

Haven Gateway Water Cycle Study

Stage 1 Report

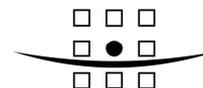
Haven Gateway Partnership

28 May 2008

Final Report

9T0070

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1 EXECUTIVE SUMMARY

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 Sub Region receives core funding from the East of England Development Agency as a Sub Regional Economic Partnership, and was awarded New Growth Point status in October 2006.

A 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)

1.1 Key Communications

- The water cycle capacity 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.

1.2 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.

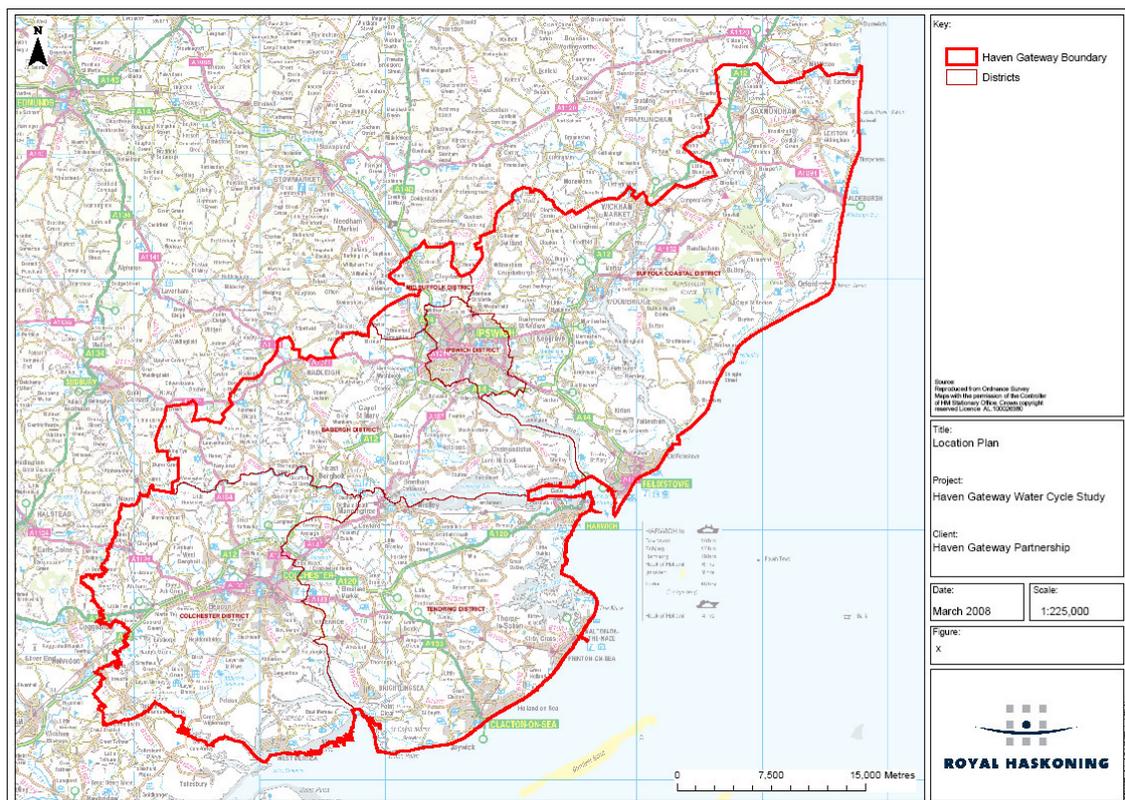
2 INTRODUCTION

2.1 Background

The Haven Gateway Sub Region (HGSR) was awarded New Growth Point Status in October 2006. 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 about 1200km² of north east Essex and south east Suffolk extending over several 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 region, Colchester and Ipswich. There are also a number of smaller market towns. The 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 74,100 new homes across the sub-region, averaging at 3,705 each year between 2001 and 2021.

Figure 2.1 The Haven Gateway Sub Region



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 Stage One Water Cycle Study (WCS) for the sub region. The WCS is needed to ensure that water supply, water quality, sewage collection and treatment and flood risk management issues can be addressed in a sustainable way to accommodate the planned growth up to 2021 and beyond. It is

intended for this study to contribute to the evidence base for the emerging Local Development Framework documents.

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

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

2.2 Stakeholders and consultation

This Stage 1 WCS was prepared on behalf of the HGP – an organisation of Local and County authorities seeking to utilise the newly awarded Growth Point Funding to promote the integrated and sustainable development of the HGSR. Collaboration with Planners from all constituent local authorities within the HGSR has been sought throughout the production of this WCS to enhance its accessibility and potential to effectively inform Local Development Framework documents. The constituent authorities, both local and county, with the HGSR include: Babergh; Colchester; Ipswich; Mid Suffolk; Suffolk Coastal; and Tendring District Councils as well as Essex and Suffolk County Councils. Furthermore, this report was also prepared in consultation with the Environment Agency, Anglian Water Services and Essex and Suffolk Water Services.

A consultation plan was developed in association with all of the above named parties, a copy of which can be found in Appendix A.

2.3 Objectives of the 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.

2.4 Integration within local development frameworks

The Planning and Compulsory Purchase Act 2004 introduced the need for each council to produce a Local Development Framework and replace the existing system of Local Plans. Each of the six councils within the Haven Gateway Sub-Region are at varying stages of development of their Local Development Frameworks.

Each Local Development Framework should be supported by an evidence base. A Water Cycle Study would become part of that evidence base, particularly as it is developed from information provided by key stakeholders within the planning and development process. The WCS will bring together development planning and infrastructure planning, to achieve a sustainable growth.

2.5 The report format

For ease of reference, the chapters within this report represent a breakdown of the task at hand and detail:

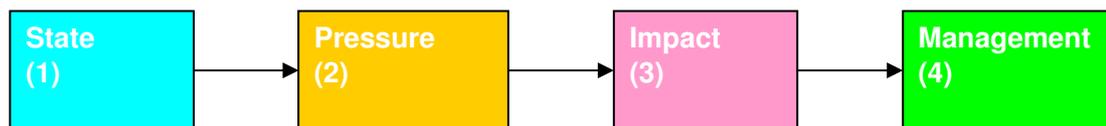
- the nature of the problem;
- how, and from whom, the information has been collated;
- how this information has been assessed;
- the outcome of these assessments as well as recommendations.

The chapters within this report make an assessment of each facet of the Water Cycle: wastewater collection and treatment; water resources and supply; water quality; flood risk management; and environmental issues and opportunities.

3 DATA COLLECTION AND METHODOLOGY

3.1 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 information requested from each consultee was listed, and requested at the inception meeting. These lists can be found in Appendix A, along with a further list of the information that was actually received, and the information that remains outstanding. The limitations of this data are discussed further in Section 2.8.

3.2 Housing growth and 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. Drawing 1 in Appendix A shows the main development areas.

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 31 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 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 the whole of the Haven Gateway Sub-region. It should be noted that not all of the Mid Suffolk District Council and Babergh District Council areas are included in the Haven Gateway Sub-region, and so the irrelevant development areas were removed from the trajectory figures. However, it was deemed necessary to consider a 10km buffer zone along the Haven

Gateway boundary, and so these areas too had to be identified within the trajectories. The final trajectory spreadsheet is shown in Appendix B.

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 (Oct. 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. The employment land trajectory spreadsheet is contained in Appendix B Table 2.

3.3 Wastewater

Some 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) and current (2007) flow data. Appendix C Table 1 presents a summary of the data received for the STWs that are to be influenced by the proposed key developments to the year 2021. These STWs were identified by considering the developments identified in the development trajectories (see Appendix B) and identifying the wastewater treatment works catchment area in which they were located. The calculated DWF figure is based upon the design flows shown within Table 3.3.1 obtained from Anglian Water.

Table 3.3.1 – Design flows

Flow Element	Design Flows	
	Litres	Metres cubed
Residential Development	145 litres/capita/day	0.145 m ³ /capita/day
Industrial Development:		
Domestic Element	46660 litres/hectare of developable land/day	46.66 m ³ /ha developable land/day
Trade effluent	58750 litres/hectare of developable land/day	58.75 m ³ /ha developable land/day
Infiltration	40 litres/capita/day	0.04 m ³ /capita/day

3.4 Water resources and supply

There are three water companies that serve the Haven Gateway Sub-region – Anglian Water Services Limited, Essex and Suffolk Water Services and Tendring Hundred Water Services.

Due to the heightened security around water supply resources, we have 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 accurate assessment on the impact of growth on the water infrastructure is particularly difficult.

3.4.1 Water Resources Management Plans

The Water Resource Management Plan Regulations (2007) require all water companies to publish a Water Resources Management Plan (WRMP). These are relatively new regulations, and the first plans were issued for public consultation in May 2008. All three water companies within the Haven Gateway Sub Region have published plans, which are reviewed in Section 6 of this report. The plans explain how each company expects to supply water to its customers over the 25 year period from 2010 to 2035. The plans will also form part of the 5 yearly business plan each company must submit to Ofwat, the next submission being due in August 2008.

3.4.2 Anglian Water Services

Anglian Water (AWS) have been extremely proactive, and attempted to provide information requested where possible, within the remit of their security guidelines. In addition to the information readily available on their website and their WRMP, AWS have also produced a report specifically for this study, regarding the impact of growth on supply. This can be found in Appendix C. From the details within this report and the Water Resources Management Plan, it will be possible to make an assessment of the impact of the new development areas on the water supply situation. Furthermore, it should be possible to approximately identify where development should not go ahead until water supply issues are resolved.

3.4.3 Essex and Suffolk Water Services

The Essex and Suffolk Water Services coverage within the HGSR is not as extensive as the other companies, and therefore they have not been as involved with the initial stages of this report as Anglian Water. Like Anglian Water, Essex and Suffolk Water's draft 'Water Resources Management Plan' has been reviewed and its content used to make an assessment of the impact of new development. 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. Essex and Suffolk Water Services have only identified growth to the north of their Suffolk catchment area, and have planned no new or additional supplies for the south. However, they have indicated that there is currently additional capacity in the Blyth Water Resource Zone, which includes the area of the HGSR that Essex and Suffolk Water covers, and that the proposed growth can be accommodated. This is something that should be considered further at Stage Two.

3.4.4 Tendring Hundred Water Services

As with Essex and Suffolk Water, Tendring Hundred Water Services' (THWS) coverage of the HGSR is not as extensive as Anglian Waters'. However, they will provide potable water services to 15% of the growth within the HGSR. The recently published Water Resources Management Plan identifies how Tendring Hundred Water Services propose to accommodate the additional demand from this growth. Other documents considered include their 'Strategic Direction Statement', dated December 2007, which outlines the direction in which the company is heading in the future. The report rightly identifies the growth in the Haven Gateway area, and has predicted an additional 30,000 homes in the area. However, if growth exceeds this figure, Tendring Hundred Water predicts that

additional resources will be needed. It would appear that they have some additional capacity in existing licenses, and would also expect additional resources to be supplied by Ardleigh Reservoir. However, this may present an issue with Anglian Water, should they both be expecting to achieve additional supply from the existing capacity at the same source.

THWS have identified that additional storage will be required at Ardleigh Reservoir by 2025, the same as Anglian Water. They have also identified that a bulk transfer scheme will be required to facilitate growth after this time.

3.5 Water quality

The Environment Agency has provided the General Quality Assessment (GQA) grades and River Quality Objectives (RQO) for all of the rivers in the HGSR, along with the Catchment Abstraction Management Strategy's (CAMS) for East Suffolk and Essex respectively. This data was used to provide an assessment of the water quality in the HGSR. Initial indications show that river quality across the area is generally good to fair, with very few rivers reaching a 'very good' status. Levels of phosphates and nitrates in the rivers also tend to be very high, although it is likely that this is because of the land uses in the area – generally arable.

3.6 Flood risk

In order to make a robust assessment of flood risk within the HGSR, a number of documents were initially requested. This list can be found in Appendix A Table 1. The table shows the information actually received in a timely nature in order to facilitate this study. At this stage the document of most use is the district Strategic Flood Risk Assessment.

An assessment of the known development sites has been made where information has been received. In other areas, an outline assessment has been made by using information drawn from other sources.

3.6.1 Ipswich Borough Council

Ipswich Borough Council published a Level 1 SFRA in November 2007. It is not currently known if there are any plans to commence a Level 2 study. The Level 1 study has been reviewed. The Study has identified a number of flood risk issues in Ipswich that will have an impact on future growth.

3.6.2 Colchester Borough Council

A Level 1 and 2 SFRA has been carried out for Colchester. This was as a part of the Mid Essex SFRA, which was published in November 2007. The report shows that some land identified as suitable for development is located within Flood Zones 2 and 3. This may affect growth.

3.6.3 Suffolk Coastal District Council

A Level 1 and 2 SFRA has been carried out for the Suffolk Coastal District Council. The SFRA also includes the Waveney District, and was published in November 2007. The

maps produced for the SFRA were received early during the study period. However, the accompanying report did not become available until the end of the study period. Therefore the report has not been studied in detail.

Much of the Suffolk Coastal area is low lying coastal land, and is therefore within Flood Zones 2 and 3. It is therefore likely that this will include land suitable for development.

3.6.4 Mid Suffolk District Council

The Mid Suffolk Level 1 and 2 SFRA has very recently been published on the Councils web site. It has therefore not been reviewed in detail. All of the development within the Mid Suffolk area of the HGSR is in the Ipswich Policy Area. This land is away from the coast, but still adjacent to Flood Zone 2 and 3 areas. Therefore these areas will require further study at Stage Two.

3.6.5 Tendring District Council

The Tendring District Level 1 SFRA Scoping Report is currently being produced. Therefore no details were available for this study. The CFMP provided some details. Significant areas of land are located within Flood Zones 2 and 3, particularly due to the district being bounded by the North Sea, estuaries and watercourses. Tendring is also the location of a number of extensive development areas. Therefore, assessment of this area will need to be made.

3.6.6 Babergh District Council

Babergh are soon to receive the Scoping of their Level 1 SFRA, and therefore no details were available for this study. Although not all of the Babergh area is within the HGSR, the areas include the coastal and estuarial elements of the district, which will again have a number of Flood Zone 2 and 3 areas.

3.7 Environmental matters

As discussed in the Inception Report for this study, a number of items requested were not received in a timely manner during the inception phase. An assessment of the number and location of environmentally sensitive sites in the HGSR and their proximity to development was been made, along with comment on the potential impact of development. An initial assessment on the impact of water quality has also been made, but further consideration of this will be made during the Stage 2 study, when further analysis of the impact of development on Sewage Treatment Works discharge consents are known.

3.8 Data limitations

As reported during the Inception Report for this Stage, the collection of data during this study has been a concern, and critical to the output of the Stage 1 study. Due to the security limitations, the assessment of water supply and treatment has not been clear cut, but an assessment of the impact of development has been made.

Anglian Water is currently reviewing the recorded flow from their Sewage Treatment Works, and this revised data should be in place early in the Stage Two study.

Table 2 in Appendix A lists all of the data received in relation to this study, the source of the data and the date it was received.

4 DEVELOPMENT SCENARIOS AND KEY DEVELOPMENTS

4.1 Introduction

In order to assess the capacity of the water cycle infrastructure to meet the likely requirements of future development, it was originally intended to assume the following projection scenarios:

- Existing projections (from current Local Plans);
- Current total projections and optimum average rates based on the latest information from the Framework for Growth (FfG) for the Sub Region; and
- Most likely total projections with stepped annual rates due to planning delays and practical constraints such as infrastructure and implementation issues. For example, this may lead to lower annual rates during the early period of the plan and higher rates during the later period.

Following consultation with the local authorities, it was found that of the Local Plan projections, some local council areas were more up to date than others, with some areas well into the Local Development Framework process and others just starting the initial consultations. Therefore, the use of data solely from existing Local Plans would not accurately reflect the current situation. Moreover, as some of the Local Plans had been in existence for some time, much of the land identified for development had already been developed, as reflected in the completions data or had been identified as unsuitable for development.

The projections in the Framework for Growth document were initially used as a basis to identify areas of development. The trajectories that were subsequently developed after meeting with the local authorities, gave more detail to the trajectories than those in the Framework for Growth document, which were generally based on the Regional Spatial Strategy figures.

Once all of the detailed development data was collated, trajectories were developed that were as accurate as possible. They consider all development within each area, including sites already identified in the Local Plan or Local Development Framework document, sites which have been removed from the Local Development Framework/Local Plan, windfall sites and any other potential sites which may come forward for development. Comparison of the Regional Spatial Strategy development (Figure 4.1.1 below) shows significant deviation from the straight line prediction of the Regional Spatial Strategy and that all areas have recently experienced an unexpected increase in growth. It can be seen from Figure 4.1.1 that we are currently at the peak growth period, with new builds expected to reduce by about 40% over the next four years.

It should be noted that the trajectories do not include the impact of any development of sites that may come forward within the next 15 years that are not currently identified in the plans, but could feasibly be used for development. This includes Greenfield sites that could be developed, previously developed land that is still being used for its original purpose but could be developed in the future, and sites that had been identified in previous Local Plans, but then excluded as unsuitable for development.

Figure 4.1.1 RSS development trajectories compared with the LDF trajectories

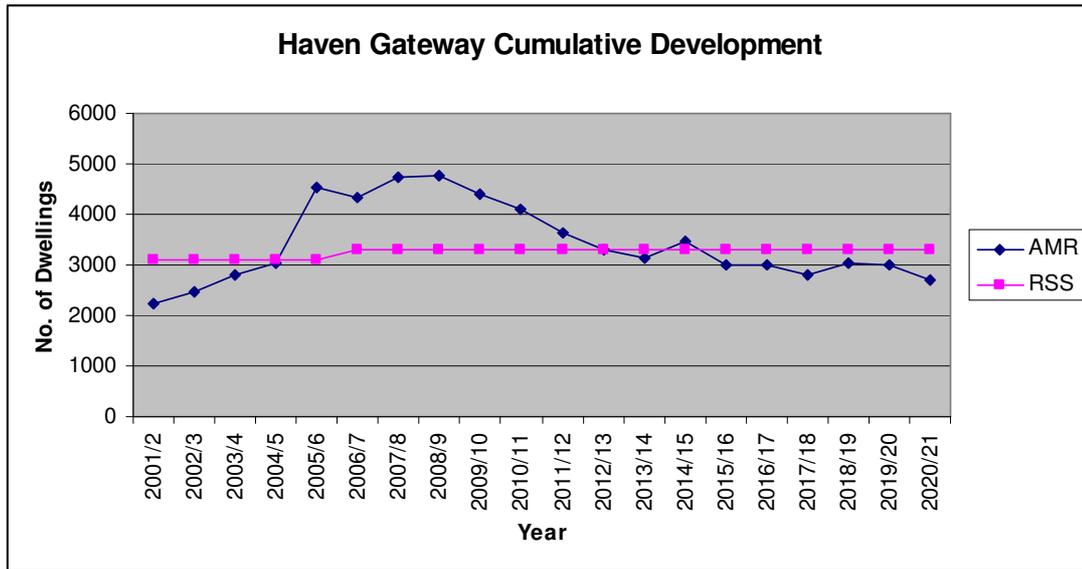


Figure 4.1.2 Balance of Growth AMR

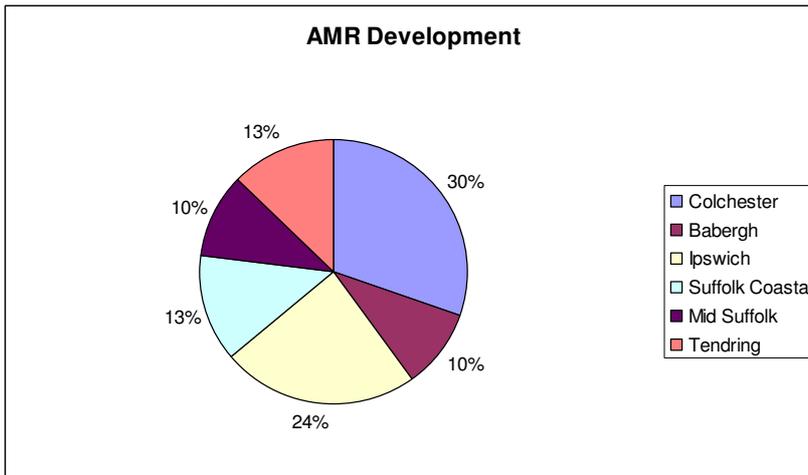
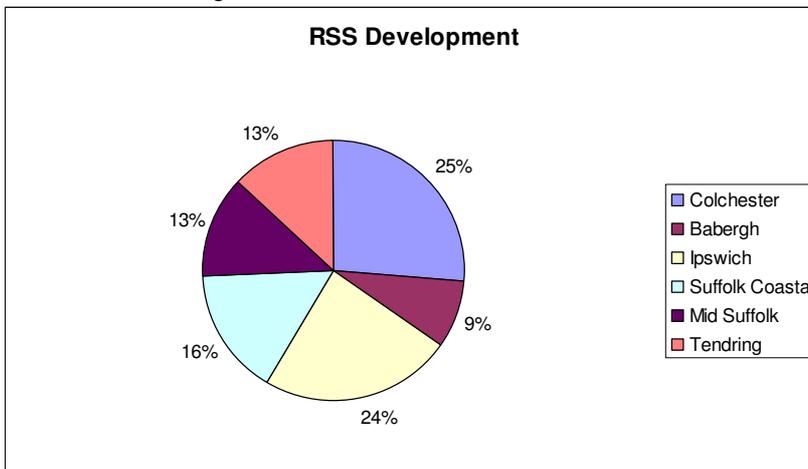


Figure 4.1.3 Balance of Growth RSS



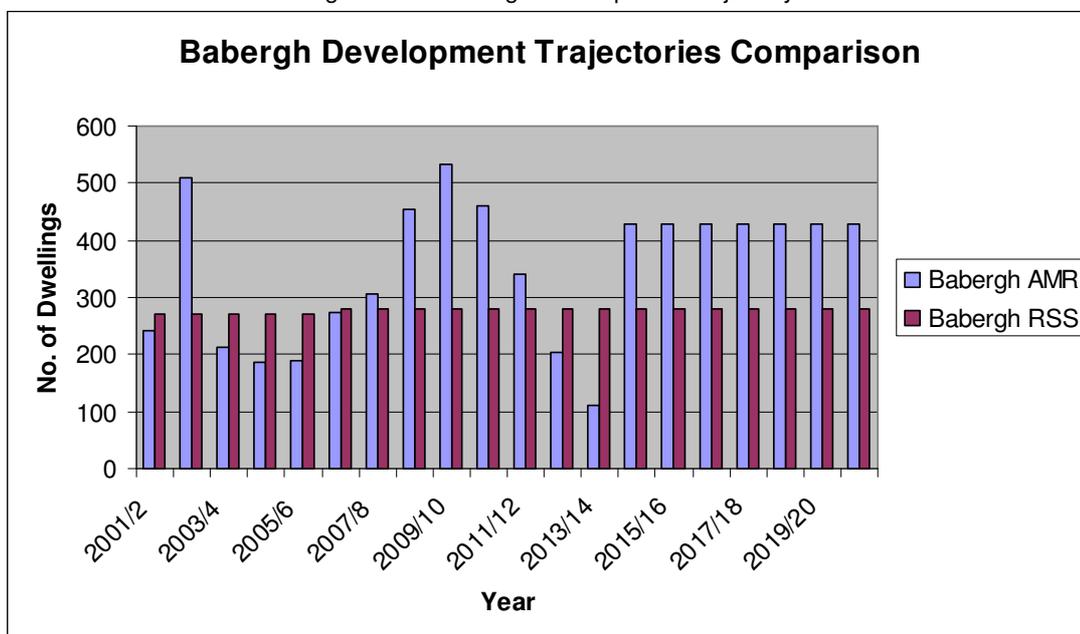
The Annual Monitoring Report trajectories show development to be weighted to roughly the same district council areas, with the two main growth areas, Colchester and Ipswich, providing a quarter of the growth between them. Figures 4.1.2 and 4.1.3 compare the balance of growth identified in the Regional Spatial Strategy to that in the Annual Monitoring Reports. Drawing B1 in Appendix B shows the approximate location of the development areas identified in the following sections.

4.2 Babergh

The district of Babergh is located to the south west of Ipswich. The district of Babergh has a geographical area of 596 km², although only a small proportion of that area falls within the Haven Gateway Sub-region. The district is predominantly rural, and has two main market towns, Sudbury and Hadleigh. Only Hadleigh falls within Haven Gateway, but Sudbury is located within the 10km buffer zone, and so the development here has also been considered.

The East of England Plan distributional strategy has identified that the Babergh district should grow by 5,600 dwellings in the 20 year period to 2021, with a trajectory of 280 dwellings per year between 2006 and 2021. However, Babergh District Council's projected housing requirement exceeds that shown in the Regional Spatial Strategy, due to underperformance in the past. Therefore the figures shown in the trajectory produced by Royal Haskoning for the purpose of this study is based on the data provided by Babergh District Council, in anticipation of providing the 5,600 new dwellings by 2021. Figure 3.2.1 shows the projected trajectory compared against the RSS.

Figure 4.2.1 Babergh Development Trajectory



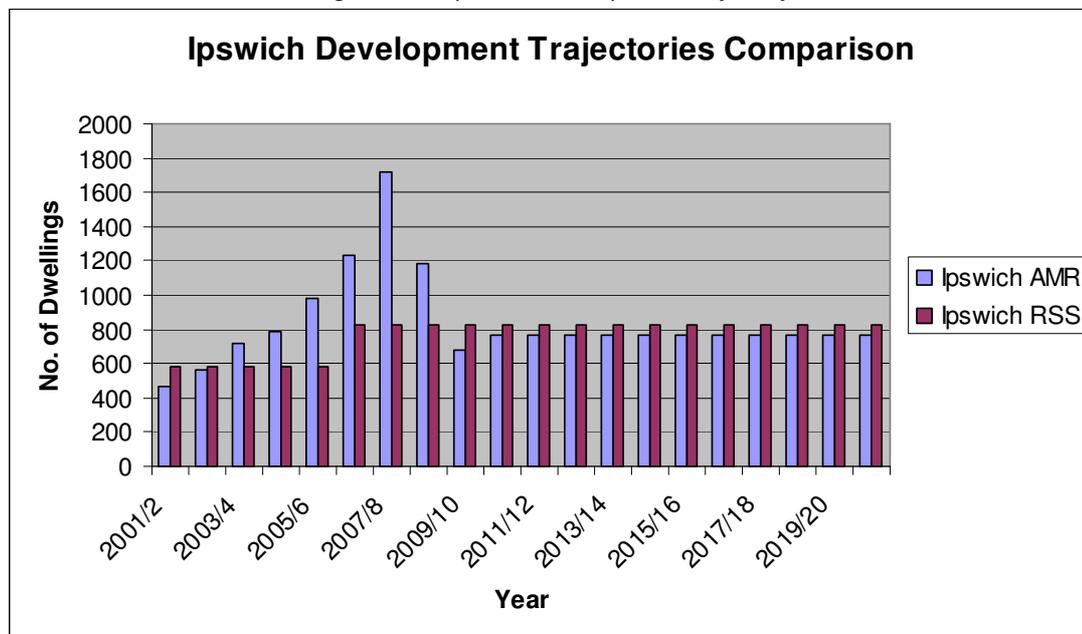
The main development areas in Babergh are located in the areas of Sudbury, Great Cornard, Hadleigh, and the HMS Ganges site at Shotley, on which development is not likely to start before 2010.

The development areas at Sproughton and Pinewood (south Ipswich) fall within the Ipswich Policy Area, although they are located within the Babergh District. There are no major employment developments identified in the Babergh District Council area.

4.3 Ipswich

Ipswich Borough is one of the smallest geographical areas within the Haven Gateway Sub-region, but one of the largest growth areas. The East of England Plan has allocated 15,400 dwellings to the Ipswich Borough Council area, the majority of which are to be built on previously developed land. The trajectory for 2001 – 2006 was set at 580 dwellings per year, increasing to 830 dwellings per year from 2006 to 2021. However, as with Babergh District Council, development has not progressed at the anticipated rate, and subsequently, more development is forecast for the period to 2010, with an expected annual rate of 770 dwellings per year thereafter. Figure 3.3.1 shows the projected trajectory compared against the Regional Spatial Strategy.

Figure 4.3.1 Ipswich Development Trajectory



As much of the growth in Ipswich is to be on previously developed land, or infill development, there are few large developments, other than those already completed. The large development site at Ravenswood still has some areas left to develop, and a larger development is expected at the St. Clements Hospital site. There are also larger developments expected at Felixstowe Road, Suffolk Road, Bramford Road, Old Norwich Road, Raeburn Road and Elton Park Industrial Estate, all of around 100 dwellings. These are all on previously developed land. There are also a number of smaller development sites of 100 dwellings or less, again all previously developed land, throughout the borough. Particular growth areas are the Town Centre, the Village and the Waterfront, including redevelopment of the Docks.

The Ransomes Europark development is due to be completed soon, this being the location of a large proportion of the employment land currently available in the Ipswich

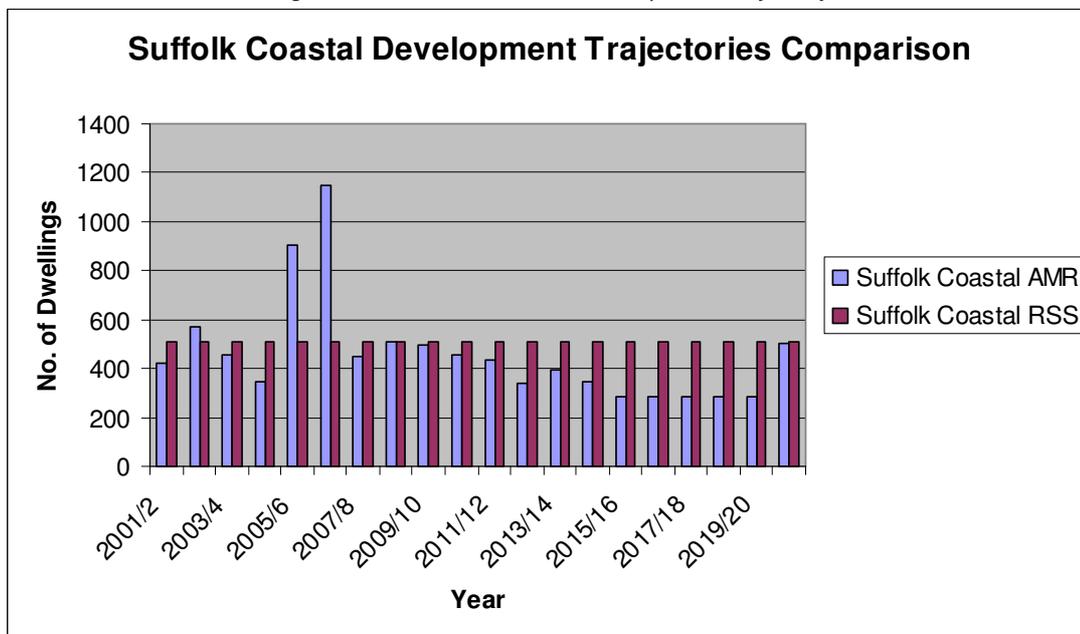
Borough area. No large area of employment land has subsequently been identified in the Ipswich Borough.

4.4 Suffolk Coastal

The Suffolk Coastal District Council area is a geographically large area, with smaller urban developments spread extensively across the area. The largest urban areas are to the east of Ipswich, and the Felixstowe and the Trimleys Peninsula. There is also the major industrial development at the Port of Felixstowe.

The East of England Plan shows the growth here to be 10,200 dwellings across the development period 2001 to 2021, at a rate of 510 dwellings per year across the period. However, the actual development rate has exceeded this in the past few years, and the trajectory for the remainder of the period shows development at a slower rate than this. Figure 4.4.1 shows the projected trajectory compared against the RSS.

Figure 4.4.1 Suffolk Coastal Development Trajectory



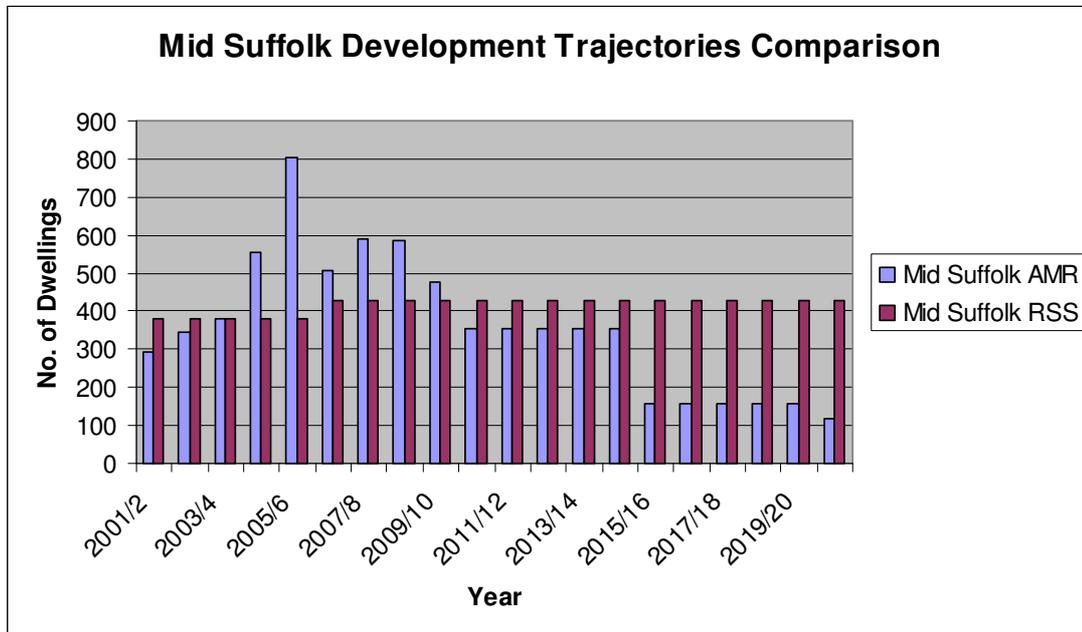
Some of the larger allocation sites have recently been completed, such as Grange Farm, Kesgrave, to the east of Ipswich. At present there are no identified large allocation sites in the period to 2021, although it is possible that one will develop at Purdiss Farm, close to the existing development at Kesgrave. Other future growth areas have been identified as Martlesham, with the proposed development of the Suffolk Innovation Park providing employment there. It is also likely that there will be growth in Felixstowe, especially with the expansion of the Port of Felixstowe.

4.5 Mid Suffolk

Only a very small area of the Mid Suffolk District Council area is included within the Haven Gateway Sub-region. This is essentially the Ipswich Policy Area. The target growth identified in the East of England Plan for the entire Mid Suffolk area is 8,300 dwellings over the 20 year period, at a rate of 430 per year from 2006 onwards. Of the

8,300 dwellings, 800 were expected within the Ipswich Policy Area. Figure 4.5.1 shows the projected trajectory compared against the RSS.

Figure 4.5.1 Mid Suffolk Development Trajectory

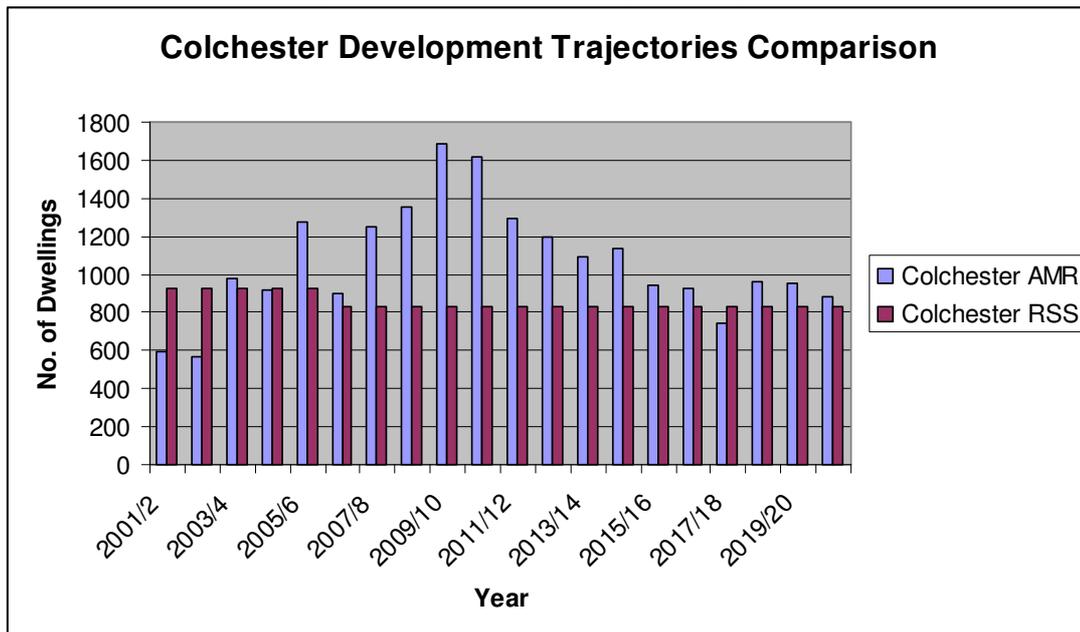


The proposed development known at ‘SnOasis’, has a trajectory showing 800 dwellings. This would be located within the Ipswich Policy Area and would satisfy the target for the East of England plan. The ‘SnOasis’ development would also provide 2,160 jobs. Other growth areas within Mid Suffolk, located around Stowmarket and Needham Market, are located outside of the Haven Gateway Sub-region, but within the 10km buffer zone. Therefore the impact of growth in these areas has also been considered.

4.6 Colchester

The Colchester Borough Council area covers not just the town of Colchester, but villages within the surrounding area. Colchester has been identified as one of the major growth points within Haven Gateway, with a target of 17,100 dwellings in the period 2001-2021. Colchester did not achieve the anticipated growth between 2001 and 2006, and so the target in the East of England Plan of 830 dwellings per year from 2007 will need to be increased. However, the trajectory this study has produced shows Colchester comfortably achieving the target number of dwellings. Figure 4.6.1 shows the projected trajectory compared against the Regional Spatial Strategy.

Figure 4.6.1 Colchester Development Trajectory



Colchester has four existing areas of regeneration – St. Botolphs Cultural Quarter, East Colchester, North Colchester and the Garrison. There is also a new regeneration area proposed North of the Station. These regeneration areas are generally on previously developed land. Development is also expected in the north and south areas of Colchester, and at Stanway. Wivenhoe, Tiptree and West Mersea are also areas in which a limited amount of development is expected.

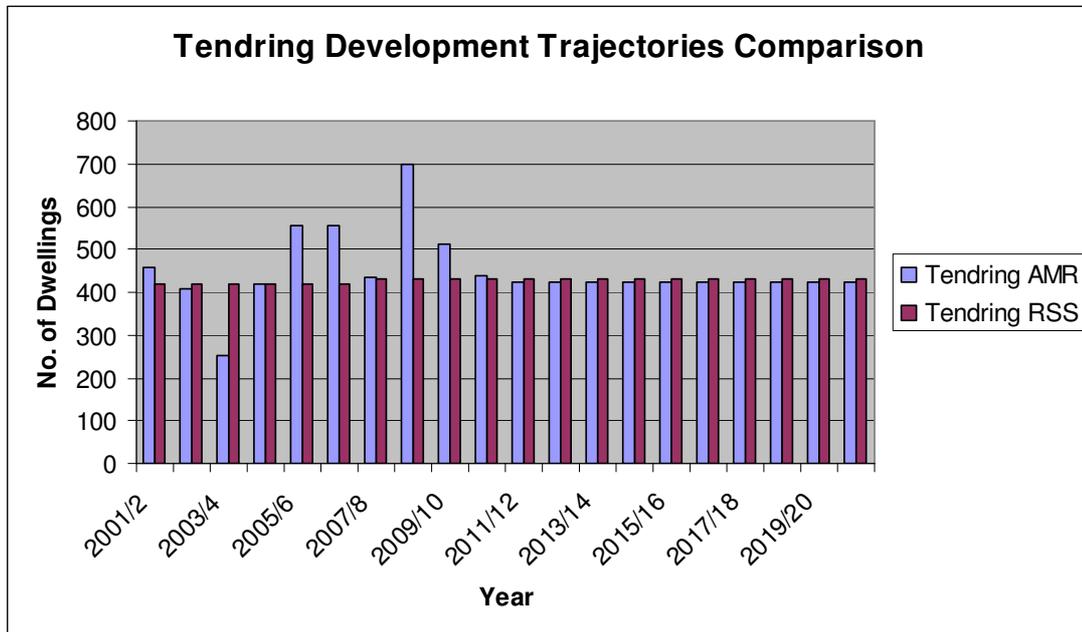
Development of employment land at Cuckoo Farm has already commenced, and is expected at Tollgate/Westside Centre, and the University Research Park. There are also a number of rural employment developments around the area.

4.7 Tendring

Tendring District Council occupies an area of 338 square kilometres, the largest town being Clacton. Harwich is the second largest town in the district, and the location of a port, and proposed Bathside Bay development. There are also three other urban areas within the district, Frinton and Walton, Brightlingsea and around Manningtree. The whole of the Tendring District is located within the Haven Gateway Sub-region.

The East of England Plan indicates that the target growth for the Tendring District is 8,500 dwellings in the period 2001-2021. As the district has grown at about the anticipated rate, the proposed trajectory of 430 dwellings per year for the period 2006-2021 is expected to be achieved. There are no major developments identified, although larger developments are expected at sites around Clacton and Jaywick, Harwich and Dovercourt, Frinton and Walton, and Brightlingsea. These are generally previously developed land sites, with Harwich particularly identified as an area of regeneration. Figure 4.7.1 shows the projected trajectory compared against the Regional Spatial Strategy.

Figure 4.7.1 Tendring Development Trajectory



The Bathside Bay development is an international container port, to be located adjacent to the existing container port at Harwich. The port itself is expected to create 770 new jobs, along with an expected 930 jobs from associated businesses.

4.8 Employment Land

The impact of employment land has been considered within the Water Cycle Study, although the way water and waste water are dealt with from employment development differs. This is discussed further in Sections 4 and 5.

Employment land is dealt with by planning officials as an overall site area. The Haven Gateway Framework for Growth identifies that the East of England Plan has a target of providing not less than 50,000 jobs in the HGSR between 2001 and 2021. It is therefore difficult to equate site area to number of jobs, especially as the employment types across the region are so varied. For example, the Harwich and Felixstowe areas have large areas of land identified as land for employment through the extension of the existing Ports. However, the amount of land required for the extensions is not proportional to the amount of employment created. Figure 4.8.1 above shows the employment land trajectories including the Ports. This shows that the land available in the Suffolk Coastal Area is extremely high, but if the port developments are removed from the trajectory, the picture is altered slightly. This can be seen in Figure 4.8.2.

Figure 4.8.1 Employment Land Including Ports

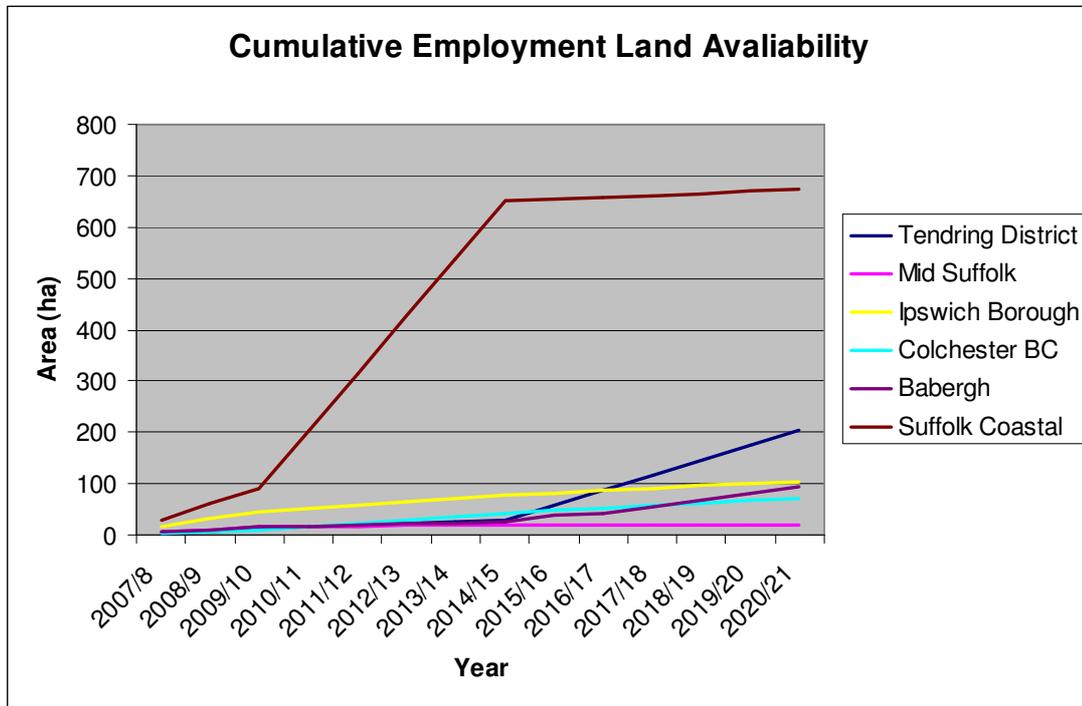
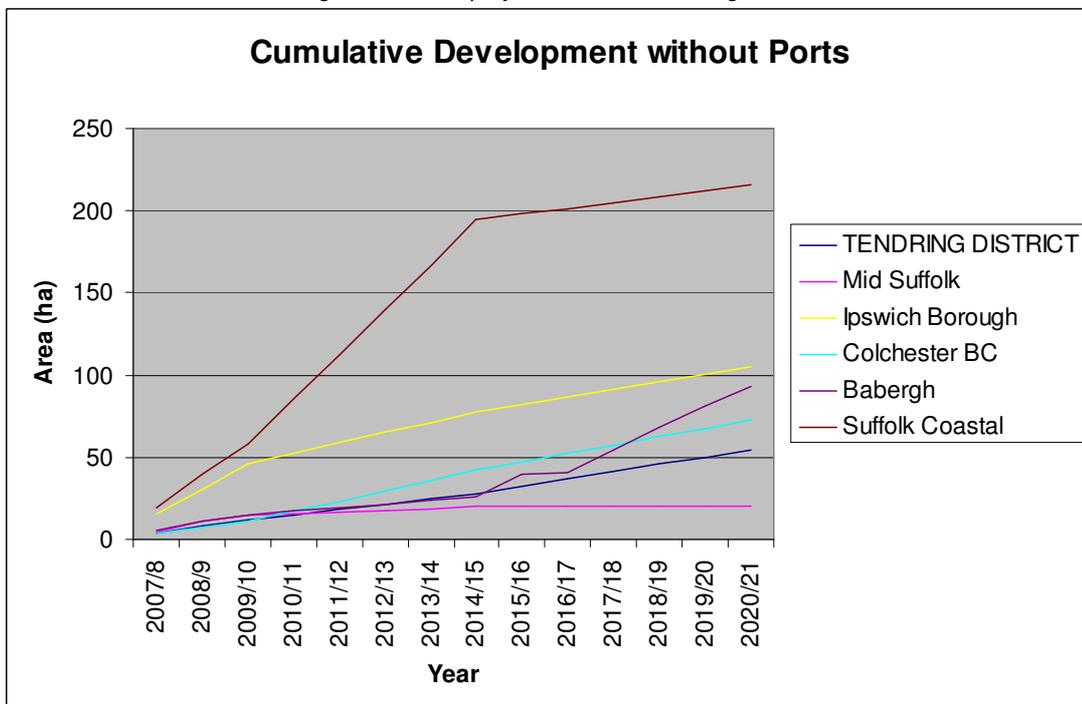


Figure 4.8.2 Employment Land Excluding Ports



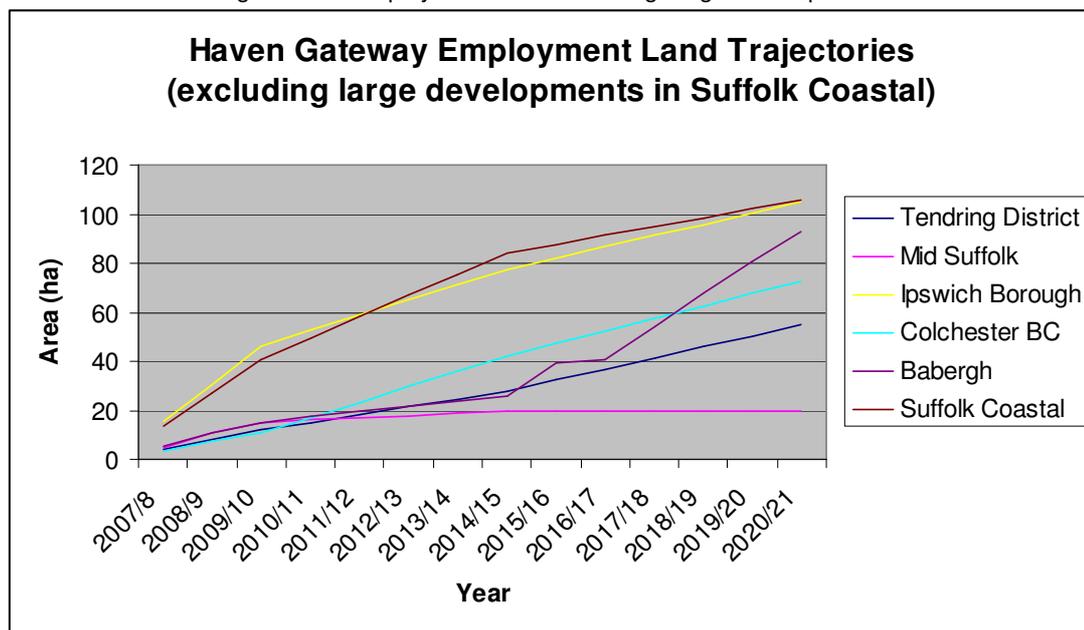
This still shows the Suffolk Coastal District as growing at a faster rate than the five other districts in the HGSR. Further consideration of the identified employment land shows that within the Suffolk Coastal area, there are a number of strategic employment areas. These are shown in Table 4.8.1.

Table 4.8.1 Strategic Employment Areas in Suffolk Coastal DC Area

Development	Location	Area
Ransomes Europark	Nacton, near Ipswich	18.59ha
Martlesham Heath	Martlesham, near Ipswich	33.5ha
Suffolk Innovation Park	Martlesham, near Ipswich	54.8ha
Former RAF Bentwaters	Rendlesham	21.95ha

If these are removed from the trajectories, the development in Suffolk Coastal is then similar to the other areas. This can be seen on the graph below, Figure 4.8.3.

Figure 4.8.3 Employment Land Excluding Large Developments



Of the larger Suffolk Coastal area sites, Ransomes Europark and the former RAF Bentwaters site are already under construction, and therefore some previous consideration of the impact of the development on existing infrastructure has been carried out. The two sites at Martlesham are currently in use as employment land, although the redevelopment of the area will most likely see an increase in jobs there, as well as potential for a new hotel development. However, these details are far from being finalised.

The employment land trajectories have been a useful tool for identifying areas of the employment growth. However, as previously mentioned, due to the size of the area of land to be utilised in the Port of Felixstowe expansion, the impact of the development on water and wastewater infrastructure, which was calculated based on the development area, is likely to be on the conservative side. A more accurate picture will require further information on the actual use of the employment land. This is a general issue with all employment land in this study as the water infrastructure requirement for this type of land use is highly dependant on the particular form of employment use of the land, but this detail was not available to this study.

Attempts have been made to use the available employment land data to produce an assessment of the land use types identified for each parcel of land. A copy of this can be found in Appendix B (Table B3).

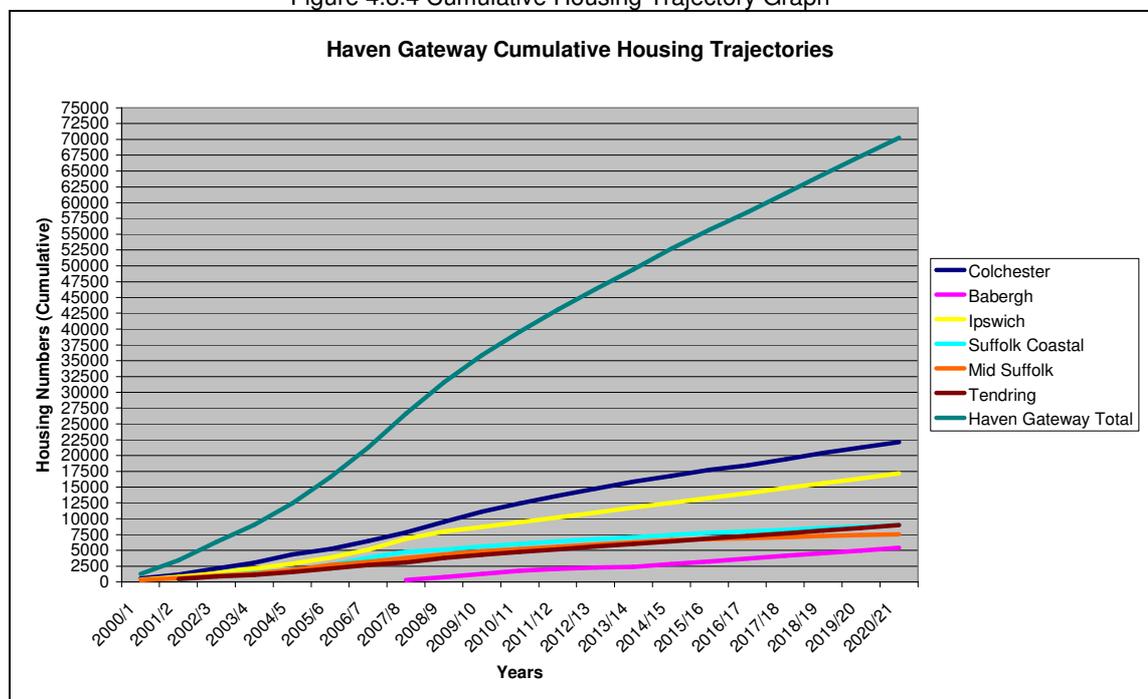
After completing the revised trajectories, it was noticed that a large proportion of employment land had been allocated the site uses B1, B2 and B8. Therefore, it would not be possible to use this data to provide a more accurate forecast of potential levels of water and wastewater use. It is proposed that this issue is further discussed with the steering group. If the steering group then feel it is beneficial to consider this issue further, it can be further analysed as part of the Stage 2 study.

4.9 Summary

The development scenario that has been produced is based on the most up to date development information available from local councils. As the AMR considers the 20 year period from 2001-2021, the trajectories show the impact of actual development for the first six years of the development period. This will subsequently affect the proposed growth for the remaining years of the plan, and beyond.

The growth to date has produced a peak in the trajectory graphs over recent years. This shows that growth has exceeded expectations to date, and therefore in order to meet the overall growth target for the HGSR, growth over the remaining 15 year period to 2021 will be at a lesser rate than that projected in the Regional Spatial Strategy. Figure 4.8.4 below shows the impact of the increase in growth across the HGSR.

Figure 4.8.4 Cumulative Housing Trajectory Graph



If growth were to continue to exceed expectations, constraints within the existing infrastructure would simply be met sooner and infrastructure improvements would need to be put in place earlier. Similarly, if growth were to slow, the constraints would be met at a later date, and there would be a risk that growth targets would not be achieved. However, as this report will later show, an assumption that no improvement will be made

to the existing infrastructure has been made, so that a worst case scenario will be considered. Development to date has commenced without extension to existing infrastructure being made.

5 WASTEWATER COLLECTION AND TREATMENT

5.1 Existing situation

Anglian Water Services is responsible for the operation and maintenance of the wastewater collection and treatment infrastructure throughout the entirety of the HGSR. This also includes the collection and subsequent treatment of surface water originating from surfaces within private properties connected directly to the wastewater network through combined systems. This therefore does not include, unless specifically adopted by Anglian Water Services, systems that do not connect directly to the wastewater network, such as: SuDS, soakaways, private drainage systems or highway drainage.

We have identified 91 sewage treatment works (STW's) within the HGSR and surrounding 10km buffer zone. Of these treatment works, it is thought that approximately 54 will be directly affected by the additional flow created by growth in the identified key development sites predicted to arise by the year 2021.

Furthermore, the performance of at least an additional 35 STW's may be affected by additional flows should development commence without proper consultation. This is generally due to their small size, and any development within their catchment would have a negative effect.

In December 2006 the East of England Capacity Delivery Strategy (by Halcrow) was issued on behalf of the Environment Agency, East of England Regional Assembly and the Government Office for the East of England. The study identified the potential for additional outflow from Sudbury (SUDBST), Manningtree (MANNST) and Great Cornard (GCORST) STWs to increase flood risk in the receiving watercourses (the River Stour, Wignall Brook and Cornard Black Brook respectively). The report also found that there is a small risk that the watercourses receiving discharge from Colchester and Ipswich-Cliff Quay STWs could be classed as Nitrate Sensitive Waters. Should this happen, the STWs would be subject to more stringent discharge consents under the Urban Wastewater Treatment Directive (91/271/EEC). The report suggests that 'significant' improvements would be necessary to meet the potential new consents.

Appendix C Table 1 lists all of the STWs which will be affected by the proposed development to the year 2021 as identified within the trajectories discussed in Section 3. Data received from Anglian Water included:

- Consented Dry Weather Flow (CDWF);
- Total Dry Weather Flow (TDWF);
- Annual Flow; and
- Daily Flow.

This assessment was made based on the volumetric discharge consents and not the Sewage Treatment Works process capacity, as process capacity information was not made available to the study.

The table then shows the annual increase in TDWF across the development period for both housing and employment growth, as identified in the Trajectories (Appendix 2 Tables 1 and 2). Appendix C Table 2 summarizes the CDWF with actual DWF across the development period. The outcomes are discussed further in Section 5.3 below.

The East of England Capacity Delivery Study omitted treatment works serving less than 500 persons, with the reasoning that significant development in these areas would be directed elsewhere for treatment. This however is not the case, and in order to direct this development, these works need identifying. Therefore all works expected to receive flows from future development have been considered in this study.

5.2 Water Usage

The water usage level originally proposed for the wastewater calculations for this study (Appendices C and D) was set at 160 litres per head per day, with an average occupancy of 2.1 people per property. These figures were based on water consumption levels set out in Sewers for Adoption (5th edition), industry best practice and Anglian Water calculated consumption.

After extensive discussions with Anglian Water, it was felt that this water consumption figure was too high. The figure calculated in their return to Ofwat for June 2007, averaged for metered and unmetered water consumption was 145 litres per head per day (l/h/d). 'Future Water', the Governments' water strategy for England, estimates the average water use in England is 150 l/h/d in a standard house. However, this document also promotes the construction of water efficient properties, where water consumption could be reduced to 80 l/h/d.

It has been agreed with Anglian Water, that a figure on 145 l/h/d will be used for wastewater calculations for the purpose of this study.

5.3 Holiday Population

Due to 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 and Dovercourt in the Tendring Hundred Water supply area, Felixstowe and West Mersea in the Anglian Water supply area, and Leiston in the Essex and Suffolk water supply area. This seasonal demand 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 (from Anglian Water) was assessed on water supply and wastewater collection, and the demands included in the tables. This also included an increase in population equivalence due to growth. These wastewater collection tables can be seen in Appendix B.

5.4 Ongoing/proposed capacity improvement work

Anglian Water are currently coming to the end of any improvement works which were identified within the Asset Management Plan 4 (AMP4), which runs from 2005 to 2010. The consultation for the next AMP period (AMP5, 2010-2015) is about to commence, although the wastewater element will be included in the company's Business Plan, the draft of which will not be completed until November 2008. The approval is not expected until March 2009, and therefore will not be available for this Water Cycle Study.

Therefore after discussion with Anglian Water, it was agreed that for the purpose of this study, the current situation be taken as the baseline for this study. It has also been assumed that no infrastructure improvements will be carried out between now and 2021.

5.5 Influence of proposed development

The proposed key developments to the year 2021 will undoubtedly have a far reaching effect upon the wastewater infrastructure across the HGSR. This effect will be varied across the HGSR depending upon:

- the current burden upon each STW and associated sewerage network;
- the nature and size of each proposed development; and
- the phasing of each development.

Given the locations, size and nature of the proposed developments as well as the STW catchment in which each resides, Table 1 in Appendix C shows an estimation of the additional post-development flow using assumptions indicated in Section 2.3 [Data Collection and Methodology - Wastewater]. However, due to the lack of specific details for the proposed developments as well as the uncertain and varied planning status of the developments listed, the figures presented here are only approximate and, until the data upon which they are based has been clarified, should be used for indicatory purposes only.

Table 3 in Appendix C shows a traffic light approach to data in Table 1, and shows the available volumetric consent capacity, in each Sewage Treatment Works each year, based on the developed trajectories. The classification system utilised here is, as stated within Section 2.3 [Data Collection and Methodology - Wastewater], a system based upon the predicted post-development DWF as a percentage of the current CDWF. The baseline for the assessment of the existing capacity in each works is the trended Dry Weather Flow (TDWF), provided by Anglian Water, or the calculated DWF where the trended data was not available. The available capacity has been assessed as the difference between the consented dry weather flow (the volumetric consent) and the trended flow data plus cumulative growth, expressed as a percentage. These figures are purely based on consented capacity, and not process capacities. Currently it has been assumed that the qualitative elements of the consent will not change, and can be achieved by the process without affecting volumetric flow.

It is important to stress that the figures used for the assessment of the capability of STWs to accommodate the additional flow from growth is based on consented discharges of the works and not the process capacities. This volumetric flow is not representative of the treatment capacity of the works. However, without the discharge consent being in place, even if the STW has the process capacity to treat any additional flow the lack of a consent to discharge at this volume would make this impossible to achieve. Where AWS have identified that additional flow cannot be accommodated within the existing process capacity of a STW, this has been identified.

Initially Table 3 shows that the CDWF volumetric capacity for each STW in the HGSR has generally will be reached by 2021, or is close to being reached. The STWs shown as having available headroom (amber or green) in 2021 tend to be the smaller works

with little or no growth in the catchment. This leaves a large proportion of the STWs showing red. These can then be classified into groups, as shown in Table 5.1.1 below.

Table 5.1.1 Oversubscribed STWs based on Volumetric Consents at 2021

0-19% oversubscribed	20-49% oversubscribed	More than 50% oversubscribed
Brighlingsea	Cliff Quay	Benhall (Saxmundham)
Bures	Colchester	Blaxhall
Charsfield	Jaywick	Felixstowe
Copford	Needham Market	Grundisburgh
Gedgrave (Orford)		Great Waldingfield
Stowmarket		Hadleigh (including outside HGSR)
Sudbury (including outside HGSR)		Harwich and Dovercourt
Tiptree		Leiston
Wix		Melton
		Otley
		Rendlesham
		Sproughton
		Woodbridge and Martlesham
		Yoxford

These works may require capital works on behalf of Anglian Water in order for the predicted increase in wastewater flows to be effectively treated. It also indicates that the proposed development cannot be accommodated within the STW catchment unless an increase in the CDWF is granted, or some alternative solution developed.

The willingness of the Environment Agency to allow an increase in the CDWF will depend primarily upon the capacity of the receiving watercourse to accommodate the additional STW treated discharge; both qualitatively and volumetrically. The water quality status of many watercourses within the HGSR is currently monitored on a regular basis by the Environment Agency, therefore, the decision to increase the CDWF will be based upon this data. This could be due to the enhanced influence an increase in treated effluent will have upon the aquatic ecosystem. This may require additional capital investment by Anglian Water in order to meet the higher required effluent standard. Any change in volumetric consent will not just involve consideration of the possibility of increased flood risk, but also the environmental impact of an increase in consent, downstream uses such as recreational uses.

5.6 Revised Trend Data

AWS are currently in the process of reviewing and checking their measured and trended data. It is expected that this may identify some sites where the information currently available is inaccurate. It is therefore recommended that the data used in the calculations for this report is checked and revised on receipt of this revised data, during the Stage Two study period.

5.7 Collection Capabilities

The study of the impact of development on an overall sewerage collection system would be an extensive study, which would include significant amounts of modelling. Therefore it is not proposed to carry out such an exercise for the purposes of either Stage One or

Stage Two of this study. However, it would be beneficial to consider the impact of development on existing infrastructure to some extent, in order to identify areas where growth exceeds the capabilities of the existing sewerage system. Similarly, it would be useful to identify areas where the existing infrastructure has additional capacity to accommodate the extra flow from the growth areas.

The existing capacity of the sewerage infrastructure to accommodate flow from additional development is very difficult to assess without a detailed knowledge of the sewerage system. Anglian Water have provided details from the DG5 register for their Colchester area. However, this records only incidences where customers are already affected, and therefore cannot be used as a tool to identify areas where further sewage flow would create problems. The DG5 register can tell us that there have previously been problems with the infrastructure in St. Osyth, Colchester, Clacton-on-Sea, Hadleigh, Harwich, Thorrington and West Mersea. Of these, only Thorrington and West Mersea have been identified as having no development, and therefore it may be suitable to consider the other areas further, particularly if these are areas of considerable proposed development. Drawing 4 in Appendix C shows known sewer issues, including DG5 register entries.

It has already been established during the Stage One process that the sewerage systems in both Felixstowe and Ipswich may come under further stress due to development. Due to the extensive development proposed for Colchester, it is likely that the sewerage system here would also be subject to capacity constraints. Therefore it is proposed to investigate sewerage infrastructure capacity further in these locations.

To consider all settlements and all development within the HGSR would not be possible within the remit of this study. Therefore it is necessary to identify other areas which require further consideration. It is likely that new development of 10 or less houses will have a negligible impact on the sewerage collection system. Therefore it is proposed to consider further only larger developments, or areas of extensive redevelopment. However, should AWS identify sewage collection issues in other areas, these too could be considered.

In order to ensure that any further analysis concentrates on the areas that are likely to be of concern, discussion will take place with Anglian Water. As there will need to be a significant amount of discussion with Anglian Water, the methodology for completing this analysis will have to be agreed with Anglian Water. This can be further discussed at steering group meetings and further discussion with Anglian Water.

5.8 Discussions and Recommendations

Of the sewage treatment works identified as at or over capacity by 2021 based on current volumetric consents, a number will be affected by employment land development. However as described in Section 4.8, the use of the employment land can have a significant effect on sewage treatment. For example, Felixstowe STW is the receiving Sewage Works for flows from the Port of Felixstowe. It is unlikely that the Port will produce a high level of sewage for treatment, as most of the land is likely to be used for container storage.

The impact of sewage from industrial development can be dealt with quite differently by the sewerage undertaker. Under Section 118 of the Water Industry Act 1991, any trade effluent must have consent from the sewerage undertaker to discharge into the sewerage system. This means that the undertaker has some control over the quantity and location of discharge, and as such can prevent large quantities of trade effluent discharging to sewage treatment works with limited capacity. The sewerage undertaker only has an obligation to accept 'domestic flows', which would include flows from offices and similar facilities within industrial developments. Careful consideration of the discharge points of industrial development could therefore result in either the reduction of capital works required or a mechanism to aid delivery of a timely sewerage system with respect to growth. Table 5.4.1 shows the treatment works that would be in an improved situation in 2021, as compared with Table 5.1.1, if the flow from industrial development could be dealt with by alternative means.

Table 5.4.1 STW Headroom without Employment Land Trade Flows

0-19% oversubscribed	20-49% oversubscribed	More than 50% oversubscribed
Benhall (Saxmundham)	Colchester	Blaxhall
Cliff Quay	Grundisburgh	Felixstowe
Sudbury (including outside HGSR)	Great Waldingfield	
	Hadleigh (including outside HGSR)	Harwich and Dovercourt
	Jaywick	Otley
		Rendlesham
		Sproughton
		Woodbridge and Martlesham
		Yoxford

The table also shows the works that would remain in a critical condition. Private treatment plants for large scale industrial development could be encouraged to reduce the flow to the existing infrastructure, or private pumping stations could be used to direct flow to areas where there is more capacity to deal with its impact. The recommendation of this part of the study is that sewerage treatment is considered in further detail, particularly for the areas identified as susceptible to the impact of growth. A further assessment of the works identified as 'Amber' in 2021 will also be carried out, especially if these works are close to exhausting their available consent.

It is interesting to note the further effect the 'domestic' flows from employment land have. This is summarised in Table 5.4.2 below. Without this additional flow only 5 treatment works would be in a critical position.

The Draft East of England Plan (2004) identifies that "Discharge limits will become more restrictive under the Water Framework Directive, which introduces a more integrated system of water management....reducing river pollution, lessening effects of floods and droughts, and ensuring that most inland and coastal waters attain 'good ecological status' by 2015". Further consideration of the impact of discharge consents on all HGSR STWs is recommended, in respect of increased volumetric discharges and the quality related discharge limits.

Table 5.4.2 STW Volumetric Capacity without Employment Land Flows

Available Headroom	0-30% oversubscribed	More than 30% oversubscribed
Benhall (Saxmundham)	Colchester	Yoxford
Blaxhall	Felixstowe	
Cliff Quay	Grundisburgh	
Great Waldingfield	Jaywick	
Hadleigh (including outside HGSR)		
Harwich and Dovercourt		
Otley		
Rendlesham		
Sproughton		
Stowmarket		
Sudbury (including outside HGSR)		
Tiptree		
Wix		
Woodbridge and Martlesham		

The East of England Capacity Delivery Study quotes that the Environment Agency considers that “any increase in discharge of over 100 litres per second (0.1m³/s) has the potential to significantly increase flood risk.” A large proportion of the Sewage Works studied will have an increase in discharge of significantly more than this by 2021. In order to make a full assessment of the associated flood risk, a broad assessment of the receiving watercourse will be made, to consider the potential of the watercourse to receive the additional discharge. This will be completed during the Stage Two study.

It may also be possible to divert final effluent away from receiving watercourses by considering effluent re-use schemes. This would seem an appropriate course of action to investigate for Cliff Quay STW, especially taking into account the number of industrial sites in close proximity. It could also be considered for Felixstowe, Harwich, Colchester, Rendlesham and Woodbridge as again these Sewage Works are affected significantly by employment land development.

It is important to consider that any increase in volumetric discharge consent is also likely to have an associated tightening in the qualitative consent. It is also likely that a revised consent could take two years to agree, and this may affect development phasing. Therefore consideration of all solution options should be made.

It is recommended that during the Stage Two study, further consideration of the impact of development on sewage collection is made. Using known areas of sewer capacity issues and existing DG5 flooding areas as a basis for this study, and then developing this in consultation with AWS, a comprehensive list of areas to be studied will be drawn up. The impact of development in these areas will then be analysed, and proposals for overcoming these issues or alternative development locations will be advised. Associated broad cost estimates will also be developed.

6 WATER RESOURCES AND SUPPLY

6.1 Introduction

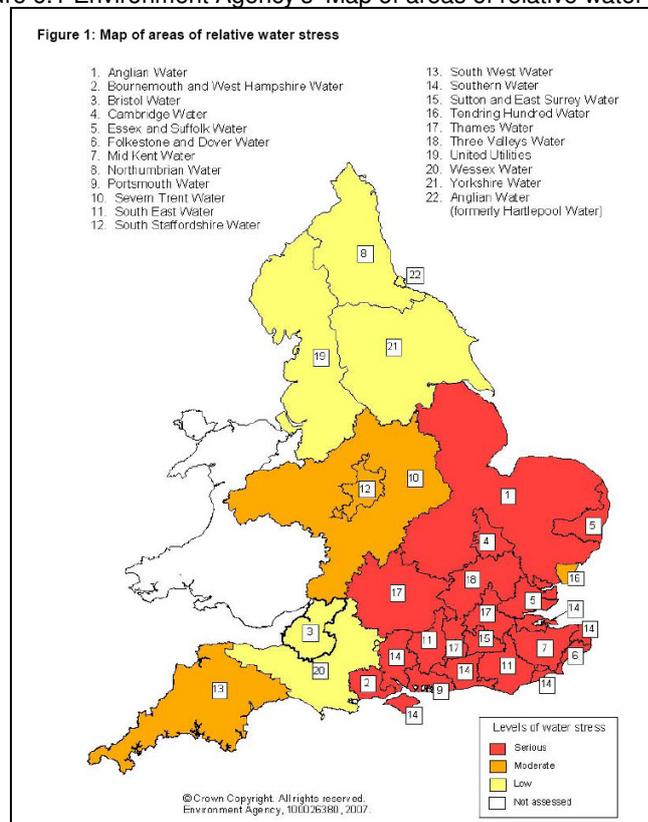
The East of England is the driest, and one of the flattest areas of the country. The HGSR is supplied by three separate water companies – Anglian Water Services, Tendring Hundred Water Services and Essex and Suffolk Water Services. An increase in population and household numbers in the Haven Gateway will place demands on water resources in the region.

Essex and Suffolk Water have indicated that they do not anticipate any problems in supplying the additional demand due to growth in the HGSR, although Essex and Suffolk Water supply around 3% of the potable water in the sub region.

Tendring Hundred Water will provide potable water to 15% of the growth in the Sub Region. As with Essex and Suffolk Water, Tendring Hundred Water do not anticipate any problems supplying additional demand.

The new Water Strategy plans which have recently been published for public consultation, seeks to provide infrastructure aimed at ensuring levels of supply to meet anticipated growth in population expected through the Local Development Framework. The Draft Water Resources Management Plans comment on the future availability of water resources in the HGSR. These documents were approved by Defra and Ofwat and published for public consultation in May 2008.

Figure 6.1 Environment Agency's 'Map of areas of relative water stress



Anglian Water's Strategic Direction Statement for the period 2010-2035 identifies climate change and growth as two of the key challenges to be faced across the region in the coming years. The Statement also shows that the Environment Agency considers the region as being one of 'serious water stress'. The Environment Agency's Map of Areas of Relative Water Stress, from their report 'Areas of Water Stress: Final Classifications' is shown in Figure 6.1 above.

6.2 Existing situation (transfer schemes/stream capacities)

The HGSR falls within Anglian Water's East Suffolk and Essex Water Resource Zone, the third largest zone in Anglian Water. Current demands within the HGSR are centred on the large towns of Ipswich, Colchester and Braintree. The previous Anglian Water 'Water Resources Plan', which was published in 2004, states that the total domestic demand for the East Suffolk and Essex zone is 75.6MI/d domestic demand; 25.6MI/d commercial demand. Despite the planned growth Anglian Water are expecting domestic demand to decline to 70.5MI/d by 2029/30. The new Water Resources Management Plan of 2008 puts domestic demand currently at 82 MI/d, rising to 90 MI/d by 2035. This is at an expected growth rate of 2,500 dwellings per year across the zone. The 2004 report attributed the decline in water demand to the fall in household occupancy size, the net effect in water efficiency, and demand management initiatives on the domestic demand.

The commercial demand is expected to remain steady at 25MI/d by 2035. These figures are based on 'dry year' demand forecasts. The impact of climate change on resource availability was assessed in relation to the projections published in 2002 by the United Kingdom Climate Impacts Programme (UKCIP).

Anglian Water analysis shows that within the East Suffolk and Essex Water Resource Zone, 7 of the 9 Planning Zones are projected to have headroom deficits against dry year average and critical period forecasts. These are shown in table 6.1 below.

Table 6.1 East Suffolk and Essex Projected Headroom Deficits

Zone	Deficit
Semer	Average deficit from 2007 to 28
Woodbridge	Current average deficit
Ipswich	Current average deficit
Colchester	Current peak/average deficit

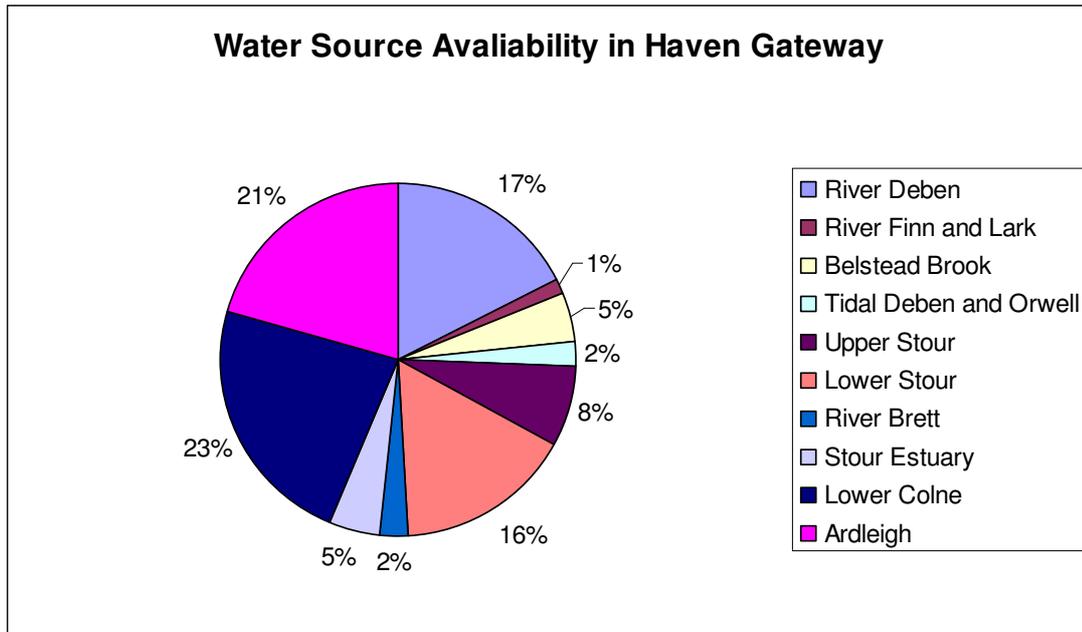
The new Water Resources Management Plan (2008) has identified proposals to remove these deficits. Details of these proposals are shown in Table 6.4.1 in Section 6.5 of this report.

Abstractions

There is a large number of ground and surface water abstraction licenses in the Essex and Suffolk Water Supply Zone, with the largest being for public water supply. Others are generally for irrigation of arable land. Table 1 in Appendix D shows that based on the information available in the Catchment Abstraction Management Strategy's, no further abstraction licenses would be granted.

AW have licenses to abstract 144 Ml/d across the Combined Essex and East Suffolk CAMS areas. However, not all of these licenses are currently fully utilised. The spread of the licenses as an overall percentage of the HGSR supply across the HGSR is shown in Figure 6.2.1.

Figure 6.2.1 Water Resources in Haven Gateway



When the licensed abstraction volume (CAMS) was compared against the average volume abstracted over the last five years, based on actual abstraction volume (from EA data), it showed that a surplus of 66.5Ml/d is still available for abstraction.

The existing Ely Ouse to Essex Water Transfer Scheme (EOETS) transfers additional water resources from the Great Ouse to the Rivers Stour and Pant. The main purpose of the scheme is to supply additional water for abstraction and water treatment, although it has the added advantage of supporting the River Stour. The scheme can transfer up to 400Ml/d, although recently it would appear that the scheme has been used solely for river support. As the rivers supported by the transfer scheme feed into Abberton Reservoir, an increase in the capacity of Abberton could accommodate an increase in the quantity of water transferred.

Anglian Water when initially providing the data for this study split the large water supply zone into two supply areas – Colchester and Ipswich.

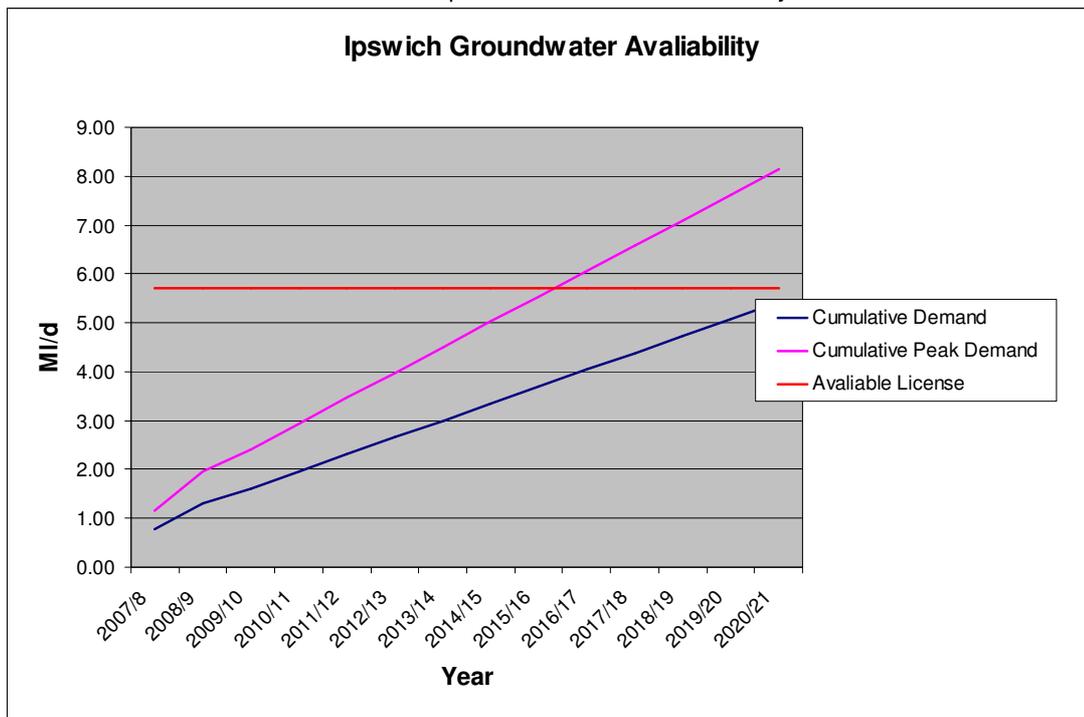
6.2.1 Colchester Supply Area

Anglian Water have already identified Colchester as a major area for growth, especially relating to domestic demand. The need to identify and develop additional water supplies has already been established, especially as the optimisation of existing water licenses has already been considered. These investigations have failed to identify adequate additional supplies in Colchester. However, Royal Haskoning's investigations have shown that according to the information available, if it was possible to fully utilise existing licenses, an additional 77Ml/d could potentially be extracted. Even allowing for

treatment losses, this would indicate that growth in Colchester could be fed from existing resources. However, this is based on average demand, and makes no assessment on the ability of the existing infrastructure to treat or distribute any additional flow.

6.2.2 Ipswich Supply Area

Table 6.2.2 Ipswich Groundwater Availability



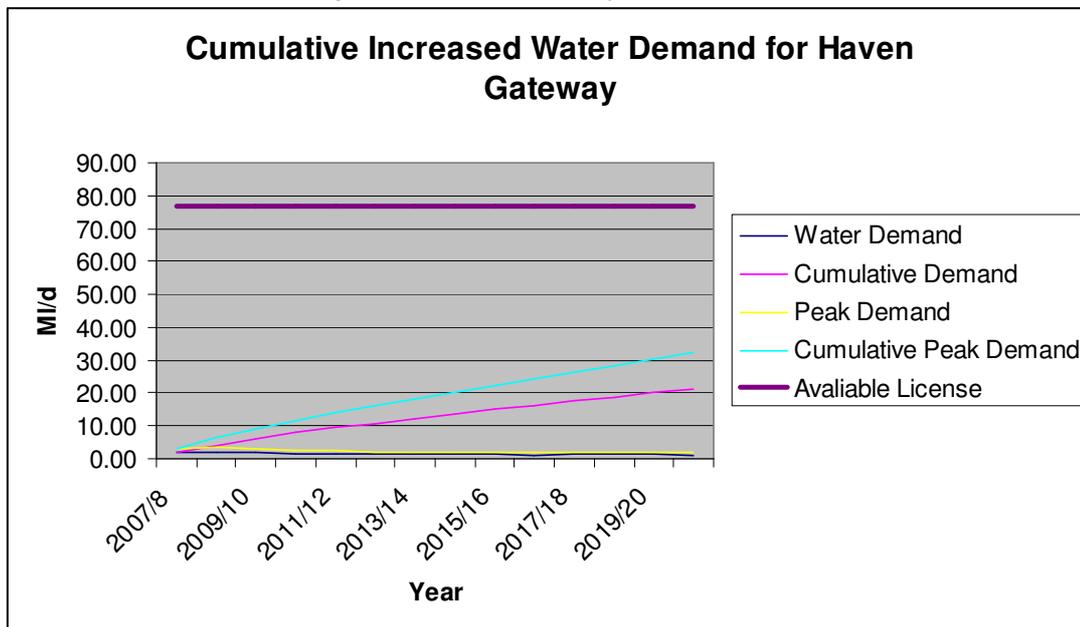
The high rate of housing growth in Ipswich will lead to the continuing requirement for additional water. Projects to be constructed during the AMP4 period will not supply the entire future demand forecast for AMP5. Additional treated water storage will be required for the Felixstowe and Raydon zones, and additional supplies could be sourced from Belstead WS and by optimising existing licenses, but there will still be a significant deficit.

Our initial assessments show that even with the optimisation of existing licenses, the peak demand in the Ipswich Catchment Area will exceed supply after 2016. This is as shown in Figure 6.2.2, above. In order for growth to continue as the AMR trajectories after this point, additional water resources in the Ipswich area would need to be found.

6.3 Influence of proposed development

Overall, our investigations have shown that the cumulative housing growth in HGSR within the Anglian Water supplied area could be accommodated within the existing water abstraction licenses, as demonstrated in Figure 6.4.1 below. However, the CAMS for both Essex and East Suffolk show that most catchments are either fully licensed or over abstracted. The growth of the ports is expected to have only a small affect on water use, although additional related industrial development may have an impact. These are usually dealt with as they are planned, as the procedure for supplying the water is different to domestic supply.

Figure 6.4.1 Haven Gateway Water Demand



Anglian Water modelling has identified the need for increased supplies to the Colchester Planning Zone. It is currently proposed to uprate the existing Lexden sourceworks to utilise the current license by improving blending for fluoride, and by a temporary re-allocation of the proportion of the deployable output at Ardleigh WTW. This together with the construction of a new treated water storage reservoir at Ardleigh WTW forms the optimal solution for the Colchester Planning Zone. Discussions with Tendring Hundred Water Services regarding reallocation of output are ongoing.

Anglian Water's 'Water Resource Plan 2004' states that in 'East Suffolk and Essex Water Resource Zone target headroom is affected by the risk of Climate Change on Alton Water reservoir. There are also fairly large risks associated with the anticipated deterioration of borehole condition and loss of supply due to groundwater pollution.' The new Water Resource Management Plan (2008) has assessed the impact of Climate Change on all resources, in accordance with supplementary guidance produced by the Environment Agency specifically for use in the production of the Water Resources Management Plans.

This report has so far assumed that the quality of water abstracted would remain at the current standard (see Section 7 Water Quality), and that the standards for Potable Water set out by the Drinking Water Inspectorate would also remain at a similar level. Should either of these standards significantly change, the impact on water resource availability would be instantaneous and significant. The likely outcome would be that the lack of available water would mean an instant reduction in growth. Provision of alternative water resources is constantly being investigated by water authorities. In this region existing groundwater resources are likely to reduce and new resources are unlikely to be found. Therefore, new water transfer schemes from other parts of the country are being considered.

6.4 Water Resources Management Plans Review

6.4.1 Anglian Water Services

Of the three water companies in the HGSR, Anglian Water supplies the most customers with water, and also provides all of the Wastewater services. Of the proposed growth within the HGSR, 82% of development will be provided with water by Anglian Water. All of this falls within Anglian Waters' East Suffolk and Essex Water Resource Zone (ES&E WRZ). This is the third largest zone in all of Anglian Waters' area.

The 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 impact. The zone also has surface water supplies, through the joint raw water storage reservoir at Ardleigh, which has developed in partnership with Tendring Hundred Water, and the Anglian Water raw water storage reservoir at Alton Water. Alton 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.

Ardleigh Reservoir 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 to Tiptree, although statutes are in place to take further supply from Colchester. This is not presently used. There are currently proposals in place to extend Ardleigh Reservoir. Further details can be found in the review of Tendring Hundred Water Services Water Resources Management Plan review (see Section 4.3 below).

Table 6.4.1 Proposed Schemes in Order to Counter 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
	Ipswich discharges re-use	25.00	25.00
	Bucklesham Aquifer Storage Recovery scheme	4.00	4.00
63 Tiptree	Colchester PZ transfer	1.20	1.20
64 Woodbridge	Ipswich PZ transfer	2.60	2.60

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 MI/d in 2010 to 90 MI/d in 2035. The WRZ is reported to have surplus headroom in 2010. That is 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 9 Planning Zones. Of these, only two are projected to have remaining headroom in 2035. In order to counter these headroom deficits, a number of schemes have been proposed. Within the HGSR, the options made available are listed in Table 6.4.1 above.

In both Ipswich and Colchester, as the volume of sewage coming forward for treatment increases, and additional treatment process are carried out to enhance the quality of the final effluent, the increased Sewage Treatment Works discharge is proposed 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 enlarged Ipswich discharge to be available in Colchester.

Although the Water Resources Management Plan 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 Water Resources Management Plan states that alternatives for this Water Resource Zone are limited. However, Anglian Water 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 6.4.2 below.

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.

Anglian Water concludes the Water Resource Management Plan 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.”

Table 6.4.2 Preferred Water Management Options (Anglian Water only)

Period	PZ	Selected option
AMP5	56 Colchester	Pressure reduction to reduce leakage
		Further targeted leakage control
		Targeted cistern devices
		Domestic water audits
	60 Ipswich	Pressure reduction to reduce leakage
		Further targeted leakage control
		Targeted cistern devices
		Domestic water audits
		Bucklesham Aquifer Storage Recovery scheme
	63 Tiptree	Colchester PZ transfer
	64 Woodbridge	Ipswich PZ transfer
AMP6	60 Ipswich	Ipswich discharge re-use
AMP7	56 Colchester	Ardleigh reservoir extension
AMP8	55 Bures	Targeted cistern devices
		Further targeted leakage control
		Targeted metering
	56 Colchester	Ipswich PZ transfer (from Ipswich discharge re-use scheme) with enhanced metering
AMP9	55 Bures	Domestic water audits
		Colchester PZ transfer

6.4.2 Essex and Suffolk Water Services

Essex and Suffolk Water Services 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.

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.

The Essex and Suffolk Water area is classed as “Seriously Water Stressed”, under the Environment Agency’s assessment methodology. However, Essex and Suffolk Water do not consider the water resources in the Suffolk area to be ‘scarce’, and therefore are

reluctant to apply for Water Scarcity Status. In fact, Essex and Suffolk Water predict that during the period 2010 – 2035, the resource zone will have a surplus. From 2029, Essex and Suffolk Water are intending to transfer this water into the neighbouring Hartismere zone, to meet the need of the potential deficit in that zone. This disparity has not been commented upon within the confines of this report.

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. However, a pressure reduction programme has already been implemented. The WRMP 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 Essex and Suffolk Waters’ Water Resources Management Plan 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.”

6.4.3 Tendring Hundred Water Services

Tendring Hundred Water Supplies potable water to the Tendring district, located in the south eastern corner of the HGSR. Tendring Hundred Water will supply 15% of the identified domestic growth within the sub-region. This includes the growth points of Harwich, along with the seaside towns of Clacton, Jaywick, Dovercourt, St. Osyth and Walton-on-the-Naze. Eighty percent of THWS’ water supply comes from groundwater drawn from a chalk aquifer. The remaining 20% comes from the River Colne, and is stored in the shared Ardleigh Reservoir. This is owned and operated in equal partnership with Anglian Water, via the Ardleigh Reservoir Committee (ARC).

The final conclusion of the Tendring Hundred Waters’ Water Resources Management Plan 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.”

However, from 2025 THWS can expect additional output from Ardleigh, as Anglian Waters’ share decreases. There is also the possibility that the EOETS can be used to augment the supply of raw water.

6.4.4 Ardleigh Reservoir

Currently the Deployable Output (DO) from Ardleigh Reservoir and its associated Water Treatment Works is shared 40:60, between Tendring Hundred Water and Anglian Water 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:30THWS, reverting to a 50:50 split in March 2015.

The Ardleigh Reservoir Committee, who manages the reservoir on behalf of both Anglian Water and Tendring Hundred Water, 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 will not realistically provide any additional water for supply before 2018.

At present, Anglian Water 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 reservoirs drought yield.

The reservoir currently holds 2185 MI when full, and can support a supply of 36MI/d over a short run.

6.5 Water Usage

The Draft Water Resources Management Plans also make reference to water usage, and especially to reducing the amount of water used. Anglian Water have assumed a decline in measured water consumption to 129l/h/d by 2030. Tendring Hundred Water Services, however, are expecting an increase in consumption. They are expecting measured consumption to rise from 118 l/h/d at present, to 132 l/h/d by 2035. However, THWS expect unmetered consumption to fall, from 135 l/h/d at present, to 130 l/h/d in 2019, but then rise again to 142 l/h/d by 2035. Essex and Suffolk Water expect water consumption in their area to remain at the current levels, at 149 l/h/d in the Suffolk area.

These figures can be summarised in Table 6.5 below:

Table 6.5 Per Capita Consumption (PCC) - Water

Water Company	2006		2019		2030		2035	
	Metered	Unmetered	Metered	Unmetered	Metered	Unmetered	Metered	Unmetered
AWS		145				129		
THWS	118	135		130			132	142
ESWS		149		149		149		149

6.6 Water supply

The exact details of water supply networks, as explained in the Stage 1 report, cannot be made available in detail, due to issues of infrastructure security. Therefore in most cases, the issue of the supply of water to new development can only be discussed at a strategic level.

6.6.1 Anglian Water Services

Anglian Water currently has no identified supply issues. However, this area will benefit from further investigation and analysis during Stage 2 of the study.

6.6.2 Tendring Hundred Water Services

Tendring Hundred Water has identified supply issues in the Harwich area. Detailed development trajectories, showing approximate development locations where possible have been developed, in order to make a further assessment of the impact of the proposed growth on the existing infrastructure. This will be further considered during Stage 2.

6.6.3 Essex and Suffolk Water Services

Essex and Suffolk Water have not identified any significant supply issues within their supply area.

6.7 Discussions and Recommendations

Colchester

Anglian Water runs Ardleigh Water Treatment Works in conjunction with Tendring Hundred Water Services. Tendring Hundred Water has identified Ardleigh as the main source of their additional water capacity, in order to provide for growth. Anglian Water currently supply more treated water from Ardleigh than Tendring Hundred Water, but should Tendring Hundred Water decide that the quantity of water supplied to Anglian Water should reduce, this could impact upon Anglian Water's security of supply in the Colchester zone, especially as Ardleigh has been identified as a source of additional supply for growth. Similarly, if Anglian Water intends to use the same additional capacity from Ardleigh to supply the growth areas, Ardleigh will be running at or over capacity.

Anglian Water's modelling system originally showed the supply zone going into a deficit midway through the AMP5 period, with the peak deployable output from AMP4 schemes being reached about 2012. However, the Water Resources Management Plan has identified proposals to address this deficit. The WRMP shows adequate Deployable Output within the Supply Zone to 2035.

During AMP6 higher output would again be required from Ardleigh and Bocking. The peak deployable output from the AMP5 schemes would be reached by 2020.

The Water Resources Management Plans have identified that studies would need to commence during the AMP5 period to facilitate the construction of a major water transfer scheme, which would need to be in place by 2025.

It is not currently envisaged by any of the three water companies that growth will have an impact on the existing network, other than the additional mains required to reach new developments. There are currently no low pressure (DG2) affected properties across the area. However, where modelling has already identified areas in which pressures to existing customers may be affected by new development proposals, the water companies have subsequently undertaken mains reinforcement projects in order to prevent this from actually happening.

Within the Anglian Water area, current modelling shows that there will be a deficit in water supply as demand increases, if no additional supply sources are identified. However, higher outputs will be made available by uprating existing works, and realising full license capabilities. Anglian Water are confident that their existing and proposed Capital Programmes contain projects that will adequately deal with the additional demand to 2035 (the AMP 10 period). Before this time is reached, consideration should be given to a Major Transfer scheme.

Ipswich

The high rate of housing growth in Ipswich will lead to the continuing requirement for additional water. Projects to be constructed during the AMP4 period will not supply the entire future demand forecast for AMP5. Additional supplies will be sourced from Belstead WS and by optimising existing licenses.

The Water Resources Management Plan has also identified that works at the old Bucklesham Water Treatment Works will bring increased supply to the supply zone, along with the proposed development of a trunk main system between the Ipswich and Colchester storage reservoirs of Wherstead and Great Horkesley. The surface water resources at Alton Water would also be developed to meet future needs, with the additional water to feed into Alton Reservoir coming from EOETS.

The Water Resources Management Plan shows Anglian Water is confident that demand can be met, along with the reinstatement of additional headroom within the zone, over and above the peak demand level.

6.8 Summary

The impact of growth on water supply has been very difficult to establish, as water companies cannot release data relating to the location or capacity of existing or proposed water sources, treatment works or networks. Subsequently, this study can only rely on the reports issued to Royal Haskoning by water companies.

From the reports available, it appears that development of Alton WTW will need to cater for increased output but with decreased input, as identified through the analysis of climate change impact. 'Augmentation' is required – proposals include effluent re-use, EOETS (Ely-Ouse to Essex Transfer Scheme), or from confined chalk aquifer. Analysis has shown this augmentation will be required during AMP4 period, but risk will be mitigated by connection of Ipswich and Colchester systems. Other plans to augment water supply are being considered.

The availability of water resources has assumed that there will be no change to the Drinking Water Inspectorates quality directive in the next 30 years. Should this happen, this will create a supply deficit, as the availability of water suitable to be treated would subsequently decline. Similarly, if the quality of the raw water declines, again the amount of water suitable to treat reduces, but also the option of blending water to give acceptable levels of, for example, nitrates, would result in less water being available, or alternatively more expensive treatment options.

The recently published Water Resources Management Plans in May 2008 shows that all three water companies within the HGSR are confident that their proposals will adequately meet demand, up to 2035.

6.9 Conclusions

Although the optimum use of the existing resources in the region will be a priority, all companies do see bulk water transfer as a means to supply future demand. The EOETS is expected to provide a future source of water or both Abberton and Ardleigh

reservoirs, as well as supporting the water flow and subsequently water quality in the associated watercourses.

The 'twin track' approach, of reducing water demand and new water resources has also been supported by all three undertakers, as a means to enhance the existing water supplies. Of the three, Essex and Suffolk Water have the lowest per capita consumption (PCC) figures, mainly due to the education of their customers and the high penetration of water meters in the area. Essex and Suffolk Water wish to continue building on this strong foundation in future years to further reduce the PCC.

Anglian Water is the only company that has identified the need to develop resources. 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.

Anglian Water 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.

Tendring Hundred Water sees the reduction of leakage, and high meter penetration as the main means to supply growth in demand.

None of the Water Resource Management Plan's for the three companies identified new water resources as a priority during the review period to 2035. In fact, ESWS and THWS have both identified that it will be possible to supply both existing and future demand from existing resources. The EA have identified this as a 'Seriously Water Stressed Area', although this is not evident from the Water Resources Management Plan's.

The resourcing of water has been well catered for within the three water companies Water Resources Management Plans. Therefore, it is not proposed to consider the sourcing of new raw water supplies within the Stage Two report. This is for two reasons, the first being the Security of Information issues would prevent the relevant information for this type of assessment being available, and secondly this would be repeating the works carried out by the water companies for the purposes of their Water Resources Management Plans.

6.10 Recommendations

It is recommended that within the Water section of the Stage Two report, Demand Management and its effects on development are considered further. It is also recommended that the supply of water is not considered further, but that the phasing and location of development is further analysed, to ensure that the timing of development corresponds with the timing of the proposed increases in Deployable Output.

7 WATER QUALITY AND ENVIRONMENTAL ISSUES

7.1 Existing situation and pressures

The water quality status of many watercourses within the HGSR is currently monitored on a regular basis by the Environment Agency. Table 7.3.1 below shows the classifications used by the Environment Agency, and Table 7.3.2 shows the quality of the watercourses receiving inflow from the Sewage Treatment Works with the potential to require an increase in CDWF, i.e. those indicated as condition 'Red' and 'Amber'. These are currently split between RE2 and RE3. In certain cases, this fair to good level of water quality may prove to be a barrier to the increase in CDWF due to the enhanced influence an increase in treated effluent will have upon the aquatic ecosystem. However, should consent be granted, the conditions will undoubtedly be more stringent and require additional capital investment by Anglian Water in order to meet the higher required effluent standard.

Table 7.3.1 RE Classifications

Classification	Use
RE1	Water of very good water quality and suitable for all fish species
RE2	Water of good quality and suitable for all fish species
RE3	Water of fair quality and suitable for high class coarse fish populations
RE4	Water of fair quality and suitable for coarse fish populations
RE5	Water of poor quality which is likely to limit coarse fish populations

Table 7.3.2 Receiving Watercourse RE Classifications

STW	Receiving watercourse	RE
Shotley-Overhall Farm	River Orwell	No data
Great Cornard	River Stour	RE3
Hadleigh	River Brett	RE2
Sudbury	Tributary of River Stour	RE2
Colchester	Colne Estuary	No data
Harwich & Dovercourt	Tidal Stour	No data
Great Bromley	Bromley Brook	No data
Sproughton Church	River Gipping	RE2
Chantry	Belstead Brook	RE2
Ipswich-Cliff Quay Raeburn	Tidal Orwell	No data
Woodbridge Creek Farm	Martlesham Creek	No data
Felixstowe	Tidal Orwell	No data
Benhall	River Alde	RE2
Stowmarket	River Gipping	RE3
Needham Market	River Gipping	RE3

The existing environmental habitats in the region have also been considered. Drawings E1 and E2 in Appendix E show the existing environmentally sensitive areas within the Haven Gateway Sub Region.

7.1.1 Babergh

The Babergh District has a wealth of important and varied natural habitats, including grassland, woodland, rivers, estuarial mudflats and saltings. Many of these habitats have their importance recognised by various designations, such as Special Protection Areas (SPA), Ramsar Sites, Sites of Special Scientific Interest (SSSI), Local Nature Reserves or County Wildlife Sites (CWS). A table showing the protected areas in the Babergh District, as identified in the Local Plan, can be found in Table 1 of Appendix E.

7.1.2 Ipswich

Ipswich Borough Council has not yet carried out an Appropriate Assessment on the Local Plan. However, Royal Haskoning has identified that the Stour and Orwell Estuaries SPA falls within the Ipswich Borough Council district area, and that there are a further two SSSI sites within the area. However, as the Borough is essentially urban, there is not the wealth of natural habitats as identified in the Babergh area.

7.1.3 Suffolk Coastal

Like the Ipswich Borough Council area, Suffolk Coastal District Council has not carried out an Appropriate Assessment. Over one third of the district is designated an Area of Outstanding Natural Beauty (AONB), with 50km of the region's 55km coastline designated as Heritage Coast. There are also an extensive number of SSSIs as well as over 200 County Wildlife Sites. The Orford RSPB Reserve falls within the district, as do the Tunstall Forest and Rendlesham Forest SPA's.

7.1.4 Mid Suffolk

Mid Suffolk District Council has prepared a Core Strategy Submission Document, which was submitted to the Secretary of State on 31st October 2007. This included supporting documents such as sustainability appraisals, appropriate assessment, evidence documents and a consultation statement. These have identified a number of protected sites, including:

- 182 County Wildlife Sites over 1443 Hectares;
- 24 Sites of Special Scientific Interest;
- 6 Local Nature Reserves; and
- The Waveney and Little Ouse Fens Special Protection Area.

7.1.5 Colchester

The Colchester district includes both urban and countryside areas. There are four Special Protection Areas designated under the Birds Directive, which are also designated under the Ramsar Convention, along with the Essex Estuaries Marine SAC, which has been designated under the Habitats Directive.

7.1.6 Tendring

The Tendring district also includes both urban and countryside areas, including the urban area of Clacton and the port development at Harwich. There are three Special Protection Areas designated under the Birds Directive, which are also designated under the Ramsar Convention. As with the Colchester district, the Essex Estuaries Marine SAC, which has been designated under the Habitats Directive, falls within the Tendring district.

7.2 Potential influence of proposed development

Drawing 3 in Appendix E shows the existing environmentally designated areas in relation to the proposed development areas.

7.2.1 Water quality

A growth in population resulting from an increase in housing will result in increased demands on the wastewater treatment system and may necessitate the establishment of new sewage treatment works. In locations where households cannot be connected to existing sewers, this may result in additional septic tank discharges to waterbodies. Irrespective of which of these alternatives is used, population expansion has the potential to increase nutrient loading to the International sites, with the potential for impacts on site integrity through eutrophication.

The increased impact of agriculture on water quality should also be considered. An increase in population means an increase in agricultural activities, with resultant increases in nitrates and phosphates being deposited in watercourses. This is along with increased abstraction from watercourses for irrigation.

This study has considered the impact of development on existing water treatment works, working within the existing discharge consents for dry weather flow. This has identified that the existing consents would generally be adequate for the planned growth. However, the larger sewage treatment works sites would require an increase in discharge licenses in order to accommodate all of the proposed growth.

A report on the adequacy of the existing waste water treatment system for population growth planned under the East of England Regional Spatial Strategy (RSS14) (Halcrow; 2007) did not identify any specific concerns as a result of growth rates outlined in RSS14.

However, The East of England Capacity Delivery Strategy Phase One Study, December 2006, indicates that development within the catchment of Sudbury, Manningtree or Great Cornard STWs could increase flood risk in the receiving watercourses. Of these, Sudbury is located outside of the Haven Gateway Sub Region, and Great Cornard and Manningtree have not been identified as treatment works likely to require an increased license. (See Table 3 of Appendix C). Felixstowe STW and Harwich STW have both been identified as works that will be likely to require extension and therefore subsequent increases in discharge consents. As Felixstowe discharges to the Tidal River Orwell, and Harwich to the Tidal River Stour, as these are non fluvial sections of large watercourses, the impact on water quality should be significantly low provided this is managed correctly.

7.3 Management options

7.3.1 Environmental Impact

It is not possible at this stage to determine that these proposals would not have an adverse effect on the integrity of the international sites (largely due to disturbance). It is therefore necessary to provide a suite of avoidance measures which will ensure that no such effects occur in policy implementation:

- Measure 1 Survey and Monitoring,
- Measure 2: Site Management,
- Measure 3: Mitigation green space.

No adverse effect on the integrity of any of the international sites in question is expected, provided the preventative measures are implemented as specified. This is particularly applicable in the Colchester district.

7.3.2 Water Quality

It is possible that the proposed growth will have a detrimental affect on the water quality in the Sub Region, particularly on receiving watercourses affected by increased waste water treatment. However, this is only likely in a handful of locations, generally the identified major growth areas. These watercourses are generally tidal, and the impact of increased discharges from Sewage Treatment Works should be minimal.

7.4 Summary

All the district council Core Strategies suggest that development will make efficient use of land and follow a sequential approach which will give priority to accessible locations and previously developed land. Councils are focusing development on areas in need of regeneration, and protecting the countryside by minimising the amount of development occurring on greenfield land. These policies will lead to an increase in housing development in existing urban areas, and this is likely to bring with it an accompanying increase in visitation and disturbance to these sites. Therefore the disturbance to rural protected areas is reduced.

The next stage will look at the potential environmental implications of the future development and the recommended strategy.

8 FLOOD RISK MANAGEMENT

8.1 Strategic Flood Risk Assessments

Each district council has identified the need to produce a Strategic Flood Risk Assessment (SFRA), in accordance with Planning Policy Statement 25: Development and Flood Risk (PPS25 December 2006). Each SFRA will then become a supporting document within the Local Development Framework. The SFRA will be used to identify what land uses may be permissible, and provides necessary information to support the PPS25 Sequential and Exception Tests. SFRAs also consider the effects of development on watercourses and local flooding. Mitigation measures may also be identified, such as Sustainable Drainage Systems (SUDS), which are discussed further in Section 8.4.

In accordance with PPS25, the location of new development should initially be based on the Flood Zones defined on the Environment Agency's Flood Map, which refer to the probability of sea and river flooding, ignoring the presence of any defences. A sequence of maps showing the Environment Agency's flood zones, and the location of identified development sites, can be found in Appendix F. Table 8.1.1 shows the Flood Risk Vulnerability and Flood Zone Compatibility (from PPS25).

Table 8.1.1 Flood Risk Vulnerability and Flood Zone "Compatibility" (from PPS25)

Flood Zone	Definition	Flood Risk Vulnerability Classification				
		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	<i>Low Probability:</i> less than 1:1000 probability of river or sea flooding in any year (<0.1%)	✓	✓	✓	✓	✓
Zone 2	<i>Medium Probability:</i> 1%-0.1% probability of river flooding or 0.5%-0.1% probability of sea flooding in any year	✓	✓	Exception Test Required	✓	✓
Zone 3a	<i>High Probability:</i> >1% probability of river flooding or >0.5% probability of sea flooding in any year	Exception Test Required	✓	X	Exception Test Required	✓
Zone 3b	<i>Functional Floodplain:</i> annual probability of flooding of 1:20 years (5%) or greater, where flood water flows or is stored	Exception Test Required	✓	X	X	X

8.1.1 The Sequential and Exception Tests

The Sequential Test aims to steer all development to areas at the lowest probability of flooding. When land is allocated for development, the sequential test should be applied to demonstrate that all other sites reasonably available for development in areas at a lower probability of flooding have been considered first.

Following the application of the Sequential Test, there may be valid reasons for considering a development type which is not entirely compatible with the level of flood risk of that site. The Exception Test provides a method of managing flood risk whilst allowing necessary development to occur. However, this is to be used only in exceptional circumstances.

PPS25 states “The Exception Test is only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons.”

The Exception Test shows:

- if a proposed development provides wider sustainability benefits that outweigh the increased flood risk;
- that the development does not subsequently increase flood risk;
- that where possible the development will reduce flood risk; and
- most importantly that the development will be safe.

The development should also be on previously developed land.

Development on Flood Risk Zone 3b land should not be residential, and development of ‘More Vulnerable’ residential developments on Flood Zone 3a land must pass the Exception Test.

8.1.2 Risk Mitigation

PPS25 states that “Development should not normally be permitted where flood defences, properly maintained and in combination with agreed warning and evacuation arrangements, would not provide an acceptable standard of safety taking into account climate change.” Furthermore the PPS25 Practice Guide states: “Wherever possible, opportunities should be sought to site new development away from existing flood defences.”

In order to mitigate the risk, PPS25 requires new development in flood risk areas to provide safe access and escape, along with safe access for emergency services.

8.2 Ipswich

8.2.1 Overview

Ipswich Borough Council published a Stage 1 Strategic Flood Risk Assessment in November 2007, alongside the Core Strategy Preferred Options Documentation. Copies of these documents have been received for the purpose of this Water Cycle Study.

Policy Area 23 of the Core Strategy recognises that much of Central Ipswich is within the flood plain of the tidal River Orwell. The existing flood defences provide a low standard of defence in places and do not address potentially rising sea levels. Many key sites available for development, all on previously developed land, lie within Flood Zone 3. The Core Strategy has identified the Ipswich Flood Defence Management Strategy as a major piece of infrastructure required to support growth, with a completion target of 2016. The strategy recognises that the tidal surge barrier is unlikely to be in place for a number of years. However, Ipswich Borough Council have identified that some developments will require phasing in order to take account of the development of the barrier.

8.2.2 Catchment characteristics

Ipswich is located where the River Gipping meets the River Orwell, a meeting of freshwater and tidal rivers. There is a temporary division at Horseshoe Sluice, with the Orwell to the west and the Gipping to the east side of an island. The island is not defended against fluvial flooding, but is defended against tidal.

To the south of Ipswich, the Orwell Estuary is joined by the Belstead Brook, at Bourne Bridge. The Brook has a mainly undeveloped floodplain. The remains still exist of the Alderman Canal, which was partially replaced by the 'low level trunk sewer'. River flows from the Gipping are prevented from entering the canal, and although there is no known formal outlet, any leakage drains back into the Tidal Orwell.

There are a number of other, smaller watercourses in the Ipswich SFRA area. Many are piped, or are fragmented. Some only flow in exceptional conditions.

8.2.3 History of Flooding

Storm surges have caused flooding in East Anglia on many occasions, the last major surge being in 1953. Flood defences built between 1971 and 1983 have since saved Ipswich from serious surge tide flooding (Source: SFRA). Fluvial flooding has partly been caused by debris obstructing small bridges. The critical bridge has now been replaced, after the last severe fluvial event in 1947. Pluvial flooding is more frequent in Ipswich, with some areas being affected several times a year.

8.2.4 Flood Risk to Proposed Development.

Of the 94 sites assessed as at risk of flooding in the SFRA, 43 were located in Flood Zones 2 or 3, almost 60% of development. Of these, 36 were identified as being 'at risk of tidal or fluvial flooding'. These sites were identified in the early copies of the Site Allocations and Policies document, and the SFRA has not been updated in accordance with the latest Site Allocations document. Drawing F1 (Appendix F) shows the Environment Agency Flood Risk areas.

One of the highest risk areas in Ipswich is the 'IP-One' area, with at least 25 of the 44 allocated sites in the area within Flood Zone 3, either wholly or partly, representing 71% of the development. At least 10 of these sites have identified difficulties in achieving safe access. Six of the sites are identified as having a very high residual risk of flooding even when the flood alleviation scheme is in place, with safe access only possible with a strategic bund. These sites identified in Table 8.2.3 below, include some of the larger proposed development areas, and represent 966 indicative dwellings.

Ground raising is recommended in the SFRA as a possible flood risk mitigation measure for at least 12 sites. However, ground raising can potentially increase flood risk elsewhere and therefore may not in fact be an appropriate mitigation measure. This will need further careful consideration.

Table 8.2.3 Sites Dependent on Strategic Bund

Site	Area (ha)	Flood Zone	Comments
Island Site	6.02	3	Tidal flood risk. Requires strategic bund to manage residual risk.
West End Road Surface Car Park	1.22	3	Existing site floods due to lack of drainage & poor ground conditions. May require strategic safe access / ground raising.
Waste Tip north of Sir Alf Ramsay Way	1.57	3	High residual flood risk, very low level ground. Safe access via bund may be possible.
Bus Depot, Sir Alf Ramsay Way	1.07	3	As for Waste Tip site, high residual risk, very low level.
Old Cattle Market, Portman Rd - South	1.60	3	Consider raising land, safe access may be difficult. Site area reduced following SFRA.
Wolsey St	0.26	3	Only suitable for less vulnerable development even with defences. Floor levels need to be much higher than adjacent roads. Safe access may not be possible

After construction of the Ipswich flood barrier there will remain a residual risk of failure or overtopping of the defences. This risk will be quite low with the construction of a flood barrier expected to provide a 1 in 300 year standard of protection (less than 0.33% probability of flooding in any year). It is therefore reasonable to expect that, for the majority of development sites, the residual flood risks could be managed through the provision of safe access and appropriate floor levels on completion of the barrier.

8.2.5 Ipswich Summary

Development in Ipswich has all been proposed on previously developed land. Of this, 40% of development is located within Flood Zone 1. The remaining land is mostly located adjacent to the River Orwell, in the areas known as IPOne and the Riverfront. Of this area, 71% of proposed development is either wholly or partially located in Flood Zone 3.

Ipswich is mainly at risk from pluvial flooding, due to the number of interlinking sewer pipes, underground watercourses and the effects of previous developments. As the Ipswich Core Strategy identifies that growth should focus mainly on previously developed land, the impact of surface water from this land may not be as detrimental as that from a greenfield site. However, the use of sustainable drainage systems (see Section 8.4) should be utilised where appropriate to reduce the risk of compounding the existing problems, but the opportunity to improve the current situation by decreasing the run off rate from sites should be fully appreciated.

The SFRA has already identified that potential mitigation measures in the Flood Zone 2 and 3 areas around the Riverfront and IPOne developments areas, may worsen flood risk from pluvial or groundwater flooding. It has suggested that a detailed FRA would be required. Moreover, this is the area most at risk from fluvial and pluvial flooding. This area is also the most dependent on the development of the new tidal surge barrier. However, it would seem that little consideration has been made of the implications of development to Ipswich should this barrier not go ahead. This is especially of concern as this is an area highlighted for major regeneration.

It is recommended that developments should only commence where they are in line with Table 8.1.1, or have been proved to be acceptable following a sequential test, exception

test, a detailed flood risk assessment, or completion of works (e.g. the barrier) that allows their flood risk to be reduced to acceptable levels.

It is recommended that the impact of the barrier is considered, along with the identification of likely areas that would not be suitable for development should the barrier not go ahead. This will be considered during the Stage Two Study. It will also consider the timing of development should the barrier be delayed.

8.3 Colchester

8.3.1 Overview

The Colchester Borough Council SFRA report is an appendix to the Mid Essex SFRA. The draft report was issued in November 2007. A copy of this Appendix has been received for the purpose of this study.

8.3.2 Catchment characteristics

The Borough of Colchester contains both fluvial and tidal watercourses. The River Colne flows from its source near Great Yeldham to the north west of Colchester. From here it flows in a southerly direction, through the town, and is influenced by tidal fluctuations. After Wivenhoe, the Colne then converges with the Blackwater Estuary at Mersea Island and Brightlingsea.

The River Colne has four main tributaries – Roman River, Bourne Brook, Toppisford Brook and Layer Brook. There are also a number of smaller tributaries.

The Ely-Ouse to Essex Water Transfer Scheme (EOETS) increases the risk of flooding from the rivers Stour, Colne and Blackwater. This is because the river levels are kept permanently high. This is more likely to occur in the higher reaches of the Stour (Source CFMP), although water transfer stops if river levels become too high in North Essex, and do not recommence until river levels return to normal.

8.3.3 History of Flooding

Both tidal and fluvial flooding is active in the Colchester Borough Council area. However, of the two, the tidal flood sources are more dominant. There is a limited history of fluvial flooding in Colchester itself during the flooding events of 2000 and 2001, as a result of the extensive flood defences in the area. Just six properties were affected.

The Colchester SFRA suggests that pluvial flooding in the Borough is insignificant. There are currently no flood alleviation schemes proposed within the Borough.

8.3.4 Flood Risk to Proposed Development.

The main proposed development areas within Colchester Borough have been assessed in the SFRA. Drawing F2 in Appendix F shows the location of the developments in relation to the Environment Agency Flood Risk Zones. Table 8.3.3 below shows each development area and its associated flood risk.

A large proportion of the East Colchester Masterplan area is located within the floodplain. This has been reflected in the table below (Table 8.3.3). Moves have already been made to steer Vulnerable Development away from the Flood Zones 2 and 3 areas.

Table 8.3.3 Colchester Development areas in Flood Zones

Development Area	Flood Zone	Comments
East Colchester (or North Station Regeneration Area)	1,2 & 3	Mostly already granted planning permission. Housing steered away from Flood Zone 2 & 3
St. Botolphs	1	FRA required to show overland flow not increased
The Garrison (North)	1	FRA required to show overland flow not increased
North Colchester including Cuckoo Farm and Severalls Hospital	1	FRA required to show overland flow not increased
Garrison (South)	1	FRA required to show overland flow not increased; consider using SuDS
Rowhedge Port	1, 2 & 3	Flood Zone 3 area: Sequential test principles should guide site masterplan; FRA will be needed; SuDS encouraged; Exception test required for housing in Zone 3
Tiptree	1	FRA required to show overland flow not increased; mostly infill development
Colchester Institute	1 & 2	Residential focussed in Zone 1; commercial and employment to Zone 2
Stanway	1	FRA required to show overland flow not increased
University of Essex	1, 2 & 3	Exception test required for housing in Zones 2 & 3; FRA required to show overland flow not increased; SuDS encouraged; Steer housing towards Flood Zone 1 & 2

8.3.5 Influence of proposed development upon flood risk

The Colchester SFRA identifies that the majority of the Colchester development areas, and especially those within Colchester town, are located on previously developed land currently discharging surface water run off into the River Colne. It is likely that these discharges are not currently attenuated. As previously discussed, development in this area would greatly benefit from a reduction in volume of surface water, through sustainable drainage systems. Table 11 in the Colchester SFRA identifies the likely discharge point of the surface water run off from each development. For ease of reference the table is reproduced below (Table 8.3.4).

The table shows that some surface water is proposed to discharge to the existing sewer. It is likely that the sewer would be unable to accommodate all of this flow without a detrimental effect downstream. This is due to the existing flow in the sewerage system. Further sewer modelling should confirm this.

Table 8.3.4 Proposed regeneration sites and their potential surface water discharge locations (from Colchester SFRA document)

Development	Approx Area (ha)	Approx. Existing Brownfield	Potential Discharge
East Colchester	83	80%	Colne
Garrison	297	60%	Sewer
Rowhedge	8	25%	Roman River/Colne
St. Botolphs	7	90%	Sewer/Colne
North Colchester	109	None	St Botolph's Brook/Sewer
Stanway	67	20%	Sewer/Roman River
Cuckoo Farm Recreational Area	77	Very little	St. Botolph's Brook/Sewer
Colchester Institute	6	80%	Colne
Severall's Hospital	75	50%	Sewer
Tiptree Infill	210	80%	Sewer/small watercourse
North Station, Colchester	139	80%	Sewer/Colne

The SFRA has also identified that the developments within Colchester town all have the potential to significantly increase foul water discharge. It is essential that the on site sewerage system has sufficient capacity, along with proper consideration of the downstream effects on the existing sewerage system. Again, sewer modelling should confirm this.

8.3.6 Colchester Summary

As sea and river levels increase over time, the risk of flooding increases. The North Essex Catchment Flood Management Plan has identified that a 20% increase in flow in the River Colne would dramatically reduce the current high level of flood protection in Colchester. Subsequently the development within flood risk areas would be at a higher risk. This would affect the areas of East Colchester, and North Colchester including the Colchester Institute. Land in these areas has also been identified as Functional Floodplain (Flood Zone 3b). The Colne Barrier will still be a critical part of the Colchester fluvial flood defences, but the risk of flooding will increase in East Colchester because of rising tides, which if combined with high river flow will compound the problem.

Consideration should be made of the impact of surface water flows from additional sites on all development areas within Colchester. The SFRA identified potential discharge points for surface water from new development, and so the impact of this flow will also be analysed during Stage Two, particularly if these discharge points compound the effects on other proposed development sites.

8.4 Suffolk Coastal District Council

8.4.1 Overview

A full copy of the Suffolk Coastal District Council SFRA was received on 28th May 2008, meaning that a full review of the document was not carried out. However, a brief review of this document has been carried out for the Stage One Study, and a more detailed assessment will be made during the Stage Two study.

From the SFRA it has been concluded that the Suffolk Coastal DC area is mostly at risk from tidal flooding. Most of the major developments within the Suffolk Coastal DC area are in coastal or estuarial locations.

8.4.2 Characteristics and Flood Risk

Suffolk Coastal DC has a number of rivers within its area, including the Alde, Deben and the estuarial Orwell. The East Suffolk CFMP identifies that tidal inundation during surge events is a significant threat in East Suffolk, and therefore the Suffolk Coastal DC area. The low-lying coastal land and estuaries are mainly affected by this. Most of this land is not residential, but the towns of Felixstowe, Aldeburgh and Woodbridge, all within the Suffolk Coastal DC area, are at the greatest potential risk.

The main development areas within Suffolk Coastal DC have been considered in the SFRA. Drawing F3 in Appendix F shows the location of the development in relation to the Environment Agency Flood Risk Zones. Table 8.4.1 below shows each development area and its associated flood risk.

Table 8.4.1 Suffolk Coastal Development Areas in Flood Zones from SFRA

Development Area	Flood Zone	Comment
Woodbridge	2/3	Vulnerable development should not be situated on west bank of River Deben Unadvisable to situate development to the east Quay Side Road or Melton Road No Vulnerable Development to South of Station Road Vulnerable development should not be encouraged north of Wilford Bridge or along river to South of Station Road
Leiston / Sizewell	2/3	Flood risk areas are not suitable for development – Minsmere Level and Sizewell Belt marshes
Felixstowe	2/3	South eastern sector of growth area not at risk South of Undercliff Road West not suitable for vulnerable development or on south of caravan and camping ground
Aldeburgh	2/3	Areas to south of Aldeburgh and around Aldeburgh Marshes not suitable for development North of Aldeburgh and around Meare and The Fens of the Hundred River floodplain not suitable for development Can develop to north west

Of the HGSR development areas, the major development areas within Suffolk Coastal District Council area that are at risk are in Felixstowe and Woodbridge. The main area of flood risk in Felixstowe is the Port area, although the proposed South Shore development is also in Flood Risk Zone 3. This SFRA did not obviously distinguish between Flood Zones 3a and 3b. Also located in this flood zone is Felixstowe Sewage Treatment Works, as shown on drawing F4 Appendix F.

8.4.3 Influence of Development on Flood Risk

The East Suffolk CFMP identifies that because of the geology in East Suffolk, surface water flooding is a particular risk. However, the SFRA appears to show that surface water flooding is not a significant risk. It also shows that no assessment has been made of the impact of development on the receiving watercourses. However, the major

growth areas in Suffolk Coastal are either coastal towns or estuarial towns. (Woodbridge and Ipswich area). It has, however, identified that the most significant flood risk is from tidal flooding, especially due to the low lying nature of the area.

8.4.4 Suffolk Coastal Summary

The Suffolk Coastal SFRA has identified the development areas of South Felixstowe, Leiston and Sizewell to be at risk of tidal flooding. However, it has also concluded that the settlements of Saxmundham, Woodbridge, Martlesham and Aldeburgh are at risk of fluvial flooding, along with the Ipswich Policy Area. Aldeburgh is also at increased risk of tidal flooding. However, the Martlesham Heath area is in Flood Zone 1. The impact of flooding in these areas will require further consideration during the Stage Two study, especially as development is not concentrated in one specific area.

8.5 Mid Suffolk District Council

The Mid Suffolk Level 1 and 2 SFRA was published on their website on 20th May 2008. Therefore the content relevant to the HGSR has not yet been reviewed in detail. This will be carried out during the Stage 2 study.

However, a brief review has been carried out. The development sites within the Mid Suffolk District that fall within the HGSR are located in the Ipswich Policy Area. These are the developments of proposed 'Snoasis' at Great Blakenham, and 'Scott's Site' at Bramford. Both of these developments are in or close to Flood Zones 2 and 3 land, due to pluvial flooding, and therefore both should be further considered during the Stage Two study.

The SFRA report rates fluvial flooding risk as low, with land affected being located mostly directly adjacent to watercourses. The report also highlights the detrimental impact surface water flows from new development can have on existing flood risk. Therefore it is proposed that this is considered during the Stage Two study.

The SFRA report also states that the Mid Suffolk Core Strategy document (published October 2007) implies that no development will be permitted in Flood Zones 2 and 3. This will also require confirmation during the Stage Two study period.

Drawing F3 in Appendix F shows the location of development in the HGSR area of Mid Suffolk, in relation to the Environment Agency Flood Risk Zones. The Mid Suffolk area of the HGSR is the Ipswich Policy Area, the main development being 'SnOasis', a proposed indoor winter resort. This will require a Flood Risk Assessment of the development, especially as it is located within a redundant quarry.

8.6 Tendring

Tendring District Council is currently carrying out the Inception of their Level 1 SFRA, and therefore no details were available for the Stage One study. The Tendring area is the location of a significant amount of development within the Haven Gateway. This includes the towns of Clacton, Jaywick, Frinton, Walton, Brightlingsea, Manningtree and St. Osyth, along with the regeneration of Harwich and the associated Harwich Port and Bathside Bay developments.

The Tendring district has significant areas of land situated within the Flood Zones 2 and 3 areas. From our initial assessment we have identified that development in Walton, Jaywick, Brightlingsea and St. Osyth will be located in Flood Zone 2 and 3. Some land allocated in Harwich and Dovercourt is also located in Zone 2 and 3. The Catchment Flood Management Plan has also identified that Clacton is at risk from flash flooding related to Pickers Ditch. Therefore it is proposed that an assessment of flood risk in the development areas previously identified is made during the Stage Two study.

Again, the discharge of surface water flows from development sites may have a detrimental impact on the area. This should also be considered at Stage Two, in order to prevent any existing problems being compounded.

Drawing F3 in Appendix F shows the location of the developments in relation to the Environment Agency Flood Risk Area

8.7 Babergh

The Babergh District includes the tidal Rivers Stour and Orwell, along with coastline between the two estuaries. Similar to the situation with Tendring District Council, Babergh District Council are currently compiling an Inception Report for their Level 1 SFRA.

The main area of development that may be affected by its location in or close to the Flood Zones 2 and 3 is the HMS Ganges and Marina developments in Shotley. This is one of the largest developments in the Babergh area of the Sub Region, and should be analysed at Stage Two. The development in Hadleigh and the Ipswich Policy Area of the Babergh district are within Flood Zone 1, and therefore will not require further flood risk analysis.

Much of the remaining development in Babergh is located outside of the HGSR. However, as with other areas, consideration of the surface water run off from new development sites should be made, in order to ensure that this does not compound existing flooding issues.

The developments have again been plotted in relation to the Environment Agency Flood Risk Zones, and the drawing (reference F3) can be found in Appendix F.

8.7.1 Sewage Treatment Works

The East Suffolk CFMP identifies that three sewage treatment works within the HGSR are at risk from flooding. These are identified in Table 8.5.4 along, along with the source of the flood risk.

Table 8.5.4 STWs at risk of flooding

STW	Flooding Source
Felixstowe	River Orwell and sea
Thorpeness	Thorpeness Hundred
Kessingland	Lothingland Hundred

Before additional development is included in the catchment of these works, it would be advisable to consider the flood protection for the works. Felixstowe should be particularly considered, as it has been identified as one of the main sewage treatment works affected by the proposed HGSR growth.

8.8 Government Reports

The Government Report “Future Water”, and the Pitt Review of the 2007 Summer Floods, have both identified that these floods were “significantly affected by surface water from overloaded drains.’ One of the outcomes of these reports, along with “Improving Surface Water Drainage: Consultation to accompany Future Water”, is a recommendation for the future use of Surface Water Management Plans in critical drainage areas. This would be an action plan, prepared by the local authority and agreed by local stakeholders with drainage responsibilities, to clarify who has responsibility, and agree management of the risk from surface water drainage. This report has already recommended the use of these for areas of increased surface water run off, particularly due to the development of Previously Developed Land. Towns such as Ipswich, Colchester and Felixstowe would benefit greatly from such plans.

The recommendations of this report, along with the potential impact on flooding within the HGSR will be further considered in the Stage 2 study.

8.9 Flood risk management options

There are a number of options available for consideration in order to manage the risk of flooding. The most straightforward would be not to build on land situated within Flood Zones 2 and 3. This is the only approach that can avoid flood risk and should be given adequate attention before other flood risk management approaches are considered. However, this is not always a realistic management strategy, particularly as this would exclude a large proportion of the previously developed land within the HGSR.

Flood defence works to prevent the pathway of flooding have historically been used to provide flood alleviation. The shift in government policy from flood defence to flood risk management has led to the wider consideration of a range of solutions to manage the sources, pathways and receptors of flooding. These include reducing the amount of surface water run off from developments and the use of Sustainable Drainage Systems (SuDS) for source management. The pathways of flooding can be managed through flood embankments or walls, improved flow conveyance or removal of constrictions, diversion of water around an area at risk or flood storage reservoirs upstream of risk areas. Receptor management techniques included education and awareness raising, flood forecasting and warning, property level flood resistance and resilience measures, provision of safe emergency access and evacuation plans.

8.10 Summary

The proposed flood barrier is the passport to growth for Ipswich. It may have been more beneficial from a flood risk perspective to consider Flood Zone 1 land for development instead of Flood Zone 3 land, especially if there is any risk that the barrier may not be constructed. However, the Flood Zone 3 land identified for development is located within the former Ipswich Docks area and is in need of redevelopment, which fits with Strategy for Ipswich and wider sustainability requirements. Striking a balance between

reducing flood risk and wider sustainable development where it is really needed is essential. Even if the barrier is constructed, this does not alter the need for sequential and exception tests and the need to take a sequential approach to side developments of carious levels of vulnerability in terms of flood risk as described in PPS25.

Ipswich is particularly at risk of pluvial flooding along with some risk of tidal flooding. The risk of tidal flooding is greatly increased should the barrier scheme not go ahead. The main risk of pluvial flooding is from the existing sewerage system. At times of increased surface water discharge into the sewerage system, the sewers quickly reach capacity, and surcharge at the lowest points. The area around the Waterfront location is usually affected by this. Furthermore, any surcharging sewers then run overland, towards the river. Again the Waterfront area would be affected by this.

Therefore it is intended to analyse further the impact of fluvial and sea flooding in the Waterfront and IPOne areas of Ipswich during the Stage 2 study. It is also intended to consider further the impact of development on pluvial flooding, and how future drainage systems can reduce this risk.

Development within Flood Zones 2 and 3 is only proposed in the Colne Harbour and University of Essex area, and the East Colchester, North Station and Colchester Institute areas, and also Rowhedge Port development, outside of the town. It is therefore proposed to further consider these developments during the Stage Two study, particularly highlighting if development in these areas is inappropriate.

The main flood risk areas within the HGSR areas are Ipswich, Colchester and Felixstowe. Much of the expansion of Colchester is situated within Flood Zone 2 or 3 land, although measures have been taken to avoid highly vulnerable development in Zone 3.

Felixstowe is at risk from tidal flooding. The development areas identified are located within Flood Zones 2 and 3, although much of this land is allocated for use in the Port of Felixstowe extension, which is not considered vulnerable development.

The impact of surface water flooding across the HGSR, but particularly in the key development locations, could potentially be reduced by careful consideration of the ways in which surface water on new and existing development sites is dealt with. Much of the development is on previously developed land. Due to the multiple sources of flood risk in Ipswich, including in particular surface water drainage issues, a Surface Water Management Plan would be a suggested way forward for developing solutions to the surface water drainage system which brings together all the relevant stakeholders. Opportunity to steer development to lower flood risk areas should be taken and weighed with sustainability criteria.

8.11 Recommendations

It is recommended that the location of proposed development in the following areas is further considered. Proposed development in these areas has already been identified as Flood Zone 2 and 3.

Table 8.11 Development areas in Flood Zones 2 and 3

District	Development areas
Ipswich Borough Council	Riverfront
	IPOne
Colchester Borough Council	East Colchester
	North Station
	Colchester Institute
Suffolk Coastal District Council	Rowhedge Port
	Felixstowe
	Woodbridge
	Leiston
	Aldeburgh
Tendring District Council	Clacton
	Jaywick
	Frinton
	Walton
	Brightlingsea
	Manningtree
	St Osyth
	Harwich (including Port and Bathside Bay)
Babergh District Council	Shotley
Mid Suffolk District Council	Great Blakenham (Snoasis)
	Bramford (Scott's)

A recurring theme within the SFRA's reviewed was the impact of future surface water flows from new development on existing flooding. Therefore it is recommended that the impact of this additional flow is further analysed, along with recommendations of how this flow can be reduced, and to what extent.

A full review of the Mid Suffolk SFRA can now be made, and it is recommended that this is also carried out within the Stage 2 study, along with an assessment its impact on proposed development.

It is also proposed to make an assessment of the impact of the Ipswich Barrier, considering the impact of its development, delay to development, or cancellation of its development.

9 DEMAND MANAGEMENT

9.1 Water Usage

The East of England Plan identifies that the Environment Agency's Water Resources Strategy for the East of England would expect to see an approach where demand management and resource development go hand in hand. They have referred to this as a 'twin track' approach. This approach is in line with Defra's new Future Water Strategy. The East of England Plan also expects that water efficient fittings and appliances are fitted to all new developments, and that existing developments should be upgraded to the same standards. They expect to see a saving of 25% in new development, and 8% in existing.

All three water companies have acknowledged the 'twin track' approach within their recently completed Water Resource Management Plan's. As Anglian Water outlined in their Water Resources Management Plan, this is the "management of water resources through investing in demand management alongside water resources development." This demand management includes household metering, water efficiency, leakage control, rainwater harvesting and greywater re-use. Anglian Water have also considered using a pricing strategy to influence customer behaviour.

9.1.1 Water Efficiency

Water companies have promoted water efficiency extensively over recent years. This includes educating the public to turn off taps when not in use, collect rainwater in butts for watering the garden and washing cars, or installing devices in toilet cisterns to reduce the amount of water needed to fill them. However, water efficiency has now started to move into new areas.

The Government report 'Future Water; The Governments Water Strategy for England', which was published in February 2008, has identified a need to "promote more sustainable behaviours". The report highlights that a joint Defra and Department for Communities and Local Government (CLG) policy statement, along with the Housing Green Paper¹ "will amend the Building Regulations to include a requirement for a minimum standard of water efficiency in new homes." This will be calculated using a PCC of 125 l/h/d. The CLG Code for Sustainable Homes², a national voluntary standard, will also be promoted. From April 2008 all social housing that is funded through the Housing Corporation has had to be built to Code Level 3, with a Per Capita Consumption of 105 l/h/d. This figure does not take into account any water reuse or rainwater harvesting.

Furthermore, *Future Water* has also stated that the Government will be reviewing the Water Supply (Water Fittings) Regulations 1999, later in 2008. In particular this will review the case for "setting new performance standards for key water fittings". This will include household appliances as well as internal fittings (i.e toilets).

¹ Department for Communities and Local Government: Homes for the future July 2007

² Department for Communities and Local Government: Code for Sustainable Homes December 2006

Tendring Hundred Water stated that they have achieved the lowest leakage figures and consumption per customer in the country. They also intend to encourage water efficiency at home, by simple methods such as not leaving taps running, using showers as an alternative to baths, installing water butts to use rainwater for garden watering or putting a block in the toilet cistern to reduce the amount of water needed to fill it. Water efficient appliances (i.e. lower water use washing machines and dishwashers) are also encouraged.

9.1.2 Household Metering

All of the Water Resource Management Plans have given a great deal of thought to the issues of water metering. From the plans it would appear that water metering has become popular within the HGSR. All companies certainly see metering as a method of influencing water demand, although none of them are demanding the introduction of compulsory metering. In the Tendring Hundred Water area the average Per Capita Consumption (PCC) is over 15 litres/head/day (l/p/d) less in a metered dwelling compared with an unmetered dwelling. Furthermore, it is suggested the PCC in metered homes will fall during the period to 2035, where as unmetered PCC will rise.

9.1.3 Leakage Control

Each water company has an ELL, the Economic Level of Leakage. This is the level at which it is both cost effective to reduce leakage to, but also affordable to have leakage at. All companies have invested greatly over recent years to bring leakage down to this level. Generally this is by engineering means, such as repairs on and replacement of old and/or damaged pipes. However, an alternative and cost effective method of reducing leakage is to reduce the pressure in the pipes. This subsequently reduces the amount of water that can be 'forced' out of the pipe and therefore reduces losses due to leakage. However, this method can only be employed in areas where there will be no detrimental impact on delivery pressures. Tendring Hundred Water and Essex and Suffolk Water already employ this method to its full potential, and therefore cannot reduce leakage levels any further in this way. However, both companies report industry low levels of leakage. Anglian Water have not implemented pressure reduction in the past to the same extent, but are now planning on implementing this method more, to keep the current ELL. They have also stated that they will further reduce leakage levels during periods of water resource stress.

9.1.4 Rainwater Harvesting and Greywater Re-use

Rainwater Harvesting and Grey Water have been discussed in 'Future Water' and all three water companies within their Surface Water Management Plans identify the 'Twin Track' approach to water resources.

The water authorities also intend to work with housing developers and local authorities to ensure new houses are fitted with water efficient technologies, and new developments include grey water recycling systems. Tendring Hundred Water also see water metering as a key to reducing water consumption

In order to reduce the amount of potable water used for household activities, the use of rainwater or greywater recycling systems is being actively encouraged. Most systems

can only be easily installed during construction, but the market in retro fitted systems is growing.

There are two types of greywater recycling systems. The first, a water diversion system diverts greywater directly to the subsoil in the garden. The second, a water recycling system with purification should be used for the reuse of water in the home. The water is collected from bath, shower and sink waste. The system then consists of a cleaning tank to remove any solids and then 'treat' the water, with the additional of disinfection tablets. This water is then collected in a tank ready for use, but provision must be made to discharge the water if it is stored too long, as it may become hazardous. The water can then be reused for toilet flushing.

Rainwater harvesting is also a growing sector of water recycling. This is where rainwater from the roof area of the property is collected, and then reused to flush toilets, supply washing machines and outside tap use. Systems that combine the collection of rainwater and the reuse of greywater are also in use.

It is important to note that rainwater harvesting also reduces surface water run off. The implication of this and the use of other Sustainable Drainage innovations will be considered further at Stage 2.

9.2 Sustainable Housing

Waterwise (waterwise.org.uk) is a NGO focussing on decreasing water consumption in the UK. In December 2006 Waterwise published the 'Code for Sustainable Homes in England'. Initially this code was compulsory for all homes receiving government funding, and restrict water use to 105 litres per capita per day.

Since April 2007 a developer of any new home can be assessed against this code. From May 1st 2008 this assessment will be mandatory. The code uses a points system to identify the most efficient homes, with higher points being awarded for the most efficient. Points are awarded for internal potable water consumption, (i.e. reduced toilet cistern sizes), external potable water consumption (i.e. water butts), surface water run off (specifically the use of SuDS) and flood risk, which is generally based on the development location.

9.3 Sustainable Drainage Systems

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 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. 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 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. 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 and would also further satisfy the Code for Sustainable Homes.

Refer to Appendix G for an introduction to the available types of Sustainable Drainage Systems for use within residential developments.

Soil maps for Haven Gateway indicate the majority of the area to possess a variable to negligible permeability; however, patches of high permeability are noted to be present within Stowmarket, Hadleigh, Sudbury and to the west of Ipswich. The permeability of the subsoil beneath a proposed development site influences the range of applicable SUDS techniques; permeable soils lend themselves to the application of infiltration based SUDS whilst the application of a SUDS system to a site with a soil of low permeability will necessitate the presence of a watercourse in which to discharge attenuated flows. However, in the absence of a watercourse, an agreement could be possible with the surface water regulating authority to discharge attenuated flows into a nearby surface water drain.

Within an assessment of the feasibility of SUDS for a development site, it is recommended that an infiltration test be conducted.

Depending upon the proposed catchment and estimated surface water runoff pollutant load, the application of SUDS, especially those based upon infiltration, must be done so with care within areas designated as Source Protection Zones (SPZ). Within Haven Gateway, the areas designated as SPZs are indicated in Appendix G [source protection zone map]; SUDS schemes serving these catchments must fully integrate the management train concept and be lined in the upper stages (i.e. where the pollutant load is likely to be at its highest) in order to minimise the potential for pollutant laden surface water to infiltrate the ground.

The same caution outlined above for the use of SUDS within SPZs must also be applied to their use in areas within which the Environment Agency has noted the Groundwater to be vulnerable – see Appendix G [groundwater vulnerability map]. The majority of the Haven Gateway sub-region is designated as a minor aquifer with areas of Groundwater vulnerability primarily to the north east of Ipswich. Within these areas, full use of the management train concept must be made as well as the strategic use of lined SUDS features if deemed necessary.

9.4 The cost 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.

Section 106 of the Town and Country Planning Act 1990 allows Planning Authorities to enter into legally binding agreements with the local unitary authority in order to offset the cost of the development. This may be 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.

9.5 Summary

A tap left running for just 15 minutes, the time it takes to brush your teeth 7 times, could use the same amount of water an efficient house uses in a day. By educating water users, a significant reduction in water demand could easily be made.

Demand management could be seen as an alternative to the sourcing of new water supplies. By reducing the current demand by 25% on 1000 dwellings, 250 new dwellings could be supplied without increasing the quantity of water required. In the HGSR, if the existing 400,000 dwellings reduced the water demand by 25%, the entire projected growth within the HGSR could be accommodated within the existing water resource available. Therefore the impact of the management of existing demand should not be underestimated as a method for accommodating future growth.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 Introduction

This study shows that in general, within the HGSR, there are currently local issues that will have an effect on the timing of growth. Once these issues are dealt with, most projected housing growth within the HGSR can be accommodated. The areas currently at issue are Ipswich, Felixstowe and Colchester, which are also the largest growth areas within the HGSR. These are not the only areas affected by growth, but they are the most significant. Figure 9.1 in Appendix H gives an indication of the ability of the HGSR to accommodate the growth, and where development of infrastructure will be needed so as not to impede the growth.

Growth in the HGSR has already exceeded expectations, without significant investment in the existing infrastructure. However, that 'buffer' has almost been used up and now is the ideal opportunity to encourage investment in the existing infrastructure to comfortably accommodate growth beyond 2021, whilst still dealing with the existing demand.

It should be stressed that Anglian Water Services, Tendring Hundred Water Services and Essex and Suffolk Water Services have already considered the impact of growth on their water supply networks, and they already have proposals for reinforcement to the existing network within the new Water Resources Plan, which was released for public consultation in May 2008.

Similarly much of the growth can be accommodated within the existing sewerage network. Careful consideration of the way in which effluent from trade is dealt with could mean that the existing infrastructure would not require such significant upgrading. Likewise the use of SuDS could reduce the required additional capacity to accommodate the proposed growth in sewerage infrastructure.

The original brief for this Water Cycle Study set out a number of objectives. These objectives have largely been met. Where restrictions were found when collecting data, alternative methods of assessing the impact of growth were developed.

The water infrastructure has been assessed, and along with the proposals shown in the recent Water Resources Management Plans, the capability of the existing infrastructure to accommodate growth has been identified.

The impact of growth on the sewerage network has also been analysed. The limitations of the existing systems have been identified, and areas where further assessments of the impact of growth is necessary, shown. An assessment of flood risk within the sub region has been made as much as is practicable, using all relevant information available. Areas where SFRA's have been unavailable have been identified, and alternative data has been used for an assessment to be made.

A Constraints Matrix has been compiled (see Section 10.2), showing the suitability of development to go ahead in the HGSR. This is further explained in Section 10.2 below,

Table 10.1 Assessed State of Infrastructure by 2021 (assumes no infrastructure works)

	Settlement	Water	Wastewater	Flooding	SW drainage
Colchester	Colchester North	Yellow	Red	Red	Green
	Colchester Garrison	Yellow	Red	Green	Green
	Colchester East	Yellow	Red	Red	Green
	Colchester Cuckoo Farm	Yellow	Red	Green	Green
	Stanway	Green	Red	Green	Green
	Tiptree	Yellow	Red	Green	Green
	West Mersea	Green	Red	Green	Green
Babergh	Sudbury	Green	Red	Green	Green
	Great Cornard	Green	Green	Green	Green
	Hadleigh	Green	Red	Green	Green
	Shotley	Green	Green	Red	Green
	Sproughton	Yellow	Red	Green	Green
	Bildeston	Green	Green	Green	Green
	Boxford	Green	Green	Green	Green
	Bures	Yellow	Green	Green	Green
	Pinewood(S.Ipswich)	Yellow	Green	Green	Red
Ipswich	Ipswich North	Yellow	Green	Green	Red
	IPOne	Yellow	Green	Red	Red
	Waterfront	Yellow	Green	Red	Red
	Ipswich South	Yellow	Green	Green	Red
Suffolk Coastal	Leiston	Green	Red	Red	Green
	Aldeburgh and Thorpeness	Green	Green	Red	Green
	Saxmundham	Green	Red	Green	Green
	Felixstowe and The Trimleys	Yellow	Red	Red	Red
	Nacton	Green	Green	Green	Green
	Kesgrave, Rushmere	Green	Green	Green	Green
	Woodbridge	Yellow	Red	Red	Green
	Martlesham	Green	Red	Green	Green
	Rendlesham	Green	Red	Green	Green
Mid Suffolk	Bramford	Yellow	Green	Red	Green
	SnOasis	Yellow	Green	Red	Green
Tendring	Clacton Town	Green	Green	Red	Red
	Little Clacton	Green	Green	Red	Red
	Jaywick	Green	Red	Red	Red
	Harwich and Dovercourt	Yellow	Red	Red	Green
	Frinton and Walton	Green	Green	Red	Green
	Brightlingsea	Green	Red	Red	Green
	Lawford, Manningree and Mistley	Green	Red	Red	Green
	St Osyth	Green	Green	Red	Green
	Weeley	Green	Green	Green	Green
	Wix	Green	Red	Green	Green

Key		Clear to develop
		Will require infrastructure improvement
		Planned infrastructure works required before development

10.2 Constraint Matrix

The Stage One report has identified that there are constraints to development. In order to accommodate the future growth identified, works will be required to the existing infrastructure in order to accommodate that growth. Table 10.1 above shows the constraints to development. Areas shown as red are where work is not planned, but will be required to accommodate growth. Where works are already planned but not yet carried out, the table is shown as amber. Where no works will be required to accommodate growth to 2021, the table is shown as green

10.3 Recommendations

It is recommended that a Stage Two study is carried out. The constraints to development have been identified during the Stage One study. A Stage Two study would identify solutions to these constraints, or even identify where there are no suitable solutions. Where there are no feasible solutions, the Stage Two study will endeavour to recommend other suitable locations for future development.

Four distinct areas have presented themselves during the Stage One Study for further consideration and analysis. These are:

- Water
- Wastewater
- Surface water Flooding; and
- Fluvial, Tidal and Coastal Flooding.

It is recommended that these four areas are examined. This Final Stage One Report has provided a sound foundation on which to carry out this further study, by scrutinising the information available, and collating the applicable data. The publishing of the Water Resource Management Plans has also provided important information, which will be used to assess the probability of the water resources being able to supply development. Furthermore the timing of development to concur with water resource development and water infrastructure improvement can now be carried out with a certain degree of confidence, as the Water Resource Management Plans will be used to develop the Water Companies Asset Management Plans later in the year. It is hoped that the timing of the AMP plan submission, and its being made publicly available, will coincide with this study.

11 HAVEN GATEWAY WATER CYCLE STUDY - STAGE TWO

11.1 Introduction

The Haven Gateway Water Cycle Study Stage Two will 'develop the findings and recommendations of the Stage One outline Study to examine in more detail what infrastructure and measures will be needed to accommodate planned levels of growth in the HGSR' (Source: Project Brief).

The Stage One report has identified the areas in which infrastructure has developed adequately to accommodate planned growth. The Stage Two study will take these areas and identify solutions to these constraints. Where there are no suitable solutions, the Study will advise if development in these locations is suitable, and where possible, endeavour to recommend other suitable locations for future development.

11.2 Collection of Data for Stage 2

Much of the data required for the Stage 2 study has now been collated, although it may become apparent during the further study of this data that other information is required. However, contact with the consultees will be maintained during the study period, both within the Strategic Consultee Meetings, and by direct contact with the associated parties.

It will be necessary during the consultation stage of the Stage 2 study to liaise closely with all three water companies, the local authorities and the Environment Agency.

11.3 Work Programme

The proposed programme for the Stage 2 study is attached. The main milestones are reflected in Table 11.2 below.

Table 11.2: Key Milestones

Date	Milestone
16 th June 2008	Start of Stage 2 Strategy Phase
9 th July 2008	Steering Group Meeting
3 rd September 2008	Steering Group Meeting
14 th November 2008	Draft Stage Two Report Submission
5 th December 2008	Steering Group Feedback Deadline
12 th December 2008	Final Stage Two Report Submission

11.4 Consultation

Continuous consultation with the Water Companies and the Environment Agency will be the key to the successful outcome of the Stage Two study. It is also proposed that bi-monthly meetings of the Strategic Consultees Group, as well as the Steering Group, are held. It may become evident that workshops with some or all of the consultees may be beneficial. If this is the case, these will be arranged at the appropriate times and locations. For example, this could a suitable basis for a discussion on the collection of

contributions from developers for Sustainable Urban Development schemes, or even future uses of the Water Cycle Strategy and its presentation.

11.5 Project Risk

A Project Risk Assessment has previously been produced for the Stage One Water Cycle Study. This has been revised and updated to reflect the Stage Two study also. The Project Risk Assessment can be found in Appendix. C.

11.6 Developers Contributions

As detailed in the Proposal for Stage Two, a method for collecting contributions from developers for the maintenance of SUDS will be developed. This will be in consultation with the Steering Group, and may necessitate a workshop in order to collect ideas from the Strategic Consultee groups. However, this will be further developed during the Stage Two Study period.

11.7 Final Report

The Final Report will consist of a number of elements. It will be made up of the finalised Stage One Report, this Inception Report, and a Stage Two report. There will also be a 'high level' summary report and a leaflet suitable for public distribution. A presentation of the findings of the full study will also be made to the Steering Group.

It is also proposed to develop a GIS tool, summarising the data collected, into an easy to use interactive map. This tool will be developed throughout the Stage Two process, with pilot tools being developed for Steering Group review. The Stage Two report will conclude with the development of a Final Strategy for the HGSR.

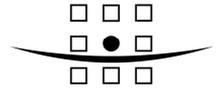
Appendix A Data Collection

Appendix B Trajectory Data

Appendix C

Wastewater Collection and Supply

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Appendix D Water Supply

Appendix E Environmental Habitats

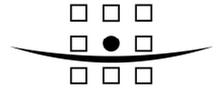
Appendix F

Flood Risk Mapping

Appendix G

Demand Management

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ROYAL HASKONING

Glossary

GLOSSARY

AMR	Annual Monitoring Report
AWS	Anglian Water Services
BDC	Babergh District Council
CAMS	Catchment Abstraction Management Strategy
CBC	Colchester Borough Council
DO	Deployable Output (Water available for supply)
EA	Environment Agency
EOETS	Ely Ouse to Essex Transfer Scheme
ESWS	Essex and Suffolk Water Services
GQA	General Quality Objective
FfG	Framework for Growth (Haven Gateway Programme of Development A Framework For Growth October 2007)
HGSR	Haven Gateway Sub Region
IBC	Ipswich Borough Council
LDD	Local Development Documents
LDF	Local Development Framework
LDS	Local Development Scheme
MI/D	Megalitres per day (1MI = 1,000,000 litres)
MSDC	Mid Suffolk District Council
PCC	Per Capita Consumption
RQO	River Quality Objectives
RSS	Regional Spatial Strategy
SCDC	Suffolk Coastal District Council
SFRA	Strategic Flood Risk Assessment
STW	Sewage Treatment Works
SuDS	Sustainable Drainage System
TDC	Tendring District Council
THWS	Tendring Hundred Water Services
WCS	Water Cycle Strategy
WMP	Water Management Plan (2004)
WRMP	Water Resources Management Plan (2008)
WRZ	Water Resource Zone