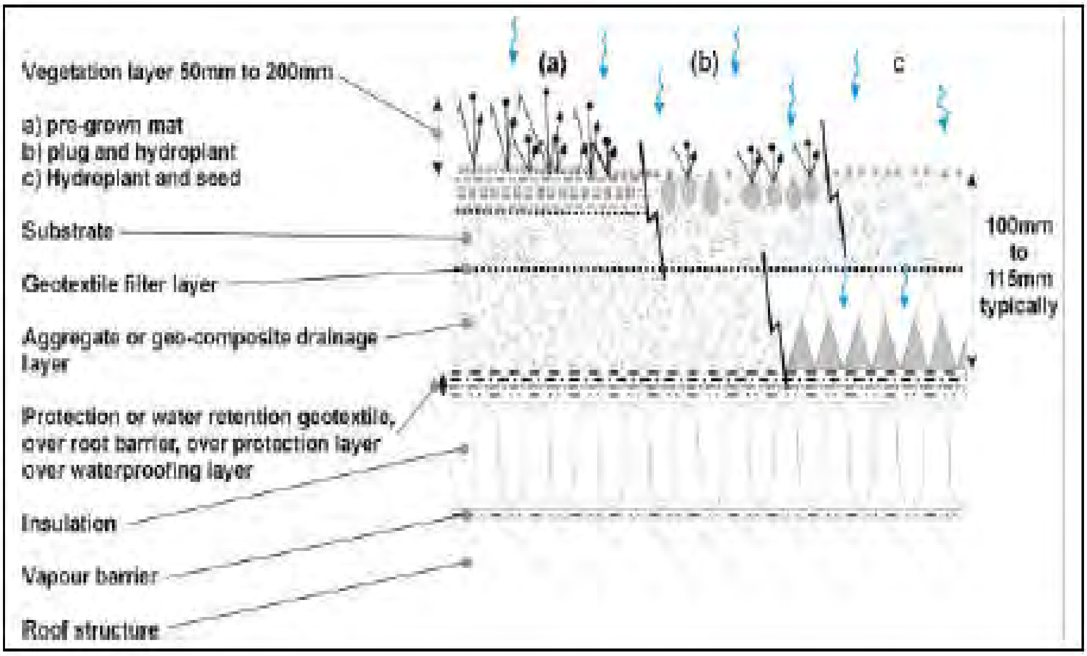
2.6.2 Green Roofs

'Green roof' technology offers a number of environmental benefits including attenuation of rainwater and flow control similar to a 'greenfield' situation.

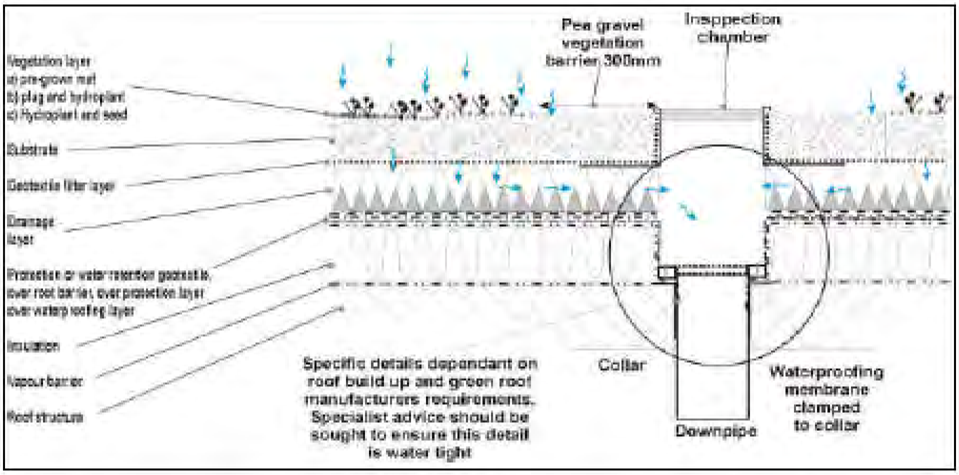
USE: Green roofs can only be used as a SUDS technique where the construction and long-term management process is guaranteed. Therefore they are particularly appropriate for housing association controlled apartments and flat type accommodation where roof is flat or gently sloping. There are now exemplars of this technique in the USA, Europe and increasingly in the UK.

MAINTENANCE: Irrigation during establishment of vegetation to provide sufficient moisture as required in first two years. Thereafter, six monthly inspections and replacement of bare patches and removal of litter.

Example of green roof (19 Portland Oregon Hamilton)



Example details of a green roof (CIRIA 2004)



Example detail of outlet from green roof (CIRIA 2004)

2.6.3 Underground Storage

Another major SUDS innovation is the development of proprietary storage box systems (e.g. geocellular plastic structures).

USE: Although it is cheaper and environmentally better to manage attenuation in open landscape features, the underground storage of runoff is acceptable subject to suitable silt management and treatment of pollution. Deep box storage is difficult to manage because the boxes require substantial cover to prevent damage and therefore cause problems for discharge to natural drainage systems. Shallow box storage offer a better solution and can replace conventional sub-base construction. The use of appropriate proprietary products in housing needs careful consideration as they should be both cost-effective and environmentally sustainable in long-term.

MAINTENANCE: As per the manufacturers' advice. At a minimum six monthly inspections for silting and blockages including the removal of silt and blockages as required.

Plastic modular tank below a trial car park at Coventry University (CIRIA 2004)

2.6.4 Water Butts

According to the Environment Agency's current guidelines, the storage available in rainwater harvesting systems may not be fully considered as available attenuation storage although they do help with controlling rapid surges of potentially polluted roofwater following dry periods and also provide some attenuation. The current guidance require that the storage provided for attenuation must drain down within a short period (e.g. 48 hours) to provide storage for any subsequent storm events and this may not be always possible with water butts as their operation and water consumption will depend on the property owner or occupants.

The installation of rainwater butts to all houses is a cheap and effective way of introducing sustainable management of the water resource and helps SUDS in the following ways:

- appropriate water butt design can intercept 'first flush' flows from roofs. This is particularly useful in summer after long dry spells when silts and other pollutants have settled on roof surfaces.
- water collected in water butts is returned to gardens acting as a limited 'source control' feature.
- a water butt, acting as a silt collector, can protect storage features such as box storage

Therefore a SUDS friendly water butt should have a silt collection volume at the base which can be drained down allowing silt to be disposed of to garden compost or household waste.

It is also important that pipe connections for roof water should not allow cross connection from household appliances.

3 ASSESSING SUDS TECHNIQUES FOR RESIDENTIAL DEVELOPMENTS

SUDS techniques for housing can be evaluated in a number of ways:

- techniques that are appropriate to meet SUDS objectives (i.e. quantity, quality and amenity) whilst meeting the needs of developer and other interested parties
- techniques that are simple to construct with minimum risk of structural compromise during construction
- techniques that have a long design life with low risk of failure
- techniques that are resilient against vandalism or accident
- techniques that are cost effective to construct
- techniques that can be easily maintained

- techniques that address health and safety of residents
- techniques that contribute to amenity

3.1 SUDS techniques evaluation

3.1.1 Filter Strips

Applications	• to collect runoff from hard surfaces and as a replacement for verges • to protect infiltration devices wherever possible
Comments	• filter strips are simple and cheap to construct and maintain

3.1.2 Swales

Applications	• to collect runoff from hard surfaces and convey it to storage or a discharge point • normal swales in public open space and where habitat amenity is required • bio-swales with under-drainage in confined spaces or as a verge replacement
Comments	• swales can be dry, wet or have other characteristics if the main filtering functions are undertaken • swales are simple and cheap to construct and maintain • swales can contribute visual, wildlife and play facilities to residential development

3.1.3 Filter drains

Applications	• to drain hard surfaces wherever silt load is low
Comments	• construct filter drains with replacement layer for reinstatement • consider standard design for adoption reasons • use filter strips to protect filter drains wherever possible

3.1.4 Pervious surfaces

Applications	• pervious surfaces require dedicated maintenance so only use it with an agreed management plan and known owner
Comments	• select appropriate permeable surface for long term performance, maintenance and reinstatement • protect pavement from silt using modified planting areas (including low soil, stone mulch, turf surfaces), filter strips, silt traps and routine maintenance

3.1.5 Infiltration devices

Applications	• use only where the 'infiltration potential' is effective • use infiltration basins for amenity and wildlife
Comments	• protect devices from silt and compaction • use filter strips to protect infiltration devices wherever possible

3.1.6 Basins, ponds and wetlands

Applications	• use in public open space areas • use hierarchy of storage including POS, car parks, roads etc to manage 1 in 100 year return volumes • provide wetland retention areas where possible to intercept and treat pollution and provide amenity
Comments	• conform to agreed health and safety criteria (check with LA) • provide residential buildings to overlook and police wetlands areas • design to enhance housing and add value

3.1.7 New SUDS techniques

- green roof attenuation is being developed as a SUDS technology
- underground storage such as box storage systems to store clean runoff prior to discharge through the SUDS system may be appropriate in dense urban development (see *Section 4*).

4 SUDS SUPPORT (ANCILLARY) STRUCTURES

The various methods of control are serviced by a series of details and structures, which contribute to effective SUDS design.

The additional features are categorised by function and should accord with the criteria used for control methods (i.e. simple robust, effective, easy to maintain and repair, and cost effective).

- Inlets and outlets should be simple and easily maintained. Blockage risk of structures should be minimum but easily removed if it occurs. Inlets and outlets should not present a hazard to residents, maintenance personnel or wildlife. A range of standard construction details including maintenance requirements should be developed to allow adoption by the Local Authority or other appropriate body.

- Storage structures, which are now being developed as proprietary products, are being offered as a way of storing runoff underground. It is important to choose these carefully and only use them where long term awareness of their management is fully agreed. These structures, which are usually a form of reinforced plastic box, require an inlet silt and trash trap, inspection cover and known outlet. It will be important to agree a protocol for the use of proprietary products in residential developments.

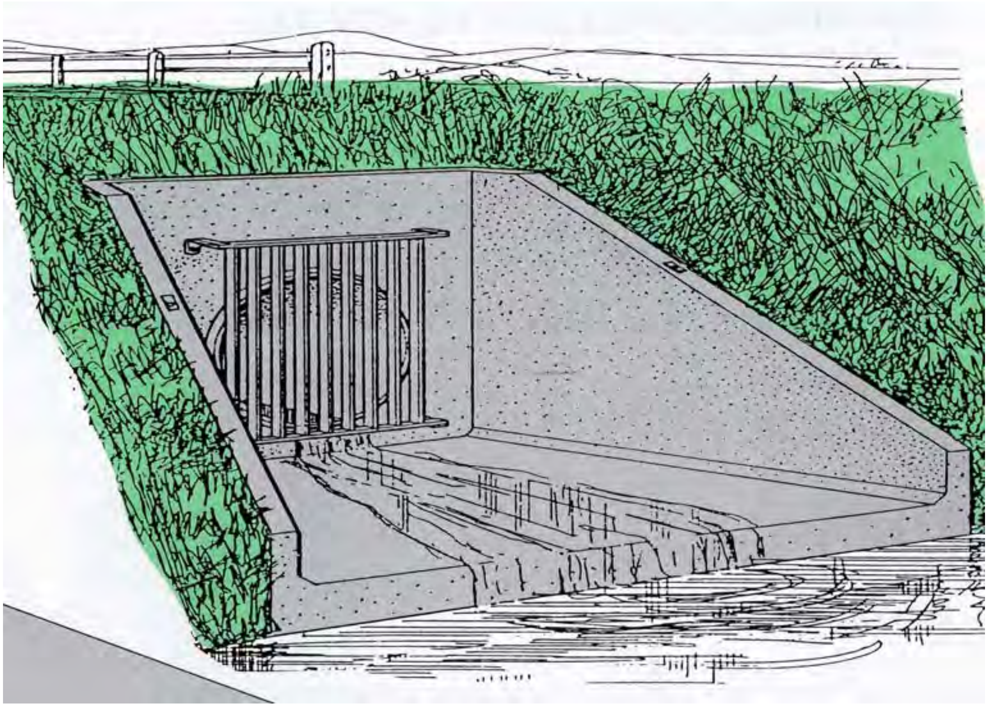
- Silt traps require maintenance and removal of silt. Silt management using SUDS techniques usually collects silt in landscape features rather than small proprietary silt traps. An agreed protocol for silt management and avoiding high maintenance silt traps will be required for residential developments.

- Flow control devices are required to restrict the rate at which water leaves a development site. These must be simple and robust and to a design agreed with the Local Authority or other bodies likely to undertake maintenance or adopt the SUDS scheme.

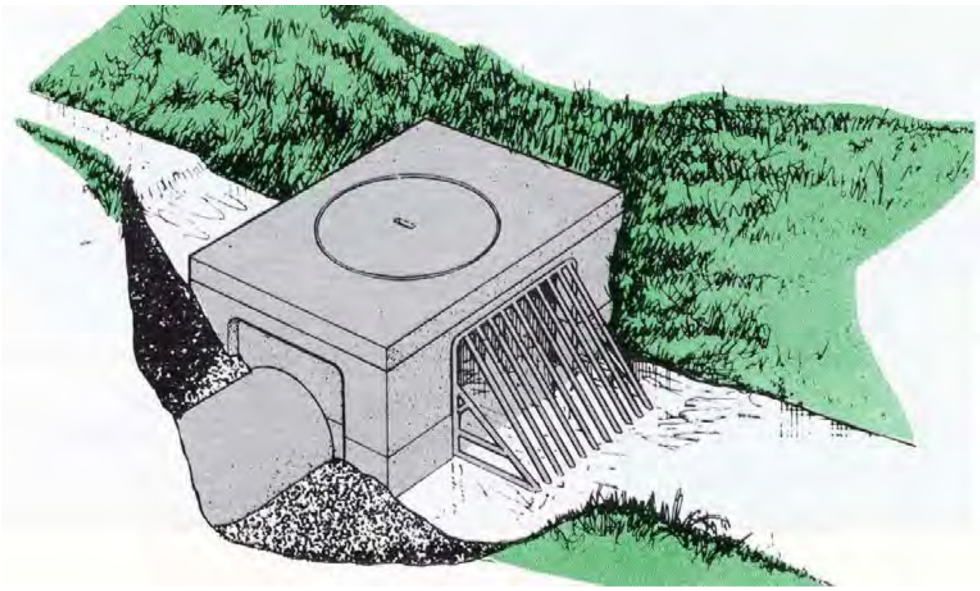
- Headwalls are often unsightly and hazardous features in the landscape used to surround inlets and outlets. It is important to develop agreed designs which prevent blockage, resist vandalism, avoid risk to residents and maintenance personnel, avoid hazard to wildlife and look acceptable for a housing development.

- Low flow channels deal with day to day drainage and can create attractive landscape features. They must allow water to flow at low velocity through treatment systems to storage and then a discharge point. They should generally be open and contribute to landscape value.

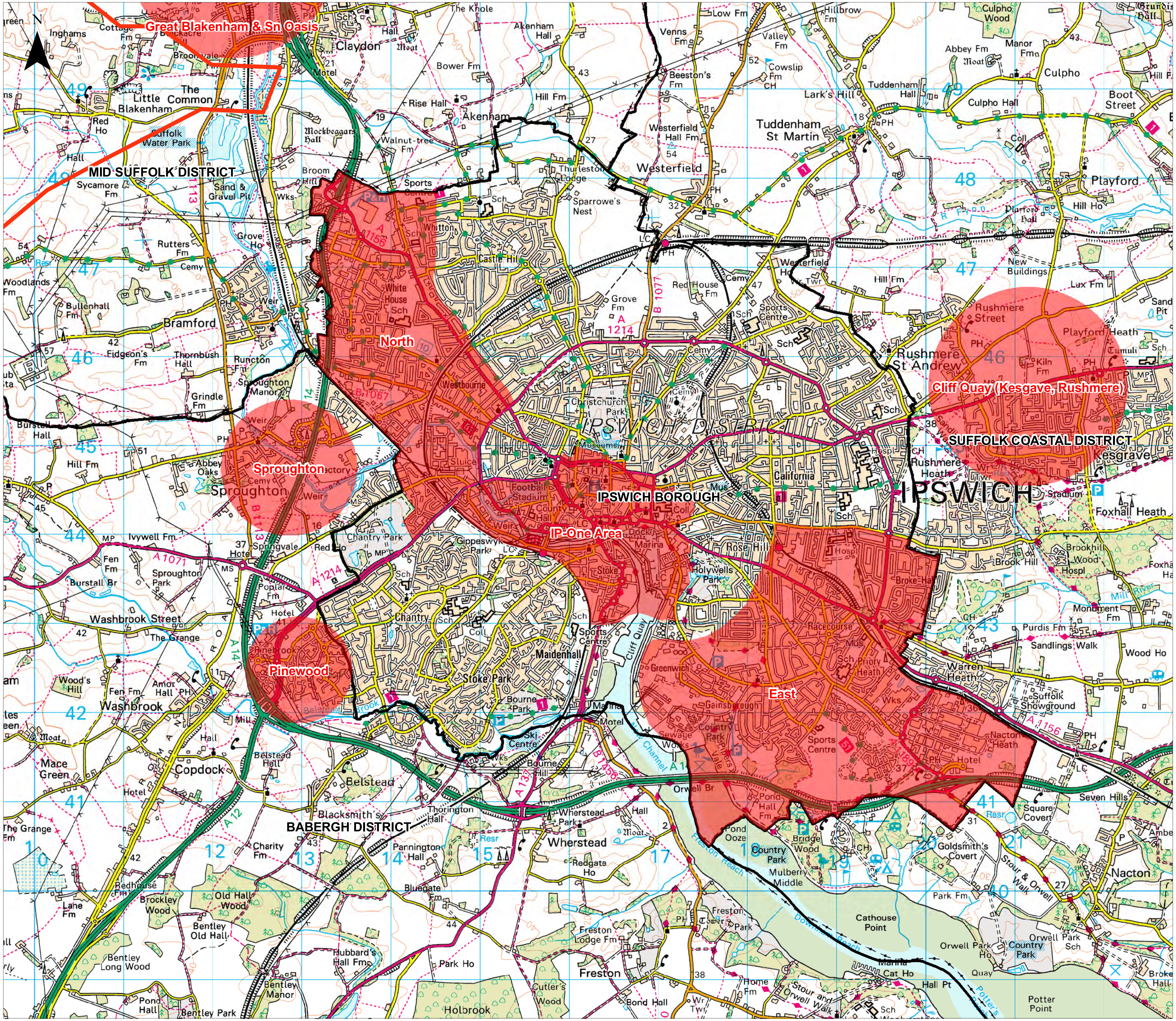
- Overland flood routes deal with occasional heavy rainfall diverting runoff in excess of ‘first flush’ or ‘treatment volume’ to the final storage feature or overland to prevent local flooding. They should be clear, unobstructed, robust and obvious.



Example of a typical outfall with headwalls



Example of a double entry silt trap inlet



Key:

Haven Gateway Sub Region

Development Areas

Local Authority Area Boundary

Title:
Ipswich Borough
Location and Development Areas

Project:
Haven Gateway Stage 2 WCS

Client:
Haven Gateway Partnership

Date:
September 2009

Scale:
1:40,000 @ A3

Figure:
6.4

ROYAL HASKONING

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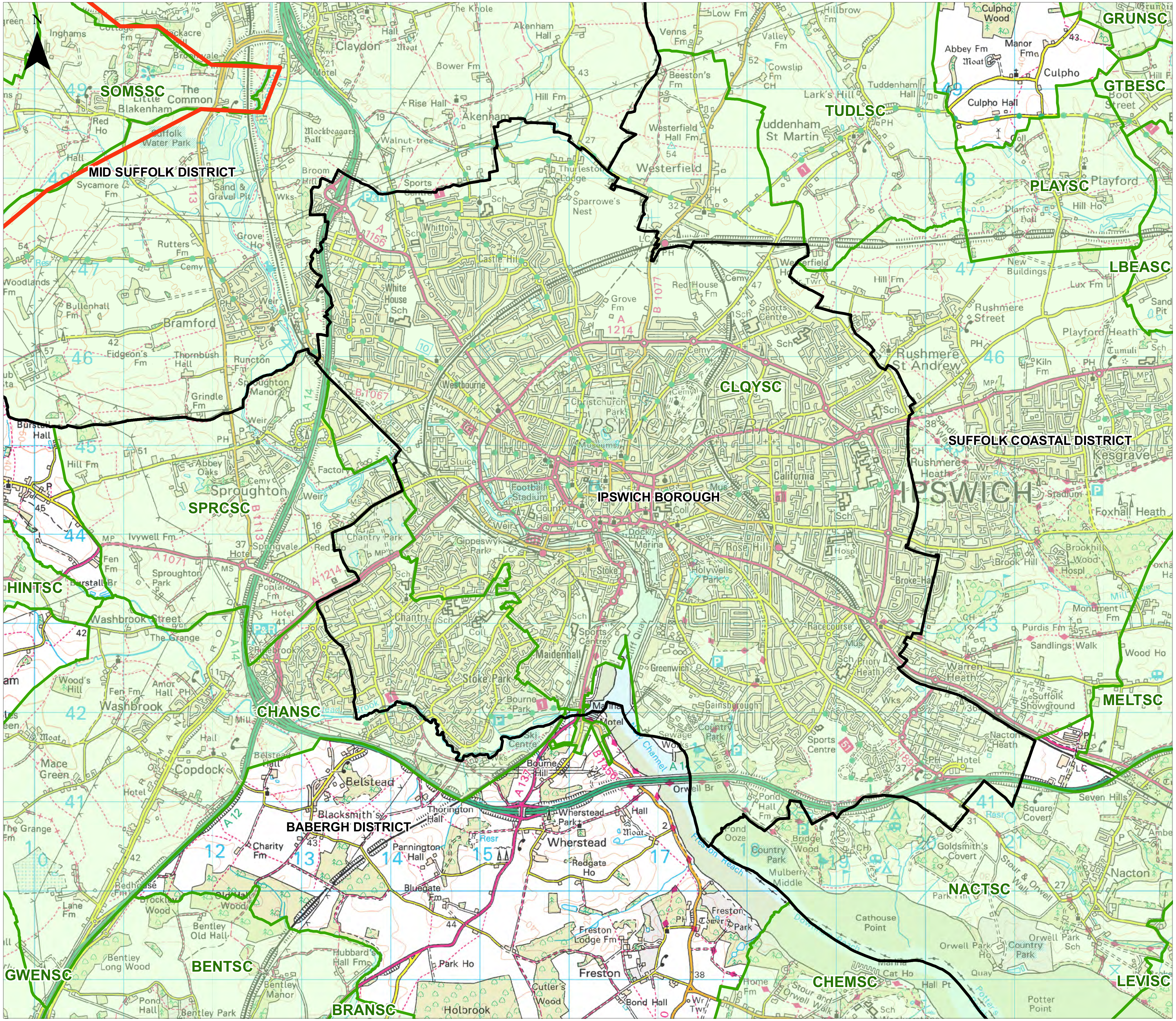


Key:

- Haven Gateway Sub Region
- Local Authority Area Boundary
- STW Catchments

Title:
Ipswich Borough
STW Catchments

Project:
Haven Gateway Stage 2 WCS

Client:
Haven Gateway Partnership

Date:
September 2009

Scale:
1:40,000 @ A3

Figure:
6.5

ROYAL HASKONING

Key:

- Haven Gateway Sub Region
- Local Authority Area Boundary
- Flood Zone 3
- Flood Zone 2

Title:
Ipswich Borough
Flood Zone 2 & 3

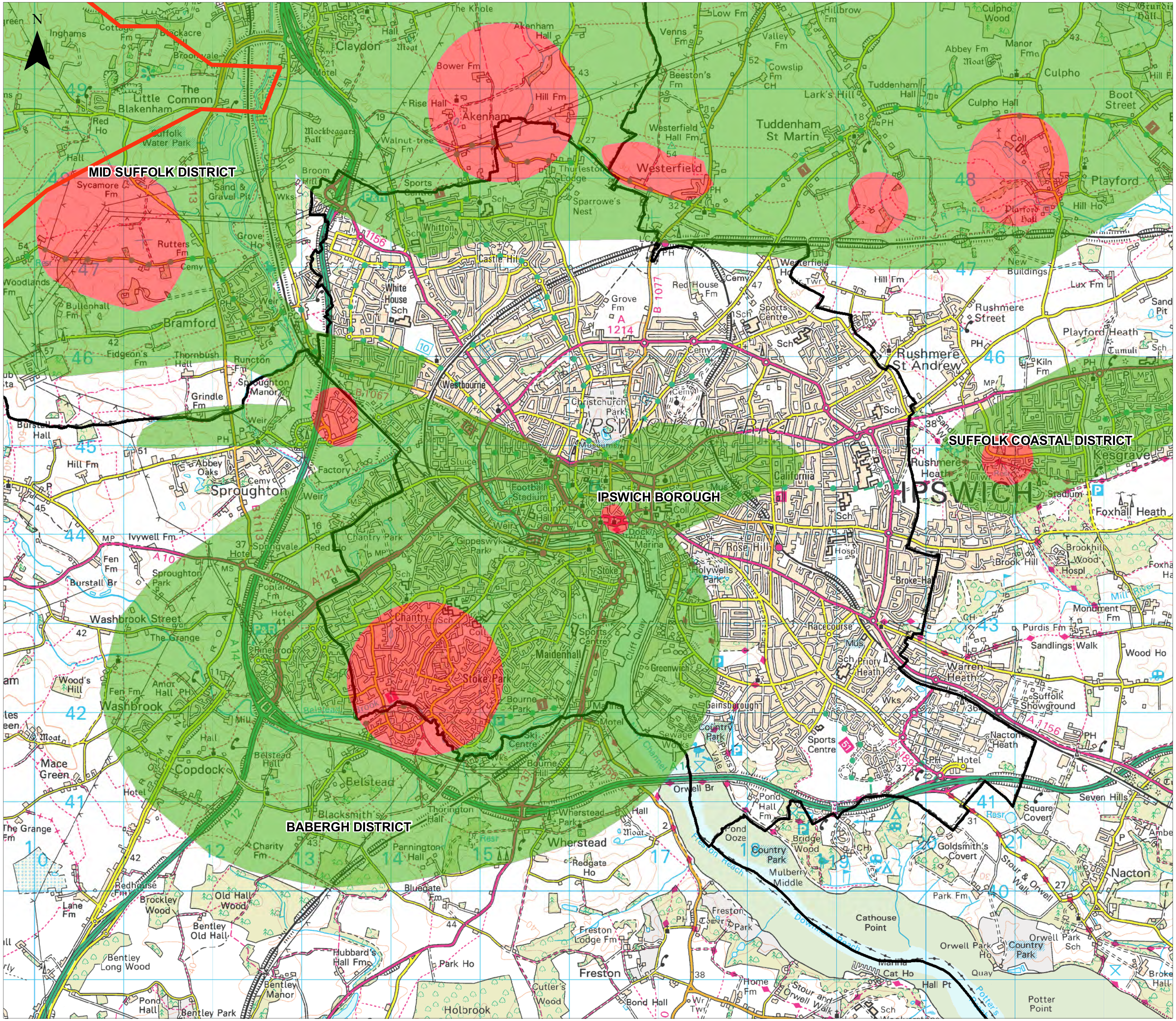
Project:
Haven Gateway Stage 2 WCS

Client:
Haven Gateway Partnership

Date:	Scale:
September 2009	1:40,000 @ A3

Figure:
6.9

ROYAL HASKONING



Key:

Haven Gateway Sub Region

Local Authority Area Boundaries

Source Protection Zones

Inner Zone

Outer Zone

Title:
Ipswich Borough Source Protection Zones

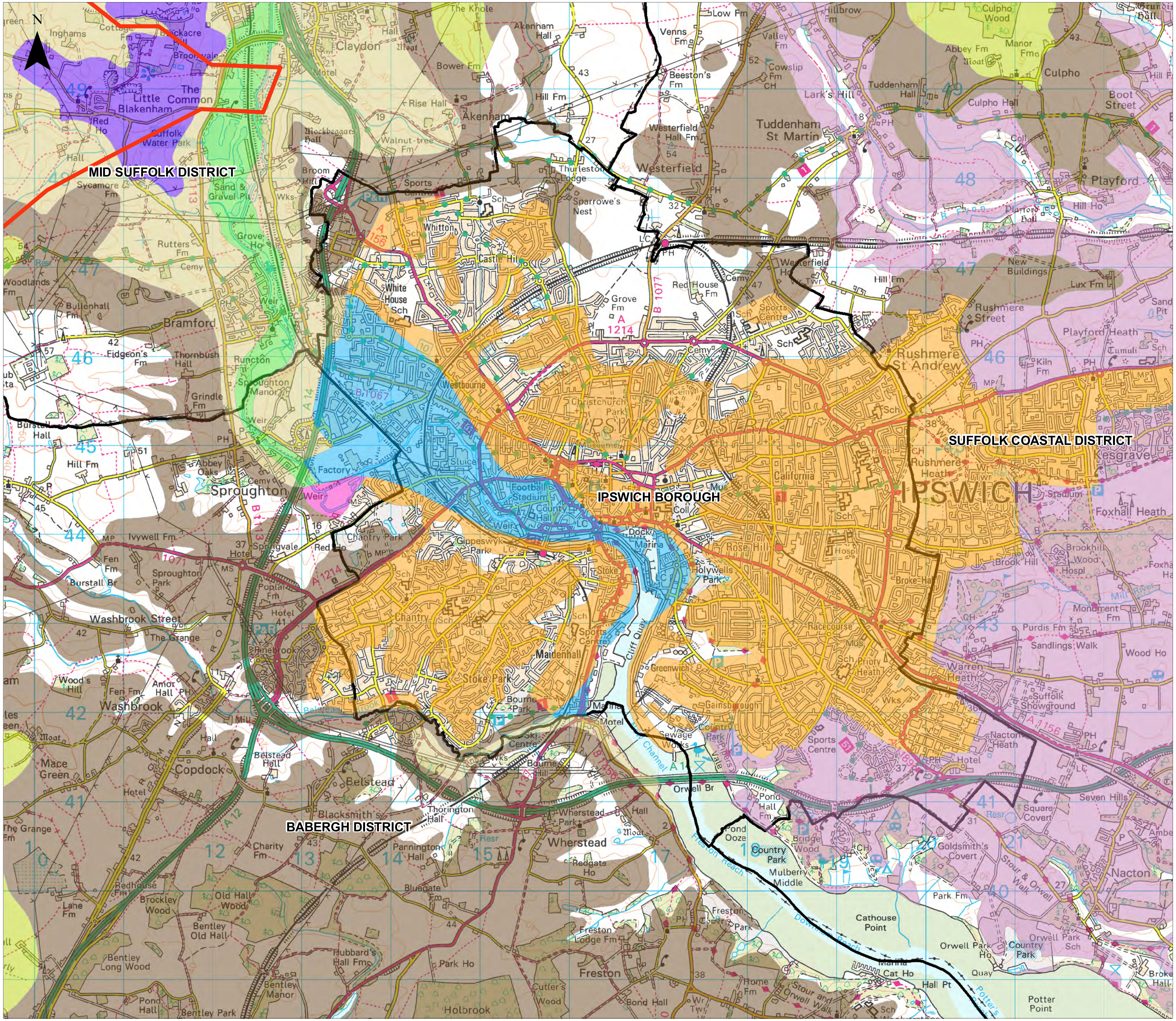
Project:
Haven Gateway Stage 2 WCS

Client:
Haven Gateway Partnership

Date:	Scale:
September 2009	1:40,000 @ A3

Figure:
6.10

ROYAL HASKONING



Key:

Haven Gateway Sub Region	
Local Authority Area Boundaries	

Groundwater Vulnerability

- MAJOR_H1
- MAJOR_H2
- MAJOR_H3
- MAJOR_HU
- MAJOR_I1
- MAJOR_I2
- MAJOR_L
- MINOR_H1
- MINOR_H2
- MINOR_H3
- MINOR_HU
- MINOR_I1
- MINOR_I2
- MINOR_L

Title:
Ipswich Borough
Groundwater Vulnerability

Project:
Haven Gateway Stage 2 WCS

Client:
Haven Gateway Partnership

Date:
September 2009

Scale:
1:40,000 @ A3

Figure:
6.11

ROYAL HASKONING

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