South Holland, South Kesteven and Rutland Outline Water Cycle Study

Technical Report

Final
January 2011

Prepared for

Revision Schedule

Technical Report
January 2011

Rev	Date	Details	Prepared by	Reviewed by	Approved by
01	September 2010	V1	**Clare Postlethwaite** Senior Consultant **Helen Judd** Assistant Hydrologist	**Carl Pelling** Principal Consultant	**Carl Pelling** Principal Consultant
	November 2010	v2	**Clare Postlethwaite** Senior Consultant	**Carl Pelling** Principal Consultant	**Carl Pelling** Principal Consultant
	January 2011	Final	**Clare Postlethwaite** Senior Consultant	**Carl Pelling** Principal Consultant	**Carl Pelling** Principal Consultant

Scott Wilson
Scott House
Alençon Link
Basingstoke
Hampshire
RG21 7PP

Tel 01256 310200
Fax 01256 310201

www.scottwilson.com

Table of Contents

Executive Summary

The administrative authorities of South Holland, South Kesteven and Rutland are expected to experience an increase in housing and employment provision over the period up to 2026. The recently revoked Regional Spatial Strategy (RSS) for the East Midlands[1] (the East Midlands Regional Plan or EMRP) states that the total housing provision from 2006 to 2026 for South Holland is 7,400, for South Kesteven is 13,600 and for Rutland is 3,000.

The overall aim of the project is to identify a clear programme of required water services infrastructure and its implementation to support the delivery of sustainable growth up to 2026.The WCS tests the impact of the proposed development on the water cycle, defines the existing baseline capacity for growth without the need for new infrastructure and determine where new infrastructure or further investigation is required to overcome constraints that may limit the required growth levels in the study area as a result of new water services infrastructure.

The objectives of the WCS are to ensure:

- water services infrastructure is provided in a timely manner to support the housing, employment and related services to support the growth planned for the region to 2026;
- there is a strategic programme for delivery of key infrastructure;
- there is a strategic approach to the management and usage of water;
- that development is only permitted where environmental capacity exists;
- that impacts on the study area from all relevant catchments (including groundwater) and their growth are assessed in order to provide a holistic picture of water management in South Holland, South Kesteven and Rutland; and
- that development is located away from areas at highest flood risk.

The assessment was carried out on the 5 key 'water cycle' topic areas:

- water resources;
- wastewater treatment and transmission;
- ecology;
- flood risk; and
- surface water management and SuDS potential.

The approach to the study was to collect baseline data from various stakeholders, to analyse the data and relate it to the proposed growth areas. Constraints matrices were drawn up to identify the constraints to growth and the relative significance of these as a barrier to growth. The key findings of the study, in relation to the existing situation, were as follows:

For water resources, both Anglian Water and Severn Trent Waters' Water Resource Management Plans forecast supply to demand deficits by the end of the planning period, although both companies have measures in place to deal with these deficits. However, water efficiency measures should still be incorporated into all new development to reduce water use where possible.

[1] http://www.gos.gov.uk/497296/docs/229865/East_Midlands_Regional_Plan2.pdf

For wastewater treatment and transmission, there are twelve wastewater treatment works that currently do not have current capacity to accept and treat any further wastewater from growth without requiring an increase in the volumes that they are consented to discharge. Any growth in these areas will require the consent parameters of the discharge to be reviewed and altered. It was not possible to carry out a full assessment of the capacity of the sewer network without knowledge of exact growth locations; this was a recommendation for a Stage 2 study.

For ecology, no effects on designated conservation sites are anticipated from the proposed growth.

There are significant areas at flood risk throughout the study area and where possible development should be steered away from these and into Flood Zone 1, in accordance with the flood zone mapping produced for the SFRAs that each of the three Councils has commissioned.

The geology of some areas, particularly to the east, is not suitable for infiltration SuDS and discussions must be held with the relevant Internal Drainage Board(s) to ensure that run-off rates from new development are appropriate and will not exacerbate flooding elsewhere.

Recommendations for a Stage 2 Detailed study included:

a) It is essential that, if available, preferred development sites are agreed for all authorities and provided to inform a more detailed assessment in Stage 2;

b) A preferred growth scenario should be selected to allow preferred solutions to be developed and tested via the sustainability assessment;

c) Options for increased wastewater treatment capacity at twelve WwTW will be required to allow growth to proceed;

d) Where discharge consent volumes will be increased, an assessment of impact on flood risk of receiving watercourses should be undertaken;

e) Wastewater network modelling at several locations is required to determine when and where new developer funded mains will be required;

f) More detailed SuDS requirements should be provided for preferred development sites when known, including deriving values for permitted runoff rates and options for linkage with green infrastructure; and

g) Infrastructure phasing timelines should be produced for each growth area to determine impact of infrastructure and mitigation provision on housing delivery.

1 Acronyms and abbreviations

Abbreviation	Description
AMP	Asset Management Plan
AWS	Anglian Water Services
BGS	British Geological Society
BOD	Biochemical Oxygen Demand
CAMS	Catchment Abstraction Management Strategy
CBA	Cost Benefit Analysis
CFMP	Catchment Flood Management Plan
CSH	Code for Sustainable Homes
CLG	Communities and Local Government
DEFRA	Department for Environment, Food and Rural Affairs
DG5	Water company's register of properties/areas affected by sewer flooding
DO	Dissolved Oxygen
DWF	Dry Weather Flow
DWI	Drinking Water Inspectorate
EiP	Examination in Public
EMRP	East Midlands Regional Plan (the revoked RSS for the East Midlands)
FEH	Flood Estimation Handbook
FFT	Flow to Full Treatment
GQA	General Quality Assessment
GWMU	Groundwater Management Unit
HA	Highways Agency
HMWB	Heavily Modified Water Body (under the Water Framework Directive)
IDB	Internal Drainage Board
l/h/d	Litres/head/day (a water consumption measurement)
LDDs	Local Development Documents
LDF	Local Development Framework
LPA	Local Planning Authority
Ml	Mega Litre (a million litres)
NE	Natural England
NRA	National Rivers Authority
NWA	No Water Available (in relation to CAMS)
OFWAT	The Office of Water Services
O-A	Over Abstracted (in relation to CAMS)
O-L	Over Licensed (in relation to CAMS)
P	Phosphorous

PE	Population Equivalent
PPS	Planning Policy Statement
PR	Periodic Review
RBMP	River Basin Management Plan
RSS	Regional Spatial Strategy (revoked)
RQO	River Quality Objective
SAC	Special Area for Conservation
SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SS	Suspended Solids
SSSI	Site of Special Scientific Interest
STWL	Severn Trent Water
SUDS	Sustainable Drainage Systems
UKTAG	United Kingdom Technical Advisory Group (to the WFD)
UWWTD	Urban Wastewater Treatment Directive
WCS	Water Cycle Study
WFD	Water Framework Directive
WRMP	Water Resource Management Plan
WRMU	Water Resource Management Unit (in relation to CAMS)
WRZ	Water Resource Zone (in relation to a water company's WRMP)
WwTW	Wastewater Treatment Works

2 Introduction

2.1 Growth in South Holland, South Kesteven and Rutland

The administrative authorities of South Holland, South Kesteven and Rutland are expected to experience an increase in housing and employment provision over the period up to 2026. The recently revoked Regional Spatial Strategy (RSS) for the East Midlands[2] (the East Midlands Regional Plan or EMRP) states that the total housing provision from 2006 to 2026 for South Holland is 7,400, for South Kesteven is 13,600 and for Rutland is 3,000.

As of the 6th July 2010, the Secretary of State for Communities and Local Government announced the revocation of Regional Strategies with immediate effect[3]. Regional Strategies are being revoked under s79(6) of the Local Democracy Economic Development and Construction Act 2009 and will thus no longer form part of the development plan for the purposes of s38(6) of the Planning and Compulsory Purchase Act 2004. However, in the absence of a replacement for the RSS, the previous housing figures will be used for the purposes of this study for the South Holland District.

This growth represents a challenge to all three districts in ensuring that both the water environment and water services infrastructure has the capacity to sustain this level of proposed growth and development.

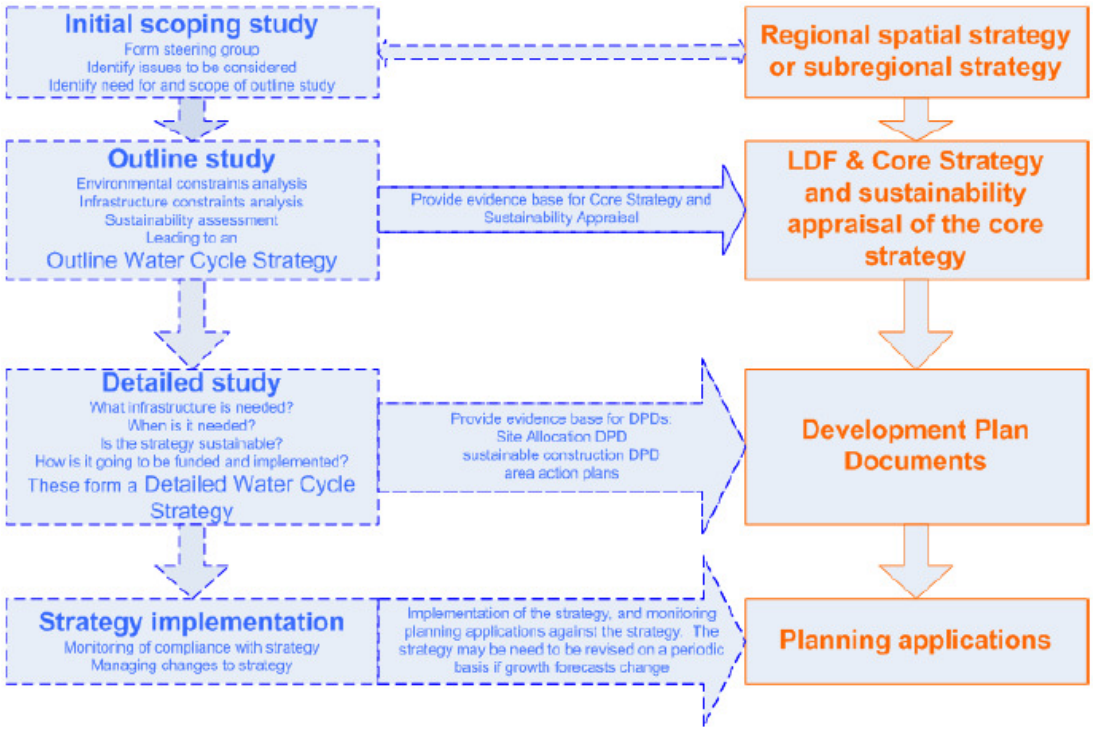
It is therefore key that the South Holland, South Kesteven and Rutland Water Cycle Study (WCS) identifies any constraints on housing and employment growth planned for the study area up to 2026 that may be imposed by the water cycle study and how these can be resolved i.e. by ensuring that appropriate water infrastructure is provided to support the proposed development. Furthermore, it should provide a strategic approach to the management and use of water which ensures that the sustainability of the water environment in the region is not compromised.

2.2 Study History

The South Holland, South Kesteven and Rutland Outline WCS is being undertaken in two stages, as recommended by the Environment Agency guidance for Water Cycle Studies[4]. The WCS stages are shown in Figure 2-1 below.

[2] http://www.gos.gov.uk/497296/docs/229865/East_Midlands_Regional_Plan2.pdf
[3] http://www.communities.gov.uk/documents/planningandbuilding/pdf/1631904.pdf
[4] Environment Agency (2009), Water Cycle Study Guidance

Figure 2-1: Water Cycle Study stages



A Scoping assessment, the Key Constraints Assessment, was completed in June 2010. Its aim was to define the study area, establish the WCS steering group and to determine the key water infrastructure and water environment constraints that have the potential to impact on growth during the plan period for the administrative area of the three authorities.

The Key Constraints Assessment concluded that although no 'showstoppers' were identified, there are significant potential constraints on housing growth in the study area requiring more detailed assessment in the Outline phase of the WCS. In particular, management of flood risk, wastewater treatment and transmission of demand for potable water.

2.3 Water Cycle Study Reporting

The undertaking of a WCS requires a significant amount of technical assessment work. This technical work requires agreement by all technical stakeholders involved such that the findings of the study can be agreed and signed up to by all parties to give an approved strategy.

It is important that the methodology, process and outputs of each of the WCS assessments is documented and reported. However, as an evidence base to the Local Development Frameworks (LDF) and associated Local Development Documents (LDD), the WCS reports should primarily be planning based documents. Therefore, this Outline WCS has been reported via two key documents:

- **The Technical Report** – this report presents the Outline Water Cycle Strategy, giving the full technical detail of the study process, assessments and findings, with full conclusions of the Outline strategy. Its aim is to be the technical reference point for the Water Cycle Study; and

- **The Planning Summary Report** – this document provides the findings of the WCS and relates them to the planning issues faced by the three partner authorities; this is aimed at a wider audience that are unlikely to have in-depth knowledge of water infrastructure and the water environment but rather have a planning background.

This report presents the Technical Report.

2.4 Study Contributors

2.4.1 Steering Group

This Outline Study has been carried out with the guidance of the Steering Group, comprising the following organisations:

- South Holland District Council (SHDC);
- South Kesteven District Council (SKDC);
- Rutland County Council (RCC);
- Lincolnshire County Council (LCC);
- Anglian Water Services Ltd (AWS);
- Severn Trent Water Ltd (STWL);
- Environment Agency; and
- Natural England (NE).

2.4.2 Other consultees

The various stakeholders, including the Steering group, were arranged into four levels, to reflect the level of input and consultation required into the WCS. The tiers were defined as follows:

- Tier 1 – lead partner authority; ongoing consultation on the findings of the study; and leaders of all steering group meetings and report direction.
- Tier 2 – Wider Steering Group (Environment Agency, Natural England, water companies) – attendance at proposed stakeholder workshops (see below), monthly steering group updates, attendance at 2 steering group meetings, invitation to comment on Scoping outputs; agreement on final WCS Outline report.
- Tier 3 – Wider stakeholders and IDBs – Contact for additional useful information on local infrastructure, potential circulation of agreed Scoping Study outputs for information and comment to feed into Phase 2.
- Tier 4 - Provide findings of the joint Scoping and Outline Study – this tier includes parish councils and neighbouring authorities.

The frequency and level of consultation and communication was agreed with the stakeholder group through the production of a stakeholder communications strategy. This is included as Appendix A.

2.5 Outline Study – Aims and Objectives

The overall aim of the project is to identify a clear programme of required water services infrastructure and its implementation to support the delivery of sustainable growth up to 2026.The WCS tests the impact of the proposed development on the water cycle, defines the existing baseline capacity for growth without the need for new infrastructure and determines where new infrastructure or further investigation is required to overcome constraints that may limit the required growth levels in the study area as a result of new water services infrastructure.

The objectives of the WCS are to ensure:

- water services infrastructure is provided in a timely manner to support the housing, employment and related services to support the growth planned for the region to 2026;
- there is a strategic programme for delivery of key infrastructure and estimates of costs;
- there is a strategic approach to the management and usage of water;
- that development is only permitted where environmental capacity exists;
- that impacts on the study area from all relevant catchments (including groundwater) and their growth are assessed in order to provide a holistic picture of water management in South Holland, South Kesteven and Rutland; and
- that development is located away from areas at highest flood risk.

2.6 Study Area

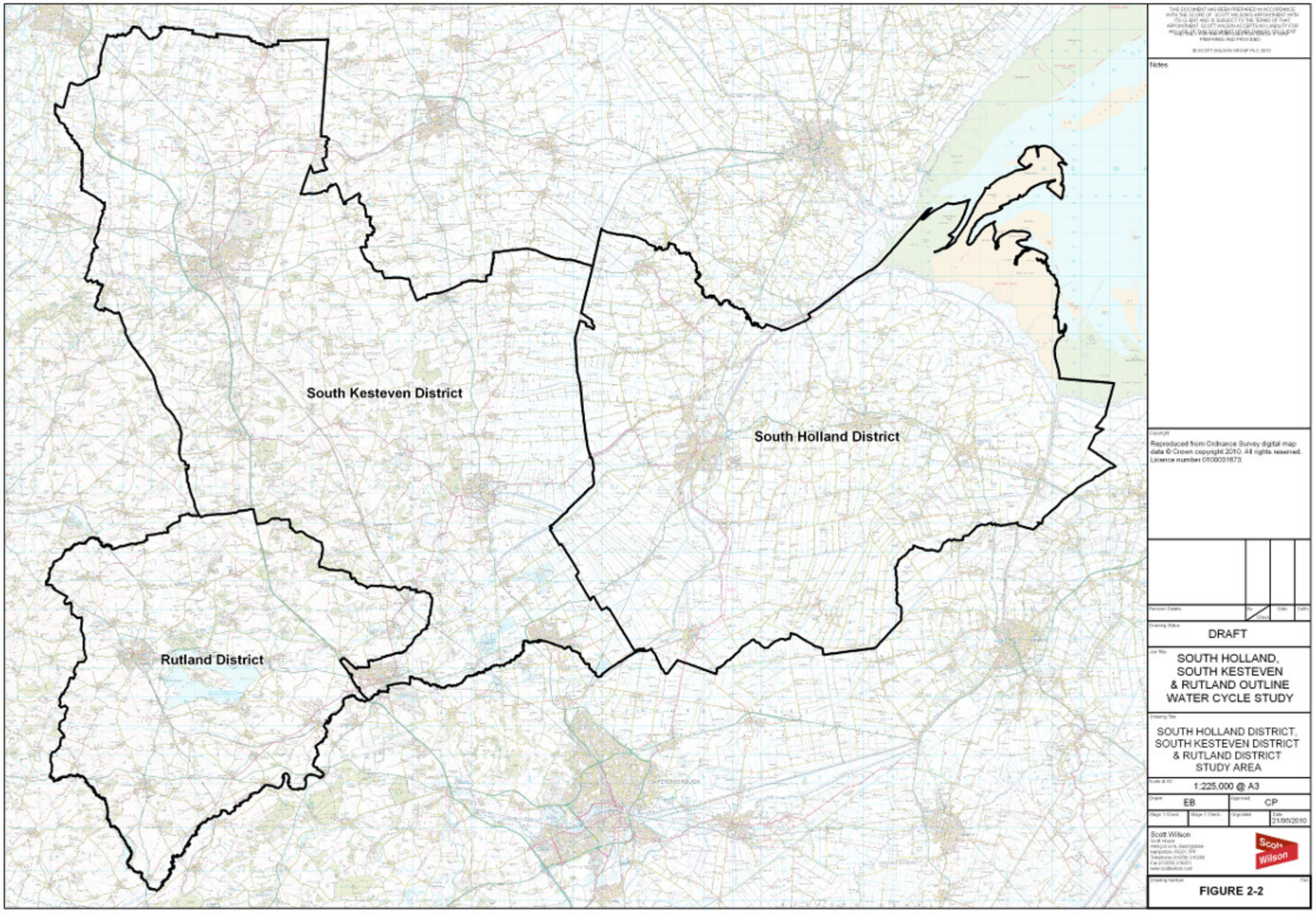
The administrative areas of South Holland, South Kesteven and Rutland are shown in Figure 2-2 below. Whilst the geographic scope of the Outline Study is limited to growth within South Holland, South Kesteven and Rutland, the wider area will be considered where it has the capacity to impact on growth within the study area. The town of Grantham was the subject of a separate WCS, carried out by Atkins in 2010[5], and will therefore not be included in this study. Stamford and Deeping WwTWs, which lie to the south of the South Kesteven District, were included within the Peterborough WCS[6], carried out by Hyder in 2010, which will therefore be cross-referenced in this study.

Other large towns and settlements upstream of the study area will also be considered, as the large upstream catchments of the major watercourses within the study area mean that wastewater discharges and water supply demands from towns such as Peterborough and Leicester can impact upon South Holland, South Kesteven and Rutland.

The study area is largely served by AWS, with the exception of an area to the west of Rutland, which is supplied by STWL.

[5] South Kesteven District Council, Grantham Water Cycle Study, Stage 2b Detailed Study, Atkins, January 2010.
[6] Opportunity Peterborough, Peterborough Water Cycle Study, Detailed Study, Hyder, March 2010.

Figure 2-2: Study area



2.7 Key Constraints Assessment

The Key Constraints Assessment[7] represented the Scoping stage of the WCS, as shown above in Figure 2-1. The assessment was carried out on the 5 key 'water cycle' topic areas:

- water resources;
- wastewater treatment and transmission;
- ecology;
- flood risk; and
- surface water management and SuDS potential.

2.7.1 Methodology

Water resources

The assessment of water resources reviewed the Environment Agency's Catchment Abstraction Management Strategies (CAMS) and Anglian and Severn Trent Water's Water Resource Management Plans (WRMP). The CAMS document looks at the environmental capacity of the available water resources, by assessing the environmental impact of existing surface and groundwater abstractions and making a judgement as to whether further abstraction would be acceptable. The WRMPs extend the assessment to include the capacity of water treatment and transmission infrastructure to supply water of drinking water quality to the required locations. The WRMPs also give the water companies' proposals to increase available resources or provide sufficient efficiencies to meet future water resource demand. Including available water to be abstracted (CAMS) and available water to be supplied (WRMP).

Wastewater treatment and transmission

The wastewater assessment addressed two key areas for wastewater: the baseline with respect to treatment of wastewater and how much 'spare' capacity is available in existing wastewater treatment facilities; and, the baseline with respect to wastewater or sewer network and whether there is scope to use the existing and/or planned network system before upgrades are required.

Baseline capacity at the wastewater treatment works was assessed by comparing the consented Dry Weather Flow (DWF) with the measured DWF. Several of the wastewater treatment works (WwTW) serving the outlying settlements have new proposed DWF consents; these variations relate to the current flow at the works (and seasonal variations) and do not consider growth. These works can therefore be considered to be operating at their consented DWF limit and further variations will be required to treat additional flows from further development.

Ecology

Information regarding Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar Sites and Sites of Special Scientific Interest (SSSIs) was supplied by Natural England.

[7] South Holland, South Kesteven and Rutland Water Cycle Study Key Constraints Assessment, Scott Wilson 2010.

Information regarding locally designated sites, such as Local Nature Reserves (LNRs), was supplied by RCC, SKDC and the Lincolnshire Biodiversity Partnership on behalf of SHDC.

Designated sites which had the potential to be impacted upon by the proposed development, for example from increased abstraction or wastewater discharges, were then assessed and possible constraints to development from designated sites were identified.

Due to the combined nature of the study and the differences in designation of local wildlife sites between the three councils, it was decided in agreement with the three client authorities that the assessment of ecological impact would be limited to internationally (SACs, SPAs, Ramsar) and nationally (SSSIs) designated sites.

Flood risk

A review of the Environment Agency's flood mapping[8] and the SFRAs for each council demonstrated that there are large areas at risk of flooding, this is of particular concern in South Holland where there is a significant risk from tidal sources.

Surface water management and SuDS potential

The potential for the use of Sustainable Drainage Systems (SuDS) is largely dependent on the underlying geology. Where there are permeable soils, infiltration SuDS can be recommended, but where a sites lies over impermeable geology, such as clay, surface water run off will need to be discharged to a surface watercourse. Attenuation should therefore be applied to the discharge to prevent flood risk elsewhere being exacerbated by the new development, consultation with the Environment Agency and Internal Drainage Boards (IDBs) will be required to determine acceptable runoff rates.

For sites where infiltration SuDS may be appropriate, the following must be taken into account:

- there should be no direct discharge to groundwater from soakaways or infiltration systems and all infiltration structures (e.g. permeable pavements, infiltration trenches, soakaways) should be at a shallow a depth as possible to simulate natural attenuation;
- the base of the infiltration structures should be at least 1 m above the highest seasonal water-table;
- roof water down-pipes should be connected to the drainage system directly, via re-use devices such as water butts or by means of back inlet gullies provided with sealing plates and there should be no open gratings;
- drainage systems should be constructed in accordance with CIRIA C609[9] and C697[10]; and
- soakaways should not be located in potentially contaminated ground. This may require a site investigation on brownfield sites to determine suitable locations for soakaways to ensure that soakaways do not increase the risk posed to groundwater.

2.7.2 Conclusions

The outcome of the key constraints assessment was the formulation of a constraints matrix for each of the identified areas. The matrix has been designed so that the amount of subjective

[8] www.environment-agency.gov.uk
[9] The Interim Code of Practice for Sustainable Drainage Systems, National SuDS Working Group, July 2004.
[10] The SuDS manual, CIRIA, February 2007

interpretation of the data is minimised, and hence the traffic lights allocated are based on factual and quantitative data where possible. Constraints matrices were produced for the major settlements within the study area, which identified a number of issues for development.

The constraints assessment was presented to the Steering Group on the 24th June 2010. The conclusions of the constraints assessment and the comments of the Steering Group have been incorporated into this Outline Study.

3 Policy and Supporting Information

National, regional, sub-regional and local planning policy and guidance documents provide both requirements and guidance for delivering sustainable development. The following is a summary of the legislative, policy and guidance drivers which have informed and shaped the development of this WCS and its deliverables, and have been considered at all stages in the WCS process.

3.1 Legislation and Policy

3.1.1 International and National

Table 3-1: Water Related European and National Legislation, Policy and Guidance

Directive/Legislation/ Guidance	Description
Code for Sustainable Homes	The Code for Sustainable Homes has been introduced to drive a step-change in sustainable home building practice, providing a standard for key elements of design and construction which affect the sustainability of a new home. It will become the single national standard for sustainable homes, used by home designers and builders as a guide to development and by home-buyers to assist their choice of home. It will form the basis for future developments of the Building Regulations in relation to carbon emissions from, and energy use in homes, therefore offering greater regulatory certainty to developers. The Code sets out a minimum water demand per person as a requirement for different code levels. CLG is currently in consultation on proposals to make certain code levels mandatory for all new homes. At present, only affordable homes must reach a certain code.
Environment Act 1995	Sets out the role and responsibility of the Environment Agency.
Environmental Protection Act 1990	Integrated Pollution Control (IPC) system for emissions to air, land and water.
Future Water, February 2008	Sets the Government's vision for water in England to 2030. The strategy sets out an integrated approach to the sustainable management of all aspects of the water cycle, from rainfall and drainage, through to treatment and discharge, focusing on practical ways to achieve the vision to ensure sustainable use of water. The aim is to ensure sustainable delivery of water supplies, and help improve the water environment for future generations.
Groundwater Directive 80/68/EEC	To protect groundwater against pollution by 'List 1 and 2' Dangerous Substances.
Habitats Directive 92/44/EEC	To conserve the natural habitats and to conserve wild fauna and flora with the main aim to promote the maintenance of biodiversity taking account of social, economic, cultural and regional requirements. In relation to abstractions and discharges, can require changes to these through the Review of Consents (RoC) process if they are impacting on designated European Sites.
Making Space for Water, 2004	Outlines the Government's strategy for the next 20 years to implement a more holistic approach to managing flood and coastal erosion risks in England. The policy aims to reduce the threat of flooding to people and property, and to deliver the greatest environmental, social and economic benefit.
Planning Policy Statements and Planning Policy Guidance	Planning policy in the UK is set by Planning Policy Statements (PPSs). They explain statutory guidelines and advise local authorities and others on planning policy and operation of the planning system. PPSs also explain the relationship between planning policies and other policies

	which have an important bearing on issues of development and land use. These must be taken into account in preparing development plans. A WCS helps to balance the requirements of various planning policy documents, and ensure that land-use planning and water cycle infrastructure provision is sustainable. The most relevant PPSs to WCS are: PPS1 – Delivering Sustainable Development; PPS3 – Housing; PPS4 – Planning for Sustainable Economic Growth PPS9 – Biodiversity and Geological Conservation PPS12 – Local Development Frameworks; PPS23 – Planning and Pollution control; and PPS25 – Development and Flood Risk
Pollution Prevention and Control Act (PPCA) 1999	Implements the IPPC Directive. Replaces IPC with a Pollution Prevention and Control (PPC) system, which is similar but applies to a wider range of installations.
Water Act 2003	Implements changes to the water abstraction management system and to regulatory arrangements to make water use more sustainable.
Water Framework Directive (WFD) 2000/60/EC	The WFD was passed into UK law in 2003. The overall requirement of the directive is that all river basins must achieve 'good ecological status' by 2015, or by 2027 if there are grounds for derogation. The WFD, for the first time, combines water quantity and water quality issues together. An integrated approach to the management of all freshwater bodies, groundwaters, estuaries and coastal waters at the river basin level has been adopted. It effectively supersedes all water related legislation which drives the existing licensing and consenting framework in the UK. The Environment Agency is the body responsible for the implementation of the WFD in the UK. The Environment Agency have been supported by UKTAG[11], an advisory body which has proposed water quality, ecology, water abstraction and river flow standards to be adopted in order to ensure that water bodies in the UK (including groundwater) meet the required status[12]. These have recently been finalised and issued within the River Basin Management Plans (RBMP).
Water Resources Act 1991	Protection of the quantity and quality of water resources and aquatic habitats. Parts have been amended by the Water Act 2003.
Flood & Water Management Act 2010	The Flood and Water Management Act 2010 is the outcome of a thorough review of the responsibilities of regulators, local authorities, water companies and other stakeholders in the management of flood risk and the water industry in the UK. The Pitt Review of the 2007 flood was a major driver in the forming of the legislation. Its key features relevant to this WCS are: • To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods. • To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments. • To widen the list of uses of water that water companies can control during periods of water shortage, and enable Government to add to and remove uses from the list. • To enable water and sewerage companies to operate concessionary

[11] The UKTAG (UK Technical Advisory Group) is a working group of experts drawn from environment and conservation agencies. It was formed to provide technical advice to the UK's government administrations and its own member agencies. The UKTAG also includes representatives from the Republic of Ireland.
[12] UK Environmental Standards and Conditions (Phase I) Final Report, April 2008. UK Technical Advisory Group on the Water Framework Directive.

	schemes for community groups on surface water drainage charges. • To make it easier for water and sewerage companies to develop and implement social tariffs where companies consider there is a good cause to do so, and in light of guidance that will be issued by the SoS following a full public consultation.

River Basin Management Plans

Implementation of the WFD is carried out through a process of River Basin Management Planning, which is coordinated by the Environment Agency. Plans are developed for each waterbody within a River Basin. The first draft River Basin Management Plans (RBMP) for England and Wales were published by the Environment Agency in December 2008 and finalised in 2010. South Holland, South Kesteven and Rutland lie within the Anglian River Basin District. The RBMP[13] identifies the following key issues for water quality in the district:

- point source pollution from WwTW treatment works;
- the physical modification of water bodies;
- diffuse pollution from agricultural activities;
- water abstraction; and
- diffuse pollution from urban sources.

In the Anglian River Basin District, 18 per cent of surface waters meet good status or better; 82 per cent do not meet good status (681 water bodies). 65 per cent of groundwater bodies are at good status with the rest being poor status. The majority of surface water bodies that fail to meet good status fail because of the Phosphate, Fish and Invertebrate elements of classification. The implications of these classifications for the watercourses within the study area are discussed further below in sections 5.5 and 5.5.

3.1.2 Regional

Regional Spatial Strategy for the East Midlands (revoked)[14]

The RSS for the East Midlands was published in March 2009 and set targets to guide the scale and location of growth within South Holland, South Kesteven and Rutland up to 2026. It should be noted that as of the 6th July 2010, the Secretary of State for Communities and Local Government announced the revocation of Regional Strategies with immediate effect[15]. Regional Strategies are being revoked under s79(6) of the Local Democracy Economic Development and Construction Act 2009 and will thus no longer form part of the development plan for the purposes of s38(6) of the Planning and Compulsory Purchase Act 2004. However, in the absence of a replacement for the RSS, the previous housing figures will be used for the purposes of this study for the South Holland District.

The Government announced the immediate revocation of Regional Strategies on the 6th July 2010 under section 79(6) of the Local Democracy, Economic Development and Construction Act 2009. Accordingly, they no longer form part of the statutory Development Plan for the

[13] http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/humber/Intro.aspx
[14] http://www.gos.gov.uk/497296/docs/229865/East_Midlands_Regional_Plan2.pdf
[15] http://www.communities.gov.uk/documents/planningandbuilding/pdf/1631904.pdf

purposes of Section 38(6) of the Planning and Compulsory Purchase Act 2004. All references to Regional Strategies in other Policy Statements are no longer valid. Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) will continue to apply until they are replaced by the National Planning Framework.

3.1.3 Local

Local Development Frameworks

South Holland District Council

Due to the above revocation of the Regional Strategies, SHDC's statutory Development Plan for the District now consists of the saved policies in the South Holland Local Plan 2006. This will be replaced by the Local Development Framework (LDF) in due course.

The LDF will be made up of a number of important documents, including:

- Local Development Scheme (LDS) - project plan setting out what new documents will be produced and when;
- Statement of Community Involvement (SCI) - Document setting out how and when the Council intends to consult with the community;
- Development Plan Documents (DPDs) - Documents that set out the planning policies to guide and control development in the District;
- Supplementary Planning Documents (SPDs) - Documents that provide further and additional information on a policy or policies held within a DPD; and
- Annual Monitoring Report (AMR) - Document that assesses the implementation of the LDS and the extent to which policies are being achieved.

SHDC's housing allocations are dependent on the outcome of the Coastal Strategy, which was requested by the Inspector following an Examination in Public (EiP) of a previous iteration of the RSS. The Coastal Strategy was requested due to the large areas of tidal flood zone that exist within the District and aims to provide policy guidance on development within the vulnerable coastal zone, taking into consideration the effects of climate change and sea level rise.

South Holland and Boston Councils are in the latter stages of discussions related to the production of a joint LDF. Boston has already completed a 'pre-outline' WCS and there is scope in the future for any detailed study commissioned to cover both local authority areas building on work already completed.

South Kesteven District Council

SKDC is currently preparing its LDF, the folder of documents which will set out the Councils planning policy framework to 2026. The Core Strategy is the key document in the LDF which sets out the overall vision and objectives and spatial strategy for the district. The Core Strategy was adopted in July 2010.

In addition to the Core Strategy the LDF will comprise a Grantham Area Action plan (GAAP) and a Site Allocation and Policies DPD which will identify sites for development and detailed policies to support the Core Strategy policies. These documents are currently being prepared.

The Water Cycle study will inform the detailed policies and site allocations to be included within them.

Rutland County Council

RCC is currently preparing its LDF, the folder of documents that will set out the Council's planning policies to 2026 and eventually replace the existing Rutland Local Plan. The Core Strategy Development Plan Document is the key document in the LDF which sets out the overall vision, objectives and spatial strategy for Rutland. Following consultation on preferred options in May- June 2010, the Council is seeking comments on the final version of the Core Strategy which is being submitted for public examination.

The consultation on the Core Strategy Proposed Submissions DPD ran until the 23rd September 2010. A "Call for sites" consultation also ran until 30th September 2010. This is the initial stage in the preparation of the Council's Site Allocations and Development Control Polices DPD.

Water Industry Funding

AWS and STWL are appointed as the water and sewerage undertakers for the study area through an appointment made under the Water Industry Act 1991[16]. The principal duties of water and sewerage undertakers are set out in that legislation. Section 37 of that Act places a duty upon a water undertaker to develop and maintain an efficient and economical system of water supply within its area. Similarly Section 94 places a duty upon a sewerage undertaker to provide, improve and extend a system of public sewers to ensure that its area is effectually drained and the contents of those sewers effectually dealt with.

Regulation

The Water Services Regulation Authority (Ofwat) is the economic regulator of water and sewerage companies in England and Wales.

For every five year asset management planning (AMP) cycle, companies submit a business plan to Ofwat. The plans set out each company's view of what it needs to do to maintain its assets, improve services to customers, provide for growth in its region and deal with its impact on the environment. Ofwat's decision on how much companies need to recover from customers through bills is expressed as price limits ('K factors').

Any major infrastructure requirements which arise after agreement of the five year AMP will normally be considered for the following AMP period. AMP5 will cover the period 2010 to 2015.

The water companies' Strategic Business Plans were submitted for the Price Review at the end of 2009 (PR09). OFWAT has determined the price limits from this PR09 (November 2009) and a review of the Final Business Plans has identified that there is over £2 billion to be spent during the period to March 2015 (i.e. AMP5) across the AWS area[17] and £2.4 billion across the STWL area[18]

Where significant water cycle infrastructure requirements are not included within PR09, funding cannot be sought until the next Price Review towards the end of AMP5 (PR14). Only in

[16] http://www.legislation.gov.uk/ukpga/1991/56/contents
[17] http://www.anglianwater.co.uk/news/general/9768FEF46C9541749367618E431BF588.aspx
[18] http://www.stwater.co.uk/server.php?show=ConWebDoc.3865

exceptional circumstances will Water Companies seek to deviate from their Water Resource Management Plan and submit an interim determination within the 5 year AMP cycle to provide funding for unforeseen investment requirements. However, these have significant cost implications and it is considered that infrastructure for planned development should be planned for in sufficient time to be included in the relevant Business Plan and Price Review.

Developer Contributions

When a developer wishes to proceed with a particular site, they may requisition the appropriate water company (or companies if separate for water and wastewater) to provide infrastructure in accordance with the relevant provisions of the act (Section 98 for sewerage and Section 41 for water). The cost of this is shared between the developer and undertaker in accordance with the legislation.

For infrastructure serving more than one development site, the Water Industry Act assumes that the first developer will pay the majority of the costs. In most cases, however, it will be preferable to share costs equitably between developers. This will need to be facilitated through the planning system.

Developers also pay an "infrastructure charge" to the water company to cover the cost of general improvements which cannot be allocated to a specific site. If the developer provides new infrastructure all the way to the treatment works, then this may be waived or taken into account in calculating other contributions.

Separate provisions exist for industrial customers.

Water Resource Planning

Water companies produce Water Resource Management Plans (WRMP) on a statutory basis covering 25 year planning horizons. WRMPs set out how a water company plans to provide and invest in existing and new water resource schemes (e.g. reservoirs, desalination) to meet increases in demand for potable supply, as a result of new development, population growth and climate change over the next 25 year period. The statutory WRMPs will be updated in 5 yearly cycles to coincide with the PR and AMP process. AWS's current WRMP[19] was finalised in March 2010 and has been used in this WCS.

STWL's WRMP[20] was published in draft for public consultation on the 7th May 2008, with a deadline for comments to be received by 29 July 2008. Due to the nature of comments received in response to the consultation, significant changes were made to the draft WRMP, with the final Plan published in June 2010.

Internal Drainage Board Policies

It was agreed at the start of the project that while it was not necessary to include Internal Drainage Boards (IDBs) on the Steering Group, it was very important that they were consulted to ensure that any issues and concerns were addressed by the WCS. The following IDBs were therefore consulted and their policies taken into account when carrying out the assessment:

- South Holland IDB;
- Upper Witham IDB;

[19] Anglian Water, Water Resource Management Plan, Main Report, February 2010.
[20] Severn Trent Water , Water Resources Management Plan, Final version, June 2010

- Black Sluice IDB;
- Welland and Deepings IDB;
- Witham First IDB;
- Kings Lynn IDB; and
- North Level IDB.

3.2 Guidance

The Environment Agency has issued a National Guidance (The Water Cycle Study Manual[21]) document to ensure that WCS are carried out in a consistent way. This guidance outlines the required approach for the Scoping, Outline and Detailed phases of water cycle studies and is intended to assist local authorities, developers and others involved in commissioning or carrying out a water cycle study. It provides non-prescriptive guidance on the purpose, scope and best-practice process for undertaking such studies, as it recognises that Water cycle studies need to be adapted to suit local conditions. The approach set out in the guidance forms current best practice and the basis for the methodology followed in this WCS.

3.3 Supporting Documents

In addition to the legislation and guidance set out in Table 3-1, the following studies and reports are relevant and, where available, have been used within the South Holland, South Kesteven and Rutland WCS:

- Water Cycle Studies for Grantham (Detailed[22]) and Peterborough; [23];
- South Holland District SFRA (2010)[24], South Kesteven District SFRA (2009)[25] and Rutland SFRA (2009)[26];
- The Nene Catchment Abstraction Management Strategy;[27]
- The Welland Catchment Abstraction Management Strategy;[28]
- The Witham Catchment Abstraction Management Strategy;[29]
- The Environment Agency Groundwater Protection Policy;[30]
- The Environment Agency's Review of Consent Process; and
- The SuDS Manual (Ciria C697).[31]

[21] http://publications.environment-agency.gov.uk/pdf/GEHO0109BPFF-e-e.pdf
[22] South Kesteven District Council, Grantham Water Cycle Study, Stage 2b Detailed Study, Atkins, January 2010
[23] Opportunity Peterborough, Peterborough Water Cycle Study, Detailed Study, Hyder, March 2010.
[24] South Holland District SFRA, Royal Haskoning, 2010
[25] South Kesteven District, SFRA, Entec, 2009
[26] Rutland County SFRA, Entec, 2009
[27] http://www.environment-agency.gov.uk/research/planning/33550.aspx
[28] http://www.environment-agency.gov.uk/research/planning/33550.aspx
[29] http://www.environment-agency.gov.uk/research/planning/33550.aspx
[30] http://publications.environment-agency.gov.uk/pdf/GEHO1006BLMW-e-e.pdf
[31] http://www.ciria.org/service/AM/ContentManagerNet/Default.aspx?template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=19&ContentID=10559&TPPID=4334&AspNetFlag=1&Section=content_by_themes

3.4 Data Summary

The undertaking of a Water Cycle Study requires a large amount of data collection, much of which is reliant on the willingness of third parties to supply in order to allow the study to be progressed. This study has requested where required; a catalogue of the data collected, identifying the data provider in each case, is included in Appendix B - Data Request.

4 Proposed Growth

4.1 Introduction

The districts of South Holland, South Kesteven and Rutland are expected to experience an increase in housing and employment provision over the period to 2026. The recently revoked Regional Spatial Strategy (RSS) for the East Midlands[32] states that the total housing provision from 2006 to 2026 for South Holland is 7,400, for South Kesteven is 13,600 and for Rutland is 3,000. In the absence of a replacement for the RSS, the previous housing figures will be used for South Holland District for the purposes of this study and reference will be made to 'RSS requirement'. South Kesteven District Council has an adopted Core Strategy, which has been used to determine growth scenarios

Three possible growth Scenarios have been calculated for the proposed growth in South Holland, South Kesteven and Rutland. The scenarios have been developed such that three levels of possible growth can be assessed in WCS ensuring that the full spectrum of possible growth is assessed for impact on the water cycle.

It should be noted that the settlements listed in Tables 4-1 to 4-3 below do not represent all the settlements in the study area where growth is proposed. Several of the smaller villages were excluded from the assessment, because the level of growth was not considered to be high enough to have a significant effect. In order to focus the assessment, only settlements that lie within WwTW catchments where proposed growth is greater than 50 dwellings have been assessed (if more than one settlement lies within a catchment the cumulative growth figure has been assessed). For this level of assessment, it is felt that a cut off of 50 houses is appropriate. For this reason the residual requirements listed in the three scenarios below are not wholly reflected in the overall totals in Fig 4.1.

The exception to this is the settlement of Ancaster, in South Kesteven, which has been included in the assessment despite only having a maximum growth level of 45 houses under Scenario 3.

4.2 South Holland

4.2.1 Housing

Scenario 1[33] represents the RSS requirement for housing growth between 2006 and 2026 (7,400 dwellings) minus dwellings completed between 2006 and 2010 (1608 dwellings), which gives a requirement over the study period of 5792 dwellings. This has been spread over scenario period, namely 2256 dwellings between 2010 and 2015, 2147 between 2015 and 2020 and 1395 dwellings between 2020 and 2026. These are spatially distributed as shown in Figure 4-1 below.

[32] http://www.gos.gov.uk/497296/docs/229865/East_Midlands_Regional_Plan2.pdf

[33] Please note, there are very small discrepancies between the above figures and those displayed below in Table 4-1 (6 houses in Scenario 1 and 8 houses in Scenarios 2 and 3). This was caused by rounding of figures during the calculation process but does not affect the overall assessment. In addition, the number given in table 4-1 the figures given in the table above represent the settlements that were assessed in this WCs and do not represent all the proposed growth within the South Holland district. As described above in paragraph 4.2.2, only WwTW catchments where proposed growth is greater than 50 dwellings have been assessed (if more than one settlement lies within a catchment the cumulative growth figure has been assessed).

Scenario 2 represents the uncapped RSS requirement[34] for housing growth between 2006 and 2026 (10,800 dwellings) minus dwellings completed between 2006 and 2010 (1608 dwellings), which gives a requirement over the study period of 9,192 dwellings. This has been spread over the scenario period, namely 3390 dwellings between 2010 and 2015, 3281 between 2015 and 2020 and 2529 dwellings between 2020 and 2026. These are spatially distributed as shown in Figure 4-1 below.

Scenario 3 represents RSS requirement[35] for housing growth between 2006 and 2026 (16,800 dwellings) minus dwellings completed between 2006 and 2010 (1608 dwellings) and minus the Boston RSS Review requirement of 2,700 dwellings, which gives a requirement over the study period of 12,492 dwellings. This has been spread over the scenario period, namely 4490 dwellings between 2010 and 2015, 4381 between 2015 and 2020 and 3629 dwellings between 2020 and 2026. These are spatially distributed as shown in Figure 4-1 below.

All of the above three scenarios include allocated sites and sites for which planning permission has been granted. These are all sites on which AWS has been consulted and those with planning permission have been included in AWS's forward planning; AWS therefore has a legal obligation to accept wastewater flows from these properties. However, this legal obligation does not ensure that there is sufficient capacity in the sewer network or at the WwTW(s) and the sites have therefore been included in this WCS assessment. This is a precautionary approach, which can lead to an element of 'double counting' for proposed growth, but it is felt that is an appropriate methodology to use.

4.2.2 Employment

One standard employment scenario has been used for each of the three housing scenarios. This represents 100 hectares of land to be allocated for employment, plus outstanding commitments. Employment land required will be evenly spread evenly over scenario period (every 5 years) and spatially distributed as follows:

- Spalding 80%;
- Holbeach 5%;
- Crowland 5%;
- Donington 5%; and
- other areas (no restrictions in relation to Flood Zones) 5%.

No information was available regarding the type of employment and assumptions have therefore not been made. In order to calculate the spread of jobs across the District across the planning period, the proportional split of land area has been applied to the target job figures.

Figure 4-1 below shows the settlements and growth figures used for the WCS assessment within South Holland District. It should be noted that some settlements were excluded from the assessment because no significant growth is planned to drain to the catchment, for example Sutton St James with 6 proposed houses or Tydd with 7 proposed houses and Deeping St Nicholas, which drains to Deeping St Nicholas Wren Close WwTW which has a descriptive consent, are not shown below. In order to focus the assessment, only WwTW catchments

[34] Figures given in the draft RSS, pre Examination in Public to approve the Final RSS documents.
[35] Figures given in the draft RSS, pre Examination in Public to approve the Final RSS documents.

where proposed growth is greater than 50 dwellings have been assessed (if more than one settlement lies within a catchment the cumulative growth figure has been assessed).

In addition, the 'Outside Coastal Zones' growth area, which has a proposed growth allocation of 108 new houses over the planning period has not been included in the table below. It has not been possible to assess this proposed growth, as the location of the growth is not specific enough to allow the wastewater catchment, flood risk zone or SuDS potential to be identified. Further assessment of the 'Outside Coastal Zones' growth area should therefore be carried out at a later date once the specific locations are known, although it is not thought that the relatively small housing figure would be likely to be a major issue if spread across a wide area.

Figure 4-1: Proposed total housing figures for South Holland the three growth scenarios (2006 to 2026)

Location	WwTW catchment	Scenario 1	Scenario 2	Scenario 3
Cowbit	Cowbit	7	7	7
Crowland (inc Postland)	Crowland	146	386	617
Donington	Donington	140	380	611
Fleet	Sutton Bridge	27	27	27
Gedney	Sutton Bridge	2	2	2
Gosberton	Gosberton	9	9	9
Holbeach	Holbeach	859	1,198	1,528
Long Sutton (inc Sutton Crosses)	Sutton Bridge	130	130	130
Moulton (inc Loosegate)	Moulton	12	12	12
Pinchbeck	Spalding	48	48	48
Spalding (inc Pode Hole)	Spalding	4,166	6,410	8,588
Surfleet	Spalding	1	1	1
Sutton Bridge	Sutton bridge	73	73	73
Weston (inc Wykeham)	Moulton	5	5	5
Whaplode (inc Saracens Head, Shepeau Stow)	Moulton	17	17	17

4.3 South Kesteven

4.3.1 Housing

Scenario 1[36] represents the Core Strategy requirement of 13,620 dwellings in total minus completions between 2006 and 2010, which gives a requirement over the study period of 681 dwellings per annum.

Scenario 2 has been calculated as for Scenario 1, but with an additional 10% growth in addition to the Core Strategy figures. This represents a total requirement of 14,982 dwellings over the study period, which is an annual completion rate of 750 dwellings. Scenario 3 has been calculated as for Scenario 1, but with an additional 20% growth in addition to the Core Strategy figures. This represents a total requirement of 16,344 dwellings over the study period, which is an annual completion rate of 818 dwellings.

4.3.2 Employment

As for the housing figures, employment Scenario 1 represents Core Strategy targets. This equates to a total of 205 hectares of employment land over the plan period 2010 to 2026, or 12.8 hectares per annum.

Scenario 2 has been calculated as for Scenario 1, but with an additional 10% growth in addition to the Core Strategy figures. This equates to a total of 224 hectares of employment land over the plan period 2010 to 2026, or 14 hectares per annum.

Scenario 2 has been calculated as for Scenario 1, but with an additional 20% growth in addition to the Core Strategy figures. This equates to a total of 242.4 hectares of employment land over the plan period 2010 to 2026, or 15.2 hectares per annum. All of the above will be phased evenly over the planning period.

No information was available regarding the type of employment and assumptions have therefore not been made. In order to calculate the spread of jobs across the District across the planning period, the proportional split of land area has been applied to the target job figures.

Figure 4-2 below shows the settlements and growth figures used for the WCS assessment within South Kesteven District.

Figure 4-2: Proposed total housing figures for South Kesteven the three growth scenarios (2006 to 2026)

Location	WwTW catchment	Scenario 1	Scenario 2	Scenario 3
Bourne	Bourne	1679	1803	2033
Deepings (Deeping St. James and Market Deeping)	Deeping	690	782	860

[36] Please note, there are very small discrepancies between the above figures and those displayed below in Table 4-2. This was caused by rounding of figures during the calculation process but does not affect the overall assessment. In addition, the number given in table 4-2 the figures given in the table above represent the settlements that were assessed in this WCs and do not represent all the proposed growth within the district. As described above, only WwTW catchments where proposed growth is greater than 50 dwellings have been assessed (if more than one settlement lies within a catchment the cumulative growth figure has been assessed).

Location	WwTW catchment	Scenario 1	Scenario 2	Scenario 3
Stamford	Great Casterton	814	936	1038
Ancaster	Ancaster	28	40	45
Barkston and Syston	Marston	44	53	68
Barrowby	Marston	25	28	40
Baston	Deeping	25	28	40
Billingborough and Horbling	Horbling	101	116	148
Castle Bytham	Little Bytham	50	50	50
Caythorpe	Caythorpe	80	80	80
Colsterworth	Colsterworth	104	105	111
Corby Glen	Corby Glen	31	44	48
Great Gonerby	Marston	68	76	79
Harlaxton	Harlaxton	25	36	32
Langtoft	Deeping	25	28	40
Long Bennington	Long Bennington	105	111	112
Morton	Bourne	32	44	48
South Witham	South Witham	32	45	48
Thurlby	Bourne	31	44	48

4.4 Rutland

4.4.1 Housing

Scenario 1[37] represents the Rutland Core Strategy Issues and Options Scenario for housing growth between 2006 and 2026 of 3,000 dwellings or 150 per annum, which minus dwellings completed between 2006 and 2010 (523 dwellings) giving a requirement over the study period of 2,477 dwellings. Removing the outstanding commitments (549 dwellings) from this total leaves the remaining Core Strategy requirement of 1,928 dwellings, which has been spread over scenario period, and which is spatially distributed as follows:

- 70% in Oakham and Uppingham (1350 dwellings) (80% Oakham- 1080 dwellings; 20% Uppingham- 270 dwellings);
- 20% in Local Service Centres (386 dwellings) (spread evenly across settlements: 14.3% Cottesmore- 56 dwellings; 14.3% Edith Weston- 56 dwellings; 14.3% Empingham- 56

[37] Please note, there are very small discrepancies between the above figures and those displayed below in Table 4-3. This was caused by rounding of figures during the calculation process but does not affect the overall assessment. In addition, the number given in table 4-3 the figures given in the table above represent the settlements that were assessed in this WCs and do not represent all the proposed growth within the county. As described above, only WwTW catchments where proposed growth is greater than 50 dwellings have been assessed (if more than one settlement lies within a catchment the cumulative growth figure has been assessed).

dwellings; 14.3% Greetham- 56 dwellings; 14.3% Ketton- 56 dwellings; 14.3% Market Overton- 56 dwellings; 14.3% Ryhall- 56 dwellings); and

- 10% in Smaller Service Centres and Restraint Villages (193 dwellings), spatial distribution unknown.

Scenario 2 is calculated as for Scenario 1, but the figures are 21% higher than the Core Strategy, which gives a requirement for housing growth between 2006 and 2026 of 2,720 dwellings or 170 per annum. If the figures for dwellings completed between 2006 and 2010 (549 dwellings) are removed, this leaves the remaining Core Strategy requirement of 2,171 dwellings, distributed as follows:

- 70% in Oakham and Uppingham (1520 dwellings) (80% Oakham- 1216 dwellings; 20% Uppingham- 304 dwellings);
- 20% in Local Service Centres (435 dwellings) (spread evenly across settlements: 14.3% Cottesmore- 63 dwellings; 14.3% Edith Weston- 63 dwellings; 14.3% Empingham- 63 dwellings; 14.3% Greetham- 63 dwellings; 14.3% Ketton- 63 dwellings; 14.3% Market Overton- 63 dwellings; 14.3% Ryhall- 63 dwellings); and
- 10% in Smaller Service Centres and Restraint Villages (218 dwellings), spatial distribution unknown.

Scenario 3 is 48% higher than Core Strategy figures and gives a housing growth between 2006 and 2026 of 3680 dwellings or 230 per annum. If the figures for dwellings completed between 2006 and 2010 (549 dwellings) are removed, this leaves the remaining Core Strategy requirement of 3,131 dwellings, distributed as follows:

- 70% in Oakham and Uppingham (2192 dwellings) (80% Oakham- 1753 dwellings; 20% Uppingham- 439 dwellings);
- 20% in Local Service Centres (627 dwellings) (spread evenly across settlements: 14.3% Cottesmore- 90 dwellings; 14.3% Edith Weston- 90 dwellings; 14.3% Empingham- 90 dwellings; 14.3% Greetham- 90 dwellings; 14.3% Ketton- 90 dwellings; 14.3% Market Overton- 90 dwellings; 14.3% Ryhall- 90 dwellings); and
- 10% in Smaller Service Centres and Restraint Villages (314 dwellings), spatial distribution unknown.

Scenarios 2 and 3 provide alternative scenarios of future housing growth that are substantially higher than those which are currently being planned for in order to demonstrate the potential implications of higher levels of growth.

4.4.2 Employment

Employment Scenario 1 represents the current site allocations, namely 2 hectares in Ketton, 12 hectares at Oakham Pillings Road and 2.1 hectares at Uppingham Gate, plus 5 hectares which corresponds to the projected delivery over scenario period 2010-26, to give a total of 21.1 hectares. This will be spatially distributed as follows:

- 80% in Oakham (4 hectares); and
- 20% in Uppingham (1 hectares).

Employment Scenario 2 is calculated as per Scenario 1 above, but with an additional 10.5 hectares over and above the current site allocations, to give a total of 26.6 hectares. This will be spatially distributed as follows:

- 80% in Oakham (8.4 hectares); and
- 20% in Uppingham (2.1 hectares).

Employment Scenario 3 is calculated as per Scenario 1 above, but with an additional 16 hectares over and above the current site allocations, to give a total of 32.1 hectares. This will be spatially distributed as follows:

- 80% in Oakham (12.8 hectares)
- 20% in Uppingham (3.2 hectares)

No information was available regarding the type of employment and assumptions have therefore not been made. In order to calculate the spread of jobs across the District across the planning period, the proportional split of land area has been applied to the target job figures.

Figure 4-2 below shows the settlements and growth figures used for the WCS assessment within Rutland. Please note, some settlements were excluded from the assessment because no significant growth is planned to drain to the catchment, for example Little Casterton and North Luffenham, which have 12 and 10 houses respectively, have not been included below. In order to focus the assessment, only WwTW catchments where proposed growth is greater than 50 dwellings have been assessed (if more than one settlement lies within a catchment the cumulative growth figure has been assessed).

Figure 4-3: Proposed total housing figures for Rutland the three growth scenarios (2006 to 2026)

Location	WwTW catchment	Scenario 1	Scenario 2	Scenario 3
Barleythorpe	Oakham	10	10	10
Cottesmore	Cottesmore	101	104	134
Edith Weston	Empingham	73	76	106
Empingham	Empingham	70	73	103
Greetham	Cottesmore	73	76	106
Ketton	Ketton	97	100	130
Langham	Langham	64	64	64
Little Casterton	Great Casterton	12	12	12
Market Overton	Market Overton	65	68	98
North Luffenham	North Luffenham	10	10	10
Oakham	Oakham	1294	1428	1964
Ryhall	Ryhall	70	73	103
Uppingham	Uppingham	327	360	497

5 Wastewater Strategy

5.1 Introduction

The wastewater assessment addresses two key areas for wastewater: the baseline with respect to treatment of wastewater and how much 'spare' capacity is available in existing WwTW; and, the baseline with respect to wastewater or sewer network and whether there is scope to use the existing and/or planned network system before upgrades are required.

An important aspect of the spare capacity of the existing wastewater treatment facilities is the assessment of the environmental capacity of the receiving watercourses. Discharge of additional treated wastewater from new development could have a detrimental impact on: the water quality of receiving waters; the hydrological/hydraulic regime of receiving waters and associated habitats; and, flood risk downstream of the discharge. In conjunction with the findings of the Flood Risk, Water Quality and Ecology constraints assessments the constraints of future wastewater treatment have been identified.

This section presents a summary of the methodology for, and the results of developing, the outline wastewater strategy.

5.2 Baseline

5.2.1 WwTW Capacity Assessment

There are numerous WwTW within the study area in the main due to the flat topography of the area, which results in it not being possible to drain catchments to a large, central treatment works. It has therefore been the policy of AWS, and the preceding water boards, to build numerous small works, which can drain small, discrete villages and catchments by gravity. To drain to larger works in rural areas would require large volumes of wastewater to be pumped over long distances, with the resulting energy demands making the process inefficient.

Several of the WwTW were excluded from the assessment, either because no significant growth is planned to drain to the catchment, or the WwTW is too small and does not have numeric values for its consented discharge (i.e. has a descriptive consent only). In order to focus the assessment, only WwTW catchments where proposed growth is greater than 50 dwellings have been assessed (if more than one settlement lies within a catchment the cumulative growth figure has been assessed). For this level of assessment, it is felt that a cut off of 50 houses is an appropriate level of detail as this does not represent a significant flow increase in a particular WwTW's catchment.

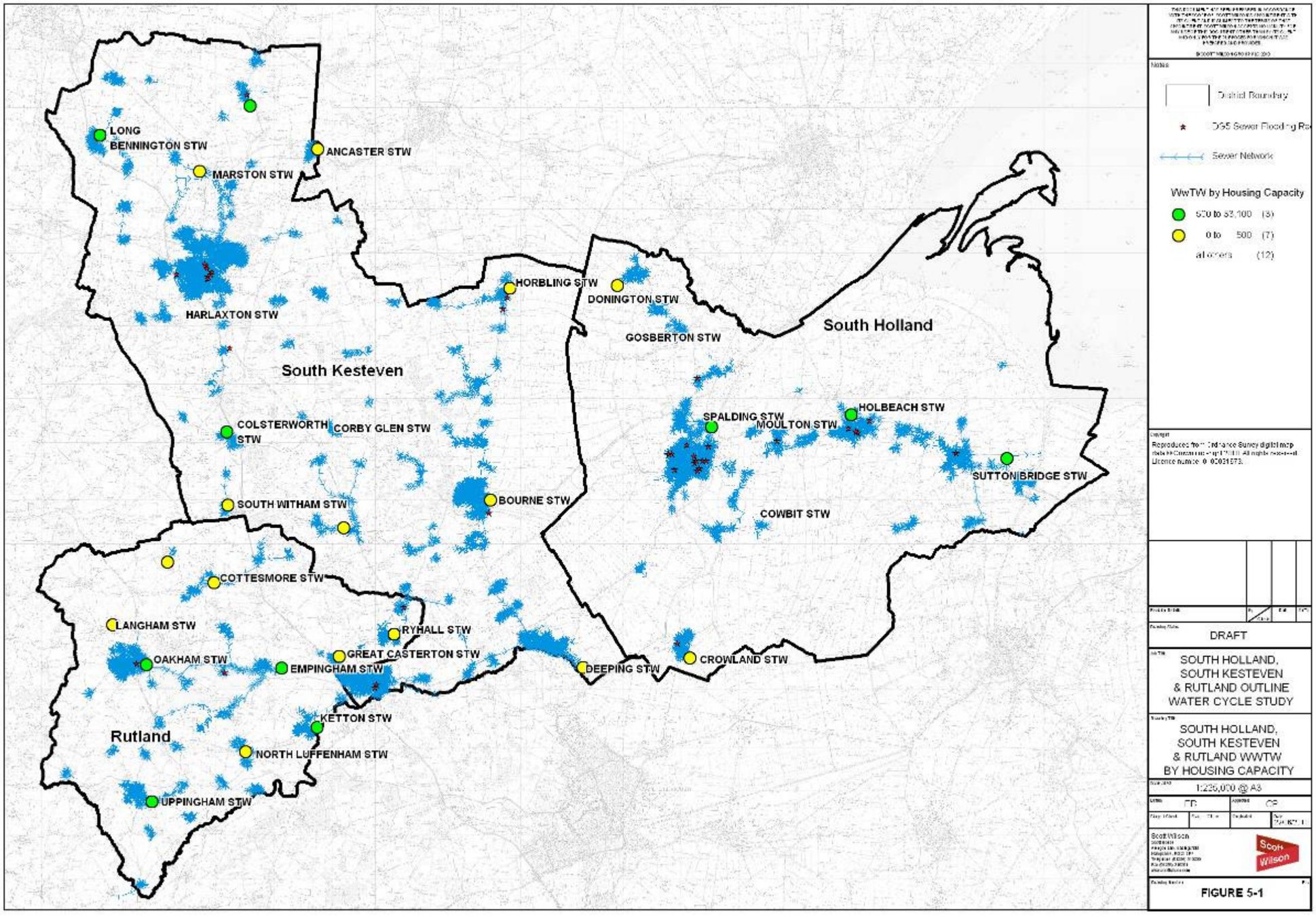
The WwTW shown below in Table 5-1 were taken forward for assessment within the WCS. The locations of these WwTW are shown in Figure 5-1.

Table 5-1: Wastewater treatment works to be assessed

Council	Treatment works	Current DWF consent (m^3/day)	Proposed DWF consent (m^3/day)	Measured flow (m^3/day)	TSS (mg/l) (95%ile)	BOD (mg/l) (95%ile)*	NH_4 (mg/l) (95%ile)
South Holland	CROWLAND WwTW	830	No Change	738	60	40	20
	DONINGTON WwTW	410	540	186	60	45	-
	HOLBEACH WwTW	1,910	No Change	1,196	60	40	-
	SPALDING WwTW	15,720	No Change	7,840	120	60	-
	SUTTON BRIDGE WwTW	3,247	No Change	1,340	230	230	-
South Kesteven	ANCASTER	190	No Change	107	35	25	15
	BOURNE WwTW	6,210	6,143	4,780	20	10	3
	COLSTERWORTH WwTW	360	No Change	183	40	25	10
	DEEPING WwTW	3,236	5,370	4,380	40	25	18
	LONG BENNINGTON WwTW	639	No Change	299	90	60	30
	HORBLING WwTW	500	878	610	40	15	15
	SOUTH WITHAM WwTW	285	372	184	50	30	-
	LITTLE BYTHAM WwTW	380	No Change	624	30	15	15
	CAYTHORPE WwTW	360	No Change	186	30	15	15
	MARSTON WwTW[38]	14,300	15,904	13,314	15	10	3
Rutland	COTTESMORE WwTW	1,100	1,422	1,187	15	10	5
	EMPINGHAM WwTW	700	No Change	86	40	20	5
	GREAT CASTERTON WwTW	115	No Change	69	60	40	12
	KETTON WwTW	620	No Change	231	100	50	-
	NORTH LUFFENHAM WwTW	399	447	262	35	17	8
	OAKHAM WwTW	2,962	No Change	1,288	60	40	20
	RYHALL WwTW	450	496	430	40	25	10
	UPPINGHAM WwTW	990	No Change	746	40	20	-
	LANGHAM WwTW	299	No Change	248	45	25	15
	MARKET OVERTON WwTW	143	No Change	74	45	25	15

[38] This figure includes the proposed development in Grantham, which is the subject of a separate ongoing WCS (South Kesteven District Council, Grantham Water Cycle Study, Stage 2b Detailed Study, Atkins, January 2010)

Figure 5-1: WwTW locations in South Holland, South Kesteven and Rutland



Proposed changes to Dry Weather Flow consent limits

DWF is a unit of measure, used by the Environment Agency in a discharge consent to describe the maximum volume that can be discharged from wastewater treatment works. Until recent changes were made to how DWF is measured and reported, DWF was defined as "the average daily flow of sewage during seven consecutive days without rain following seven days during which the rainfall did not exceed 0.25 mm on any one day, averaged over a summer and winter period". In industrial towns the seven days are replaced by five working days. Essentially it is supposed to represent the proportion of flow treated by a WwTW that is made up of foul (or waste) water and not surface water which is generated from rainfall events.

However, it is widely recognised that the previous definition of DWF had a number of shortcomings, including the lack of qualifying periods without rainfall across an entire sewerage catchment. A UKWIR project WW21/D to develop an alternative measure of DWF was carried out in 2006, which concluded that the measure of DWF that would be the most appropriate replacement for DWF was the 20th percentile (Q80)[39]. Subsequent to this, Environment Agency has accepted AWS using the 10^{th} percentile rather than the 20^{th} percentile as the measure of DWF at AWS WwTWs.

As a result of the redefinition of DWF and the installation of flow measurement at the majority of AWS's treatment works, discrepancies have been noted between consented and measured DWF values. To rectify these discrepancies, AWS applied to vary all discharge consents where there are measured flows higher than the consented DWF. These new DWF values are referred to as the Proposed Consent. Where a WwTW has a proposed consent this figure has been used in the assessment to represent the maximum flow that a WwTW is consented to discharge during dry weather and, the actual flow that it is currently discharging. Effectively, this means that there is no consented capacity at the WwTW to discharge any further flow without applying for a further increase in consented flow.

Where no consent variation has been applied for, the existing consented DWF has been used for the assessment. The Consented DWF values shown in Table 5-1 show proposed consented values where appropriate, or existing DWF values where no application for a variation has had to have been made. It should be noted that while the Environment Agency has approved all proposed consents in principle, no varied consents have been issued.

However for Bourne WwTW, the revised consent limit is 6210 m^3/d, which is not subject to the "no headroom for growth condition". The consent for Bourne revised for a different reason and the revised limit has taken account of the committed growth in the catchment. AWS has stated that it is therefore reasonably confident that there is sufficient headroom (current measured vs consent limit) for the planned growth so Bourne.

Other proposed changes to discharge consents

Key actions have been identified in the RBMPs to begin the process of ensuring that all waterbodies in the study area move towards achieving 'Good' status as required under the WFD.

In addition, schemes were proposed under the Environment Agency's National Environment Programme (NEP) for investigation into risk of chemical pollution at Corby WwTW and to meet

[39] An Improved Definition of Sewage Treatment Works Dry Weather Flow, Manuel Starr, 2006

the requirements of the UWWTD at Ketton WwTW. The NEP also proposed schemes to reduce the levels of Ammonia in rivers by targeting discharges from Uppingham WwTW and Holbeach WwTW. Uppingham STW will receive a 3 mg/l ammonia limit from 22nd Dec 2012.

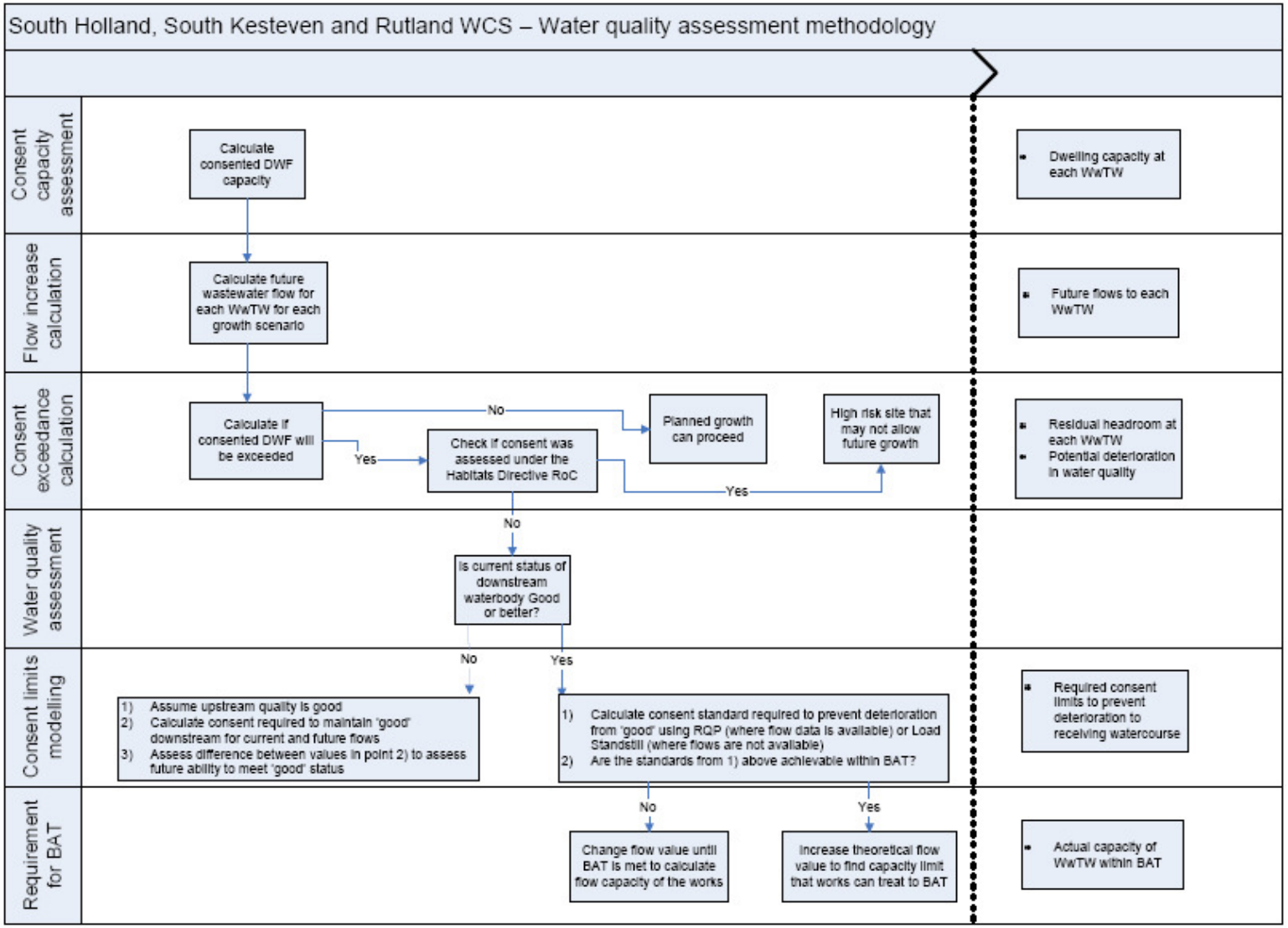
It should also be noted that there is a proposed First Time Rural Sewerage Scheme for Holbeach in AMP5, under s101 of the 1991 Water Industry Act[40]. If this scheme goes ahead, it could use up the majority of the spare capacity at Holbeach WwTW. It is not possible to fully assess the scheme at this point due to uncertainties as to whether the scheme will progress, but this should be taken into consideration during a Detailed WCS.

5.3 Capacity Assessment Methodology Overview

The assessment methodology for this WCS is based on that given in the Environment Agency's document 'No deterioration and growth', issued as draft in December 2009[41]. Although only draft, it is felt that this document gives the best available methodology to assess the impacts of growth on WFD targets and statuses and it has therefore been used as the basis of the following assessment methodology. A summary process diagram is provided in Figure 5-2.

[40] Water Industry Act 1991, HMSO, http://www.legislation.gov.uk/ukpga/1991/56/contents
[41] No deterioration and growth, Environment Agency, 15th December 2009, DRAFT

Figure 5-2: Diagrammatic representation of the water quality assessment methodology



5.4 Wastewater Treatment Capacity Assessment

5.4.1 Calculated consented volumetric capacity

Of the WwTW assessed, AWS have applied for an increase in consented DWF (new proposed consent) for the following WwTWs which are therefore deemed to have no capacity in their consented DWF for any further discharge:

- Cottesmore, North Luffenham, Ryhall, Deeping, Horbling, South Witham, Marston and Little Bytham WwTWs[42].

The following WwTW had less than 20% variation between their measured and calculated flows and the consent capacity to be able to treat further wastewater flow can therefore be calculated as the difference between the measured and consented DWF:

- Great Casterton, Uppingham, Crowland, Spalding, Bourne, Deeping, Horbling, Marston, Caythorpe, Langham and Market Overton WwTWs.

The remaining WwTW had greater than 20% variation between their measured and calculated flows and the consent capacity was therefore calculated as the difference between the calculated and consented DWF:

- Empingham, Ketton, Oakham, Donington, Holbeach, Sutton Bridge, Colsterworth and Long Bennington WwTWs.

The calculations of volumetric flow capacity are presented in Table 5-2; the household figures have been rounded to the nearest 50.

[42] The recent consent variation for Bourne was carried out for a different reason and it should therefore not be considered to have no capacity as a result of this.

Table 5-2: Calculated DWF capacity at assessed works

Treatment works	Current DWF consent	Proposed DWF consent	Measured flow	Calculated flow	Difference between measured and calculated flows (as % of measured)	Current DWF capacity (m3/day)	WF capacity (households)
COTTESMORE WwTW	1,100	1,422	1,187	1,187	0	0	0
EMPINGHAM WwTW	700	No Change	86	410	-377	614	2,339
GREAT CASTERTON WwTW	115	No Change	69	69	0	46	174
KETTON WwTW	620	No Change	231	382	-65	389	1,482
NORTH LUFFENHAM WwTW	399	447	262	262	0	0	0
OAKHAM WwTW	2,962	No Change	1,288	2,207	-71	1,674	6,379
RYHALL WwTW	450	496	430	430	0	0	0
UPPINGHAM WwTW	990	No Change	746	746	0	244	928
CROWLAND WwTW	830	No Change	738	738	0	92	349
DONINGTON WwTW	410	540	186	467	-151	0	0
HOLBEACH WwTW	1,910	No Change	1,196	1,544	-29	366	1,393
SPALDING WwTW	15,720	No Change	7,840	7,840	0	7,880	30,019
SUTTON BRIDGE WwTW	3,247	No Change	1,340	2,935	-119	1,907	7,265
BOURNE WwTW	6,210	6,143	4,780	4,780	0	1,430	5,448
COLSTERWORTH WwTW	360	No Change	183	275	-50	177	674
DEEPING WwTW	3,236	5,370	4,380	4,380	0	0	0
LONG BENNINGTON WwTW	639	No Change	299	463	-55	340	1,295
HORBLING WwTW	500	878	610	610	0	0	0
SOUTH WITHAM WwTW	285	372	184	331	-80	0	0
MARSTON WwTW	14,300	15,904	13,314	13,314	0	0	0
LITTLE BYTHAM WwTW	380	1,189	624	624	0	0	0
CAYTHORPE WwTW	360	No change	186	186	0	174	663
LANGHAM WwTW	299	No Change	248	-	-	51	194
MARKET OVERTON WwTW	143	No Change	74	-	-	69	263
ANCASTER WwTW	190	No Change	107	-	-	83	315

5.4.2 Calculated future flow to each works for each of the growth scenarios

The growth scenarios are presented above in Section 3. For each housing and employment scenario, additional wastewater generated in each wastewater catchment has been calculated using the following assumptions:

- an occupancy rate of 2.1[43] for all new dwellings;
- a per capita water consumption figure of 125 litres[44] per day; and
- an assumed average per job use of 15 litres per job[45].

The values for 'post growth' wastewater flow are provided below in Table 5-3.

Table 5-3: Calculated future flow and capacity at treatment works

Treatment works	Scenario 1 Housing allocation		Scenario 2 Housing allocation		Scenario 3 Housing allocation	
	Post growth flow (m3/d)	Capacity post growth (m3/d)	Post growth flow (m3/d)	Capacity post growth (m3/d)	Post growth flow (m3/d)	Capacity post growth (m3/d)
COTTESMORE WwTW	1,468	-46	1,469	-47	1,485	-63
EMPINGHAM WwTW	448	252	449	251	439	261
GREAT CASTERTON WwTW	281	-166	298	-183	312	-197
KETTON WwTW	408	212	408	171	416	204
NORTH LUFFENHAM WwTW	449	-3	449	-3	449	-3
OAKHAM WwTW	2,552	410	2,582	380	2,722	240
RYHALL WwTW	514	-18	515	-19	523	-27
UPPINGHAM WwTW	827	213	841	149	877	113
CROWLAND WwTW	777	53	840	-10	900	-70
DONINGTON WwTW	577	-37	640	-100	700	-160
HOLBEACH WwTW	1,776	134	1,865	45	1,952	-42
SPALDING WwTW	8,973	6,747	9,561	6,159	10,134	5,586
SUTTON BRIDGE WwTW	2,988	259	2,988	259	2,988	259
BOURNE WwTW	5,234	976	5,234	976	5,234	976
COLSTERWORTH WwTW	298	62	298	62	298	62
DEEPING WwTW	5,560	-190	5,568	-198	5,581	-210
LONG BENNINGTON	488	151	488	151	488	151

[43] A standard assumed occupancy rate, as agreed with AWS for previous WCS.
[44] Taken as the Building Regulations minimum for new homes plus 5 litres for garden watering
[45] A standard assumed consumption figure, as agreed with AWS for previous WCS. The employment figures have been converted into residential population equivalents, by using the relative water use figures.

Treatment works	Scenario 1 Housing allocation		Scenario 2 Housing allocation		Scenario 3 Housing allocation	
WwTW						
HORBLING WwTW	891	-13	891	-13	891	-13
SOUTH WITHAM WwTW	379	-7	379	-7	379	-7
MARSTON WwTW	17,684	-1,781	17,826	-1,922	17,966	-2,062
LITTLE BYTHAM WwTW	1,202	-13	1,202	-13	1,202	-13
CAYTHORPE WwTW	207	153	207	153	207	153
LANGHAM WwTW	265	34	265	34	265	34
MARKET OVERTON WwTW	91	52	91	52	91	52
ANCASTER WwTW	114	76	118	73	119	71

Where the analysis indicates that there is sufficient consented volumetric capacity, the flow generated as a result of growth can be accommodated for that catchment within the limits of the WwTW's current consent conditions.

The current consents for all WwTW are assessed by the Environment Agency each AMP period, and hence, unless the Environment Agency have highlighted that consent conditions need to change in order to meet the requirements of the WFD, Habitats Directive or another local driver, then the assumption used in this assessment is that the consent is considered to be fully usable (up to its maximum) without affecting the ability of the downstream waterbody to meet its statutory water quality standards.

Despite this, the analysis shows that there are 12 WwTW where the volumetric capacity will be exceeded, namely:

- Cottesmore, Great Casterton, North Luffenham, Ryhall, Crowland, Donington, Holbeach, Deeping, Horbling, South Witham, Marston and Little Bytham.

These WwTW will need to have applications for an increase in DWF consent in order to accommodate all the planned growth and as a result, an assessment must therefore be undertaken to determine whether the increase in flow would lead to deterioration in downstream water quality or impact on ecological designations. Any proposed future increases in flows from STWs will also need to take into account the downstream waterbody's WFD classification. See section 5.4.14 below for this assessment.

The volumetric capacity results are displayed geographically per catchment for each growth scenario in the following figures, so that the implications on spatial growth can be more easily determined for each of the growth scenarios. A current baseline figure is represented for each district to show that, even without growth, several of the WwTW have existing capacity issues as a result of the change in how DWF is calculated/measured (i.e. WwTW with new 'proposed consents').

5.4.3 Proposed future consent limits

In order to meet the requirements of the WFD, discharge consent standards are calculated to ensure that the downstream water quality achieves or maintains Good status. If the RBMP

indicates that the current status is Moderate or worse, then the assessment should be aiming to show what the WwTW needs to achieve in order to enable the watercourse to meet 'Good' Status as defined in the WFD.

In order to determine appropriate consent limits to meet these conditions, a combination of Mass Balance calculations (using the Environment Agency River Quality Planning [RQP] tool) and Load Standstill calculation have been used to assess the required consent standards for the affected WwTW.

The consent standards will be determined using RQP Mass Balance calculations where upstream river flow data are available or Load Standstill Calculations where no upstream river flow data are available. For those works where the flow or water quality sampling points are either downstream or at some distance upstream, both RQP and Load Standstill Calculations will be carried out, to provide a quality check on the suggested consent limits obtained.

The modelling was undertaken to determine what quality conditions (or consent standards) would need to be applied to the discharges to ensure no deterioration in water quality downstream and hence meet WFD standards and ecological requirements downstream. This is to determine whether a feasible solution to increase the discharge at the existing WwTW is available, and whether this is achievable within the limits of conventional wastewater treatment technology[46]. Modelling has been undertaken for the key discharge parameters of Ammonia (NH_4), Biochemical Oxygen Demand (BOD) and Phosphorus (P).

If the consent standards are not achievable within the limits of conventional wastewater treatment technology, the increased flow that the WwTW can accommodate is calculated. If the consent limits can be achieved within the limits of conventional wastewater treatment technology, the maximum additional flow which the works can accommodate is calculated, to assess the number of new dwellings that can be connected to a particular WwTW.

Using the guidance set out in the Environment Agency's draft No Deterioration document[47], Good status has been used as the target status for all WwTW. A summary is given in Table 5-4. The consent limits in italics were obtained from the RQP method; all of the others were obtained from the load standstill method.

[46] i.e. The limit of conventional wastewater treatment technology is currently considered to be the at the following limits for the following determinands 5 mg/l BOD, 1 mg/l NH4 and 1 mg/l P

[47] No deterioration and growth, Environment Agency, 15th December 2009, DRAFT

Table 5-4: Summary of modelling results & suggested DWF, BOD, NH_4 and P consent limits

Treatment works	Development scenario	Flow	Suggested BOD limit (mg/l as 95%ile)	Suggested NH_4 limit (mg/l as 95%ile)	Suggested P limit (mg/l as 95%ile)
Cottesmore WwTW	1	1,485	9	4	1
	2	1,487	9	4	1
	3	1,511	9	4	1
Great Casterton WwTW	1	286	16	5	1
	2	318	15	4	1
	3	345	14	4	1
North Luffenham WwTW	1	449	16	8	2
	2	449	16	8	2
	3	449	16	8	2
Ryhall WwTW	1	514	24	9	1
	2	515	24	9	1
	3	523	23	9	2
Crowland WwTW	1	776	42	21	2
	2	839	39	19	2
	3	900	36	18	2
Donington WwTW	1	567	42	9	2
	2	630	38	8	1
	3	690	34	7	1
Deeping WwTW	1	5,558	24	*11*	1
	2	5,583	24	*11*	1
	3	5,606	23	*11*	1
Horbling WwTW	1	898	14	14	2
	2	900	14	14	2
	3	1,875	7	7	1
South Witham WwTW	1	381	29	9	2
	2	384	29	9	1
	3	385	29	9	1
Marston WwTW	1	17,699	*5*	*1*	1
	2	17,910	*5*	*1*	1
	3	18,125	*5*	*1*	1
Holbeach WwTW	1	1,774	42	10	2
	2	2,437	40	10	2
	3	2,438	39	9	2
Little Bytham WwTW	1	1,202	11	11	1*
	2	1,202	11	11	1*
	3	1,202	11	11	1*

*No current consent limit

The table above indicates that, with the exception of Marston, all of the improvements are technically feasible within the limits of conventional treatment, which is currently considered by AWS to be 8 mg/l for BOD, 1 mg/l for NH4 and 1 mg/l for P, and that with upgrades at certain WwTW, the additional flow could be treated to a higher quality and still ensure downstream compliance with water quality and protection of ecological sites. Further water quality modelling, in conjunction with discussions with the Environment Agency, should be carried out for Marston WwTW. More detailed assessment may allow the proposed consent limits to be relaxed.

5.5 Environmental and Ecological Impact

It was decided, in consultation with the three client authorities, that due to the differences in assessment and designation of local wildlife sites (which are designated at the local authority level), that it would be impractical and inconsistent to assess these in this WCS. Therefore only sites which are designated at a national or international level have been considered.

5.5.1 Internationally designated sites

The Wash SPA/Ramsar site and The Wash & North Norfolk Coast SAC

An analysis of WwTW capacity within South Holland, South Kesteven and Rutland showed that there are 12 WwTW where the volumetric capacity will be exceeded, namely: Cottesmore, Great Casterton, North Luffenham, Ryhall, Crowland, Donington, Holbeach, Deeping, Horbling, South Witham, Marston and Little Bytham. Five of these WwTW's lie in Rutland, with a further three in South Holland and two in South Kesteven. See Figure 5-1.

As such it will be necessary to apply for an increase in the consented discharge volume for each of these works to meet the housing levels to be delivered within the study area. All of these WwTWs discharge to watercourses that ultimately drain (via the Witham, Nene or Welland) into The Wash SPA/Ramsar site and Wash & North Norfolk Coast SAC.

Studies indicate that The Wash is a P-limited system with a N:P ratio of >10 and that freshwater species predominate in The Wash estuaries. Natural England in its Regulation 33 advice for the site indicated that most features are moderately sensitive to nutrient enrichment, but only intertidal sand and mud are moderately vulnerable. There are no highly vulnerable features.

However, the Environment Agency Review of Consents (RoC) process undertaken for The Wash SPA and Wash & North Norfolk Coast SAC concluded that while the features of the Wash are generally sensitive to eutrophication and The Wash can be classed as a hypernutrified system, it is not currently eutrophic. According to the RoC report, marine influences rather than fluvial inputs and discharges dominate nutrient dynamics in the system; estimates indicate that the vast proportion of the nutrient flux (in excess of 99 %) occurs across the seaward boundary, due to the extent of the bay closing line and the large tidal volumes involved. Despite the high marine nutrient input, the high turbidity, tidal range and flushing rates appear to prevent serious biological response to nutrient enrichment. In addition, the RoC concluded that although fluvial nutrient inputs have been high, patterns/temporal trends have been stable for over 25 years (and more recently are in decline due to the Urban Wastewater Treatment Directive). Moreover, the marine environment is very turbid with limited light availability, which limits the build up of algae. As such, there is no evidence that hypernutrification and seasonally high production of algae in the tidal freshwaters or brackish

waters of the estuaries is adversely affecting the ecological functioning of The Wash system and thereby having any undesirable disturbance to the balance of organisms and deterioration of water quality.

The RoC report concludes that not only is the Wash not currently eutrophic, but *'An assessment of trends in nutrient loading and modelling of future risks does not suggest that these waters were at risk of becoming eutrophic'*. On this basis the report seemed to be indicating that while the interest features of the European site(s) have a sensitivity to eutrophication, there are inherent factors within the Wash system that prevents eutrophication (particularly due to fluvial inputs as these have a much less significant role than marine nutrient inputs in the overall nutrient status of The Wash). Due to these inherent limiting factors, it can be concluded that the small increase in fluvial nutrient inputs that would be associated with the proposed growth in South Holland, South Kesteven and Rutland would be unlikely to have an adverse effect, even when considered 'in combination'.

It can therefore be concluded that any increase in these consented discharge volumes would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC and as such no further studies are required as part of the detailed Water Cycle Study.

Rutland Water SPA & Ramsar site

Rutland Water a drinking water storage reservoir, which is heavily managed by AWS who balances abstraction and replenishment to ensure a continued water supply to customers across the region. The natural upstream catchment is small with minimal inputs from the River Gwash and the Egleton Brook. However, the catchment is artificially enlarged by pumped inputs from the River Welland and River Nene. Assessment of the water quality in Rutland Water therefore has to include the quality and influences in the catchments of the Welland and Nene upstream of the abstraction points combined with the immediate catchment of the reservoir itself.

From 1993, a project to control levels of nutrients and prevent eutrophication of rivers and standing waters was implemented on WwTW on the rivers Nene and Welland and on Oakham WwTW that discharges into Rutland Water. The River Welland, River Nene and Rutland Water are all designated Sensitive Areas UWWTD and as such, any large (over 10,000 population equivalent) WwTW discharging to the watercourse/reservoir can be targeted reduce nutrient outputs. Six WwTWs upstream of Rutland Water have progressively brought nutrient stripping online since 1998, which has resulted in a reduction in P levels in Rutland Water[48].

The Appropriate Assessment carried out as part of the Habitats Directive Review of Consents concluded that there are no Water Quality Consents which have been shown to have an adverse affect on Rutland Water SPA, even under worst case scenarios in combination with other potentially significant influences on the site.

The effects of increased surface water run-off on Rutland Water should also be considered, once the individual development sites are known. However, it is thought at this point that there should be sufficient scope for the use of SuDS in new development to ensure adverse effects of increased surface water run-off can be mitigated.

Baston Fen SAC

[48] Rutland Water Appropriate Assessment, Environment Agency, 2008

Baston Fen SAC is a 2 km long drainage channel, The Counterdrain, running alongside Baston Fen. It contains high densities of Spined loach *Cobitis taenia*, and is an example of spined loach populations in the Welland catchment. The patchy cover from submerge plants provides excellent habitat for the species.

The SAC is described as being in Favourable condition[49] and it can therefore be assumed that it is not currently being adversely affected by wastewater discharges. There are no WwTW upstream of Surfleet Lows on the River Glen and the proposed growth will therefore not impact upon the SAC.

5.5.2 Nationally designated sites

SSSIs (other than those which are already covered by the international designations above)

There are two SSSIs in South Holland District; Cowbit Wash SSSI is designated for its archaeological interest features rather than ecological features, but the archaeological features are water dependent and the site is therefore dependent on groundwater levels and could be subject to impacts from the proposed development. However, no impacts on groundwater levels in the vicinity of Cowbit Wash SSSI are anticipated as a result of changes to the abstractions or wastewater discharges from the proposed development. Surfleet Lows SSSI is one of the few remaining wet alluvial meadows in Lincolnshire which has not been subjected to agricultural improvement. Meadows of this type are now rare throughout lowland Britain and Surfleet Lows displays a typical range of meadow plants is present as well as a number of species more characteristic of coastal locations. Surfleet Lows SSSI is current in Favourable condition and it can therefore be assumed that it is not currently being adversely affected by wastewater discharges. Surfleet lies within the catchment of Spalding WwTW, which discharges to the River Welland, whereas Surfleet Lows lies upstream of the discharge point, on the River Glen, a tributary of the Welland. There are no WwTW upstream of Surfleet Lows on the River Glen and the proposed growth will therefore not impact upon the SSSI.

Rutland has numerous SSSIs but (other than Rutland Water itself) only Empingham Marshy Meadows SSSI is particularly hydrologically sensitive and it is not connected with any WwTWs or public water supply abstraction points. There are several SSSIs in South Kesteven District but only three (Baston & Thurlby Fens, Langtoft Gravel Pits and Deeping Gravel Pits) are particularly hydrologically sensitive. Of these, only Baston & Thurlby Fens SSSI is connected with the fluvial regime, but this has already been considered above as part of Baston Fen SAC. Horbling Fen SSSI, as with Cowbit Fen, is designated for its archaeological interest features rather than water dependent ecological features and will therefore not be considered further as part of this WCS. Shacklewell Hollows SSSI contains a range of semi-natural plant communities which have developed along the valley of a small tributary of the River Gwash. The tributary itself is a clean-water stream which drains strata of the Jurassic Lincolnshire Limestones and Northampton sands[50].The SSSI lies immediately downstream of Empingham WwTW, which could receive additional flows as a result of the proposed development. However, there is sufficient headroom within the consented DWF at the works to ensure increase will be required as a result of the proposed development.

Eyebrook Reservoir SSSI lies to the west of the study area, in Leicestershire. The site is a major wetland area which combines an extensive sheet of open water with a complex of

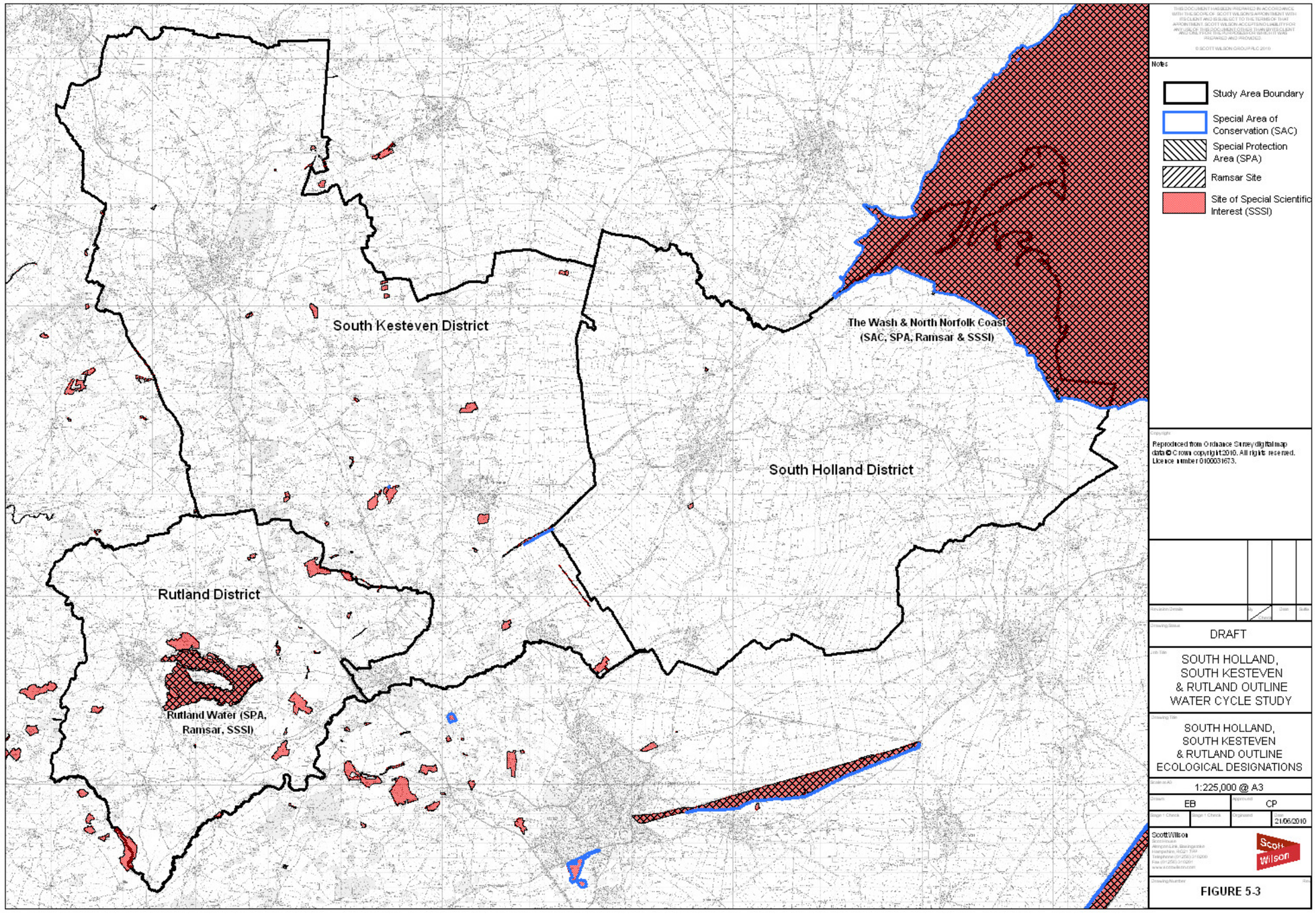
[49] http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0030085
[50] http://www.sssi.naturalengland.org.uk/citation/citation_photo/1001268.pdf

wetland and lakeside habitats including mudflats, marsh, pasture, broad-leaved woodland, and broad-leaved, mixed and coniferous plantations. In autumn and winter the site attracts large numbers of ducks most notably Wigeon, Mallard, Teal and Pochard, while in spring and autumn flocks of a wide variety of wading birds on passage use the area for feeding[51]. The site is heavily dependent on groundwater and could therefore be subject to impacts from the proposed development. However, no impacts on groundwater levels are anticipated as a result of the wastewater discharges from the proposed development.

Therefore, no further investigation of impacts on Sites of Special Scientific Interest should be required as part of the WCS. Figure 5-3 shows the location of designated conservation sites within the study area.

[51] http://www.sssi.naturalengland.org.uk/citation/citation_photo/1004428.pdf

Figure 5-3: Designated conservation sites within the study area



5.6 Wastewater Network Capacity Assessment

A high level assessment of the existing wastewater network has been undertaken to determine whether there is likely to be sufficient capacity in the system to transmit additional wastewater flows from new development to the relevant WwTW.

The study area is fairly flat and the majority of the wastewater networks rely on pumping stations to transfer flow to the treatment works. In addition, most of the drainage catchments have records of sewer flooding incidents as recorded in the DG5 register[52] to OFWAT (see Table 5-5 and Figure 5-1) suggesting that network capacity is limited in several locations.

Table 5-5: Catchment Settlement Areas with DG5 records of sewer flooding

Catchment[53]	Settlements within catchment	DG5 record[54]
Bourne	Bourne, Thurlby, Northorpe, Morton	✓
Cottesmore	Cottesmore, Market Overton, Greetham	✓
Crowland	Crowland, Postland	
Deeping	Deeping St James, Market Deeping, Langtoft	X
Donington	Donington	X
Empingham	Empingham, Edith Weston	✓
Great Casterton	Stamford, Little Casterton	✓
Holbeach	Fleet, Gedney, Gedney Hill, Holbeach	✓
Ketton	Ketton	X
Marston	Grantham, Barkston, Syston, Barrowby, Great Gonerby	✓
Oakham	Oakham, Langham, Barleythorpe	✓
Ryhall	Ryhall	✓
Spalding	Deeping St Nicholas, Shepeau Stow, Tongue End, Pinchbeck, Spalding, Pode Hole, Surfleet	✓
Sutton Bridge	Sutton Bridge, Long Sutton, Sutton Crosses	✓
Uppingham	Uppingham	✓

The growth scenarios proposed by the three authorities entail a major increase in flows into/through the pumped sewerage networks. The risk of pollution/amenity issues caused by overflows and flooding in sewage networks as a result of growth needs to be assessed in detail. However, in order to fully assess the capacity within wastewater networks further study and information is required, including development site locations and pumping station details. Additionally networks models are needed for combined or pumped systems to assess the quantities of rainwater and pumped flow in the network, as this will have an effect on available capacity. However, development site locations are not available at this point in the production

[52] As part of an ongoing performance checking process associated with delivery during the AMP Period, each year OFWAT require Water Companies to report on the current number of properties in their areas at risk of flooding. This is reported under a series of returns to the Director General (DG) of OFWAT known as the June Return. OFWAT describe this process as "our main source of information…….in which each company sets out its levels of service to customers, the investment it has made and the outputs delivered". Sewer flooding is the fifth measure and hence known as the DG5 Register (others include DG2 – Properties affected by low water pressure and DG3 – Properties affected by supply interruptions). The information contained on these returns is critical in terms of assessing company performance.

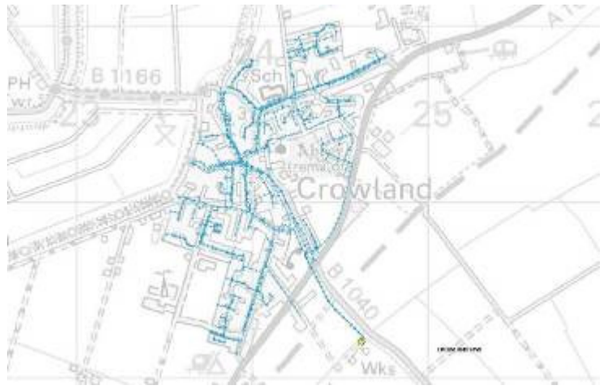
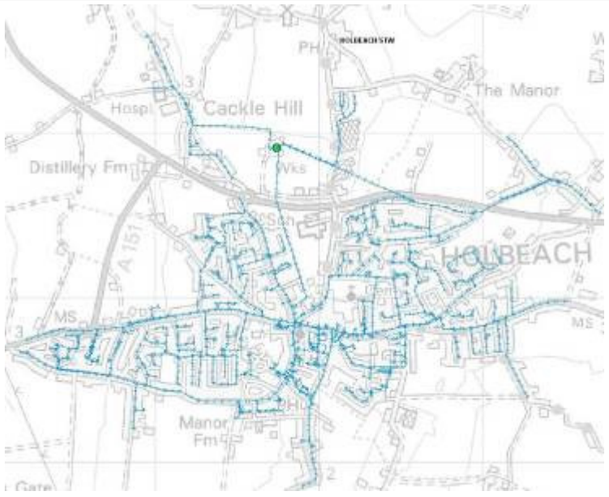
[53] Catchment name reference refers to WwTW it is connected to.

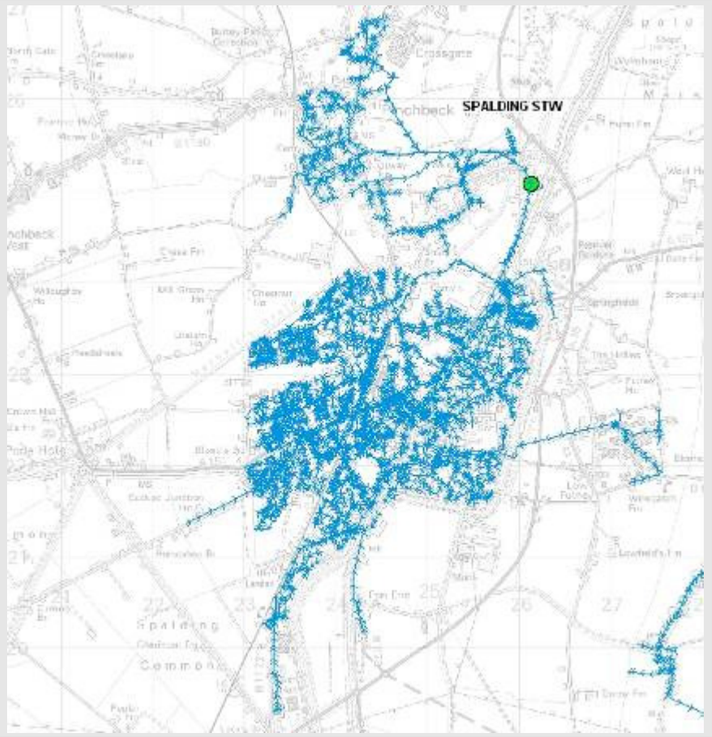
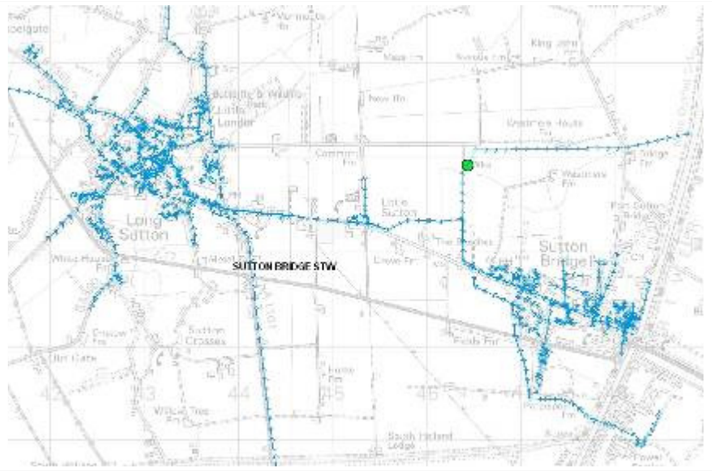
[54] DG5 information from Rutland SFRA 2009 (Entec UK Limited)

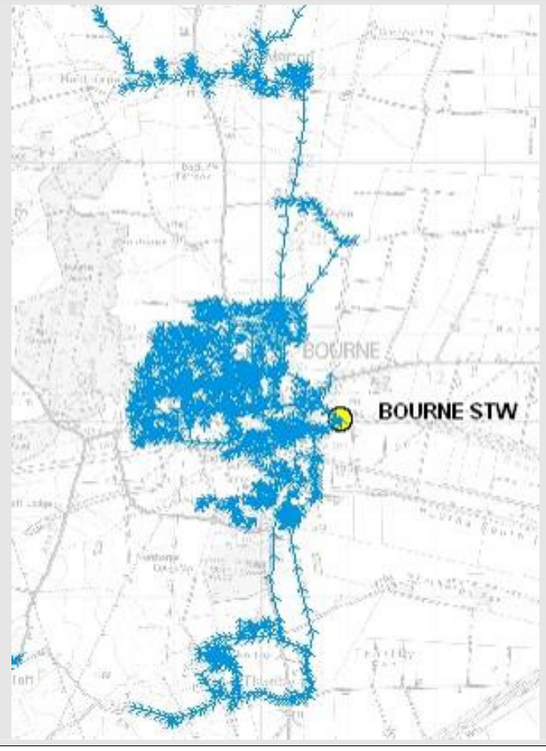
of the LDFs and network modelling would be too detailed at this Outline stage of developing the WCS. Therefore, a high level strategic assessment has been undertaken.

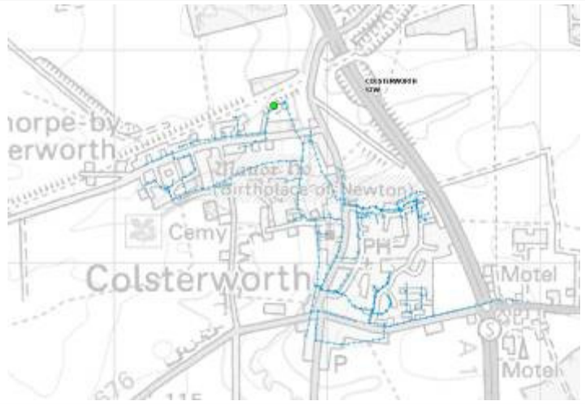
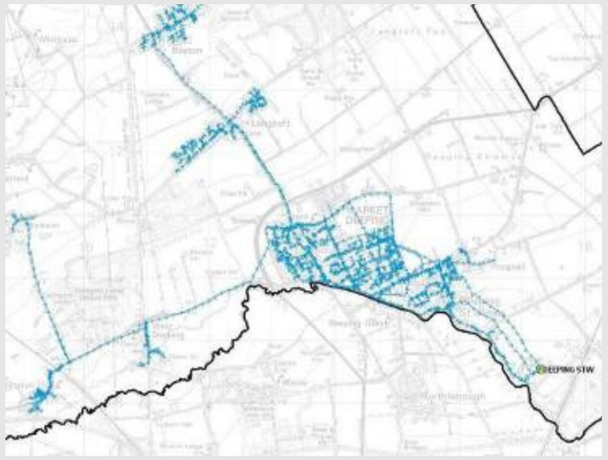
The network layout, including pipe sizes and locations of pumping stations have been used in conjunction with records of sewer flooding and AWS feedback on problem drainage areas to determine which catchments are likely to have more capacity than others. The assessments have been carried out where there is significant growth proposed of 50 houses or more, as summarised in Table 5-6 below; see section 9 for settlement specific assessments.

Table 5-6: Wastewater Network Assessment

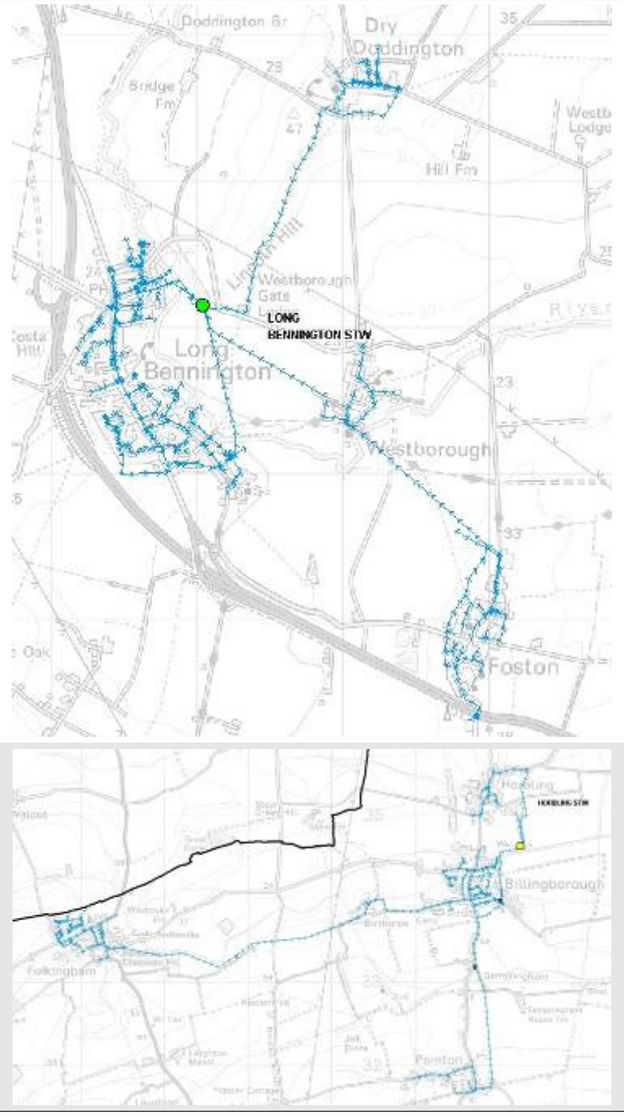
Parish	WwTW	Catchment description and possible effects of growth	Catchment area
South Holland			
Crowland	Crowland STW	The wastewater network in Crowland is a foul system that drains to Crowland WwTW located in the south of the District. The catchment is dependant on a network of pumping stations, and the system is pumped to the WwTW by three pumped mains. The proposed development will have a significant discharge into the existing network, with flows estimated to increase by up to 20%. Any new development may require new infrastructure or upgrades to existing pumping stations depending on the location of the development. There is one record of sewer flooding (DG5 record) to the North West of Crowland and future development could increase the frequency of flooding in this area. Further information is required on the pumping stations and housing locations and further study required to determine the possibility of connecting new development.	
Donington	Donington WwTW	The wastewater network in Donington is a foul system that drains to Donington WwTW located in the north of the district. The catchment is dependant on a network of pumping stations, and the system is pumped up to the STW. The proposed development will have a significant discharge into the existing network, with flows estimated to increase by up to 30%. Any new development is therefore likely to require new infrastructure or sewer upgrades depending on the location of the development Further information on the pumping stations and housing location will be required to determine which sewers/pumping stations require upgrades.	
Holbeach	Holbeach WwTW	The wastewater network in Holbeach is a foul system that drains to Holbeach WwTW located towards the middle of the district. The catchment is dependant on a network of pumping stations and the system is pumped up to the WwTW. There are records of sewers flooding (DG5 records) in this area and future development could increase the likelihood and volume of flooding. The proposed development will have a significant discharge into the existing network, with flows estimated to increase by up to 30%. Any new development is therefore likely to require new infrastructure or sewer upgrades depending on the location of the development. Further information on the pumping stations and housing location will be required to determine which sewers/pumping stations require upgrades. Fleet and Gedney currently drain via pumped mains to Sutton Bridge WwTW that has spare capacity. Infrastructure should not need upgrading for the small number of additional houses proposed. Gedney Hill is approximately 10 miles south of Holbeach WwTW, where there is no existing wastewater network on record. New infrastructure would be required to connect the new development to a WwTW. The closest WwTW with capacity is Sutton St James.	

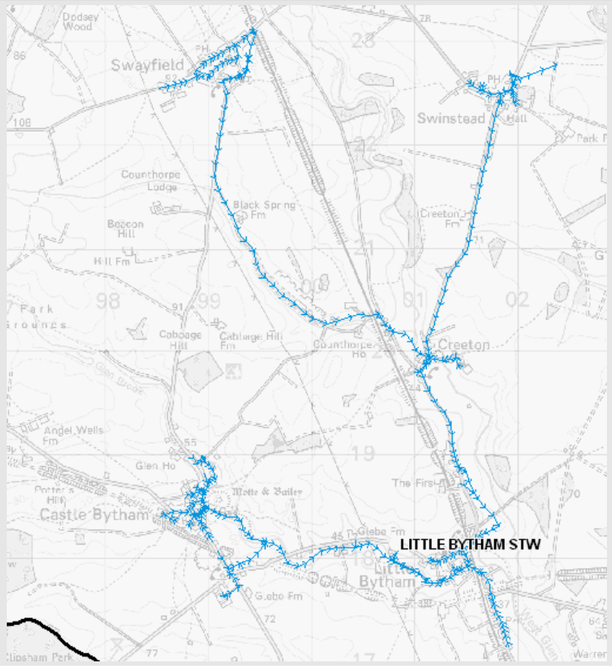
Spalding	Spalding WwTW	The wastewater network in Spalding is a large combined system with several pumping stations. There are several pumped sewers pumping up to one large gravity main that drains into WwTW from the South, Pinchbeck drains into the STW from the north west. AWS have highlighted that there are existing issues with surcharging sewers and there are records of sewers flooding (DG5 record) in the Spalding network and future development could increase the likelihood and frequency of flooding in this area. Due to the existing surcharging issues it is likely that large areas of new development could require new infrastructure connected directly to the WwTW or major upgrades to the existing system. To determine the capacity of the existing network at Spalding and to confirm the above, a network model is required; this will show the effects of surface water in the combined system. Further study would be required, along with further information on housing locations and pumping stations to determine the potential for connecting new development to the existing system. Pinchbeck is to the north of Spalding and drains to Spalding WwTW. The network at Pinchbeck is split in to areas and these areas are pumped up to one single point before being pumped to Spalding WwTW. Depending on the location and size of individual developments within Pinchbeck it is possible that only local infrastructure will need upgrading. Deeping St Nicholas, Tongue End, Pode Hole and Shepeau Stow all require new infrastructure to be connected to Spalding WwTW.	
Sutton Bridge	Sutton WwTW	The sewerage network in Sutton Bridge is a gravity & pumped system reliant on several pumping stations. The networks in Sutton Bridge and Long Sutton are pumped up towards the WwTW and both enter a single large gravity sewer before reaching Sutton Bridge WwTW. To determine the possibility of connecting new development in to the existing network further information is required on housing locations and pumping stations, as the system is heavily reliant on pumping stations. Due to a large main sewer, it is possible that only local upgrades will be required in Sutton Bridge, depending on the location and size of individual developments and further investigation. There is one record of sewer flooding (DG5 record) near Long Sutton and future development could increase the volume of flooding in this area.	
South Kesteven			

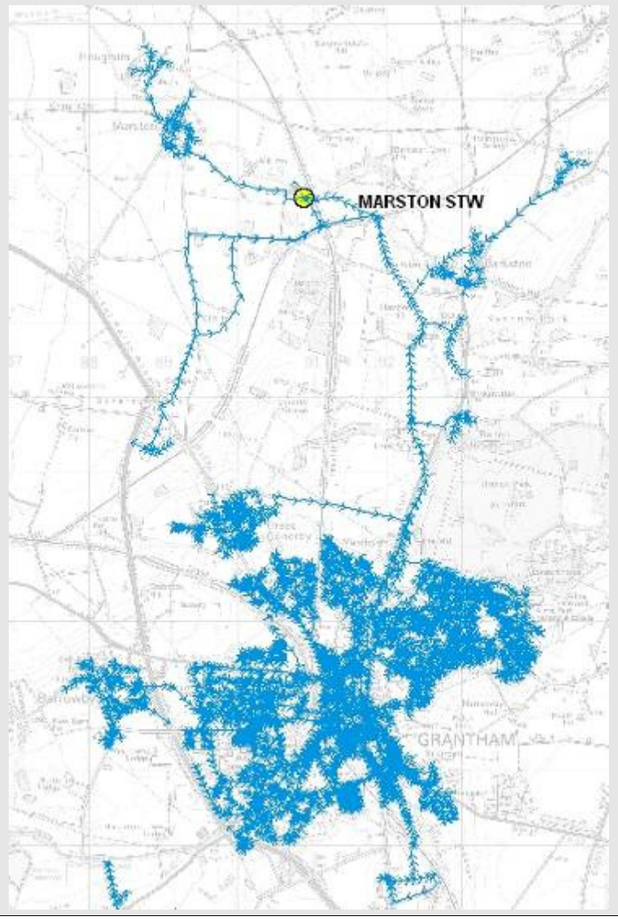
Ancaster	Ancaster WwTW	The sewerage network in Ancaster is a gravity drained system and is not reliant on pumping stations. The WwTW lies to the east of the village and is fed by a 225 mm diameter gravity sewer. To determine the possibility of connecting new development in to the existing network further information is required on housing locations and sewer sizes as local upgrades may be required in Ancaster, depending on the location and size of individual developments and further investigation. There are no recorded incidents of sewer flooding (DG5 record) in the Ancaster network.	
Bourne	Bourne WwTW	The wastewater network in Bourne is a foul gravity system with the surrounding villages Morton, Thurlby and Northorpe being pumped in to the Bourne network from the north and the south. Five main sewers from the Bourne network drain to one point before being pumped up to the WwTW via a very small pumped sewer, this sewer will require upgrading to take increased flows. The existing foul sewers collectively have capacity to take DWF from new development; however the system may require upgrading to meet peak flows. There is one DG5 record for a minor sewer in the network, Local upgrades may also be required depending on the scale and location of individual developments.	

Colsterworth	Colsterworth WwTW	Colsterworth is situated in the west of the district. Colsterworth has a small foul gravity system that drains to Colsterworth WwTW via a 300 diameter trunk sewer. It is estimated that flows will increase by 8%. Depending on the locations and spread of the houses it is likely that the trunk sewers have the capacity to take the increased dry weather flow, however local infrastructure may require upgrading depending on the size of the development plots. Trunk sewers may require upgrading to meet the increased peak flows especially if a large number of new houses drain in to one trunk sewer. There are no recorded DG5s in the catchment area. Further information on housing locations is required to confirm the above.	
Deepings	Deeping WwTW	The wastewater network in Langtoft, Market Deeping and Deeping St James is a foul system that drains to Deeping WwTW located in the south of the District. Market Deeping and Deeping St James are dependant on a network of pumping stations, and the system is pumped to the WwTW by two pumped mains. Any new development within in the Deepings may require new infrastructure or upgrades to existing pumping stations depending on the location of the development. Langtoft is a gravity system that is pumped up to the Deepings network via two pumped mains. Further information is required on housing locations, but it is likely that only local infrastructure will require upgrading depending on the size on individual developments. To determine the capacity of the existing network within the Deepings a network model is required due to the number of pumping stations. Further information is also required on the pumping stations and housing locations and further study would be required to determine the possibility of connecting new development.	

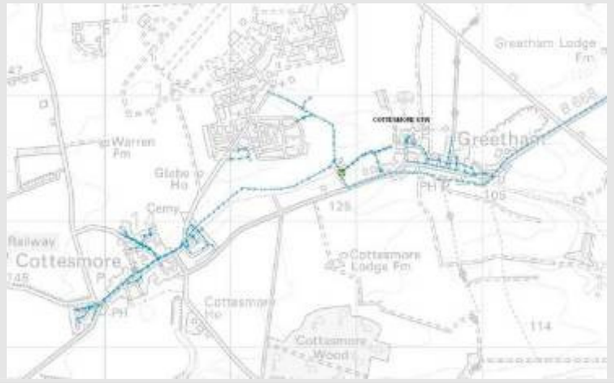
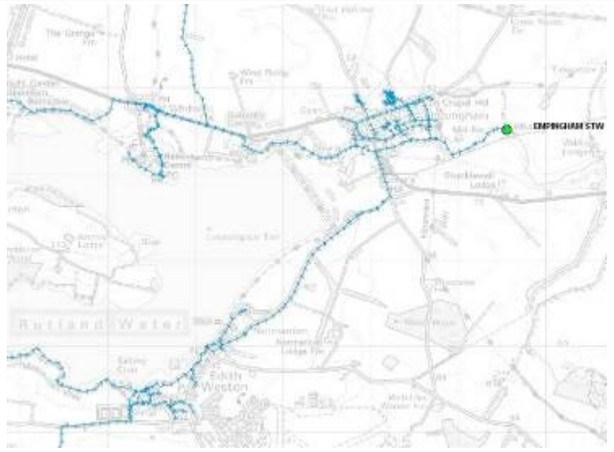
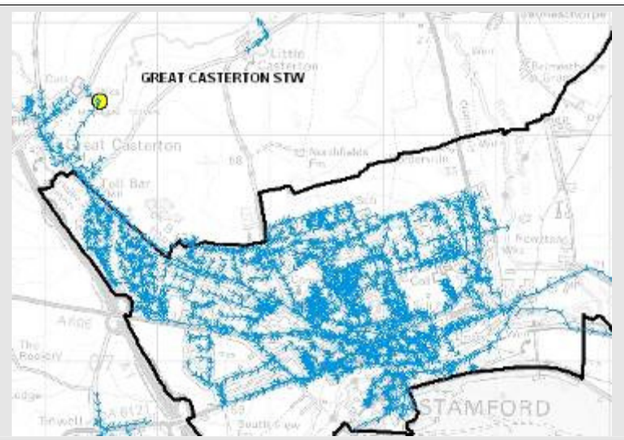
Long Bennington	Long WwTW	Bennington Long Bennington is located in the north west of the district. Long Bennington, Westborough, Foston and Dry Doddington all drain to Long Bennington WwTW. Long Bennington has a foul network reliant on several pumping stations. North of Long Bennington drains to the WwTW by a pumped main of unknown diameter, and the South is pumped up to the WwTW by a 125mm diameter main. It is estimated that flows in Long Bennington will increase by 5%. Further information is required to determine the network capacity but it seems likely that the sewer will require upgrading to meet peak flows and possibly dry weather flows if all new development is in one location. Information on the size of pumping stations, the diameter of the trunk main draining the North of Long Bennington, the location and scale of development and possibly network modelling is required in order to determine the capacity of the network in Long Bennington. There are no recorded DG5s in the catchment area.
Horbling	Horbling WwTW	Horbling is located in the north east of the district and drains to Horbling WwTW. Horbling WwTW also serves the villages of Billingborough, Birthorpe, Folkingham and Pointon. There are no DG5 records at Horbling or between Horbling and Horbling WwTW, but there are 2 DG5 records on the network draining from Pointon through Billingborough to Horbling WwTW. Horbling has a small gravity system that is pumped up to Horbling WwTW via a 100mm diameter pumped main. There is potential that the system can cater for the increase in dry weather flow however It is likely that the trunk sewer will need upgrading in order to take increased peak flows from new development. Further information on pumping stations and the size and location of development is required in order to confirm the above.

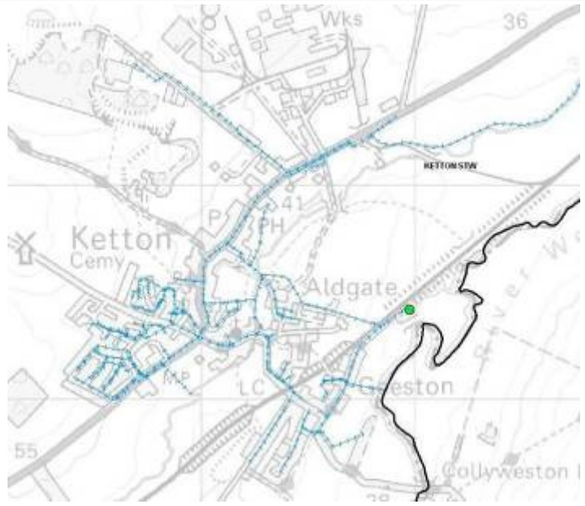


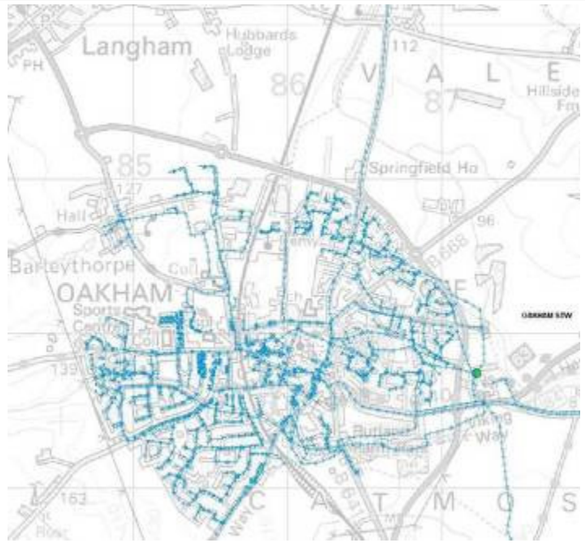
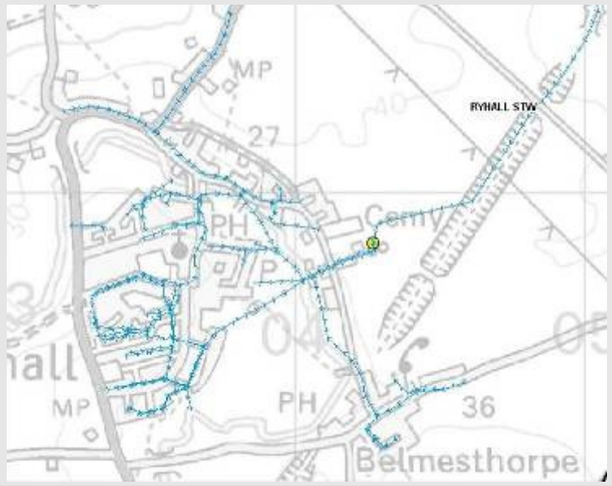
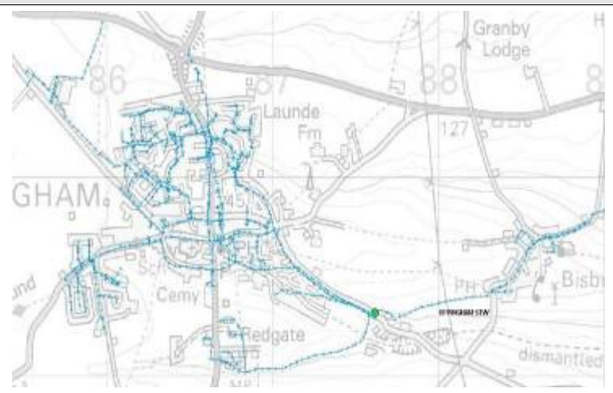
South Witham	South Witham WwTW	South Witham WwTW is located in the south west of the district and drains North and South Witham. South Witham has a small foul gravity network that drains to the WwTW via a 225mm diameter sewer. The network at North Witham is pumped up to South Witham WwTW. It is possible that the existing network at South Witham has capacity to take the proposed increase in flows; however local infrastructure may need upgrading depending on the location and size of any new development. There are no recorded DG5s in the catchment area. Further information is required on the size and location of development and the diameter and pumping station size of the pumped sewer from North Witham in order to confirm the above.	
Little Bytham	Little Bytham WwTW	Little Bytham is located towards the south of the district and drains many small villages including Castle Bytham, Little Bytham, Swayfield, Swinstead and Creeton. The system is a foul pumped system with no DG5 records. From an initial assessment of the existing foul network, it is likely that main sewers will need upgrading to take peak flows from any new development. Local infrastructure may also need upgrading depending on the size of individual developments. To confirm the above, further information is required on housing locations and pumping station sizes, along with a network model due to the number of pumping stations.	

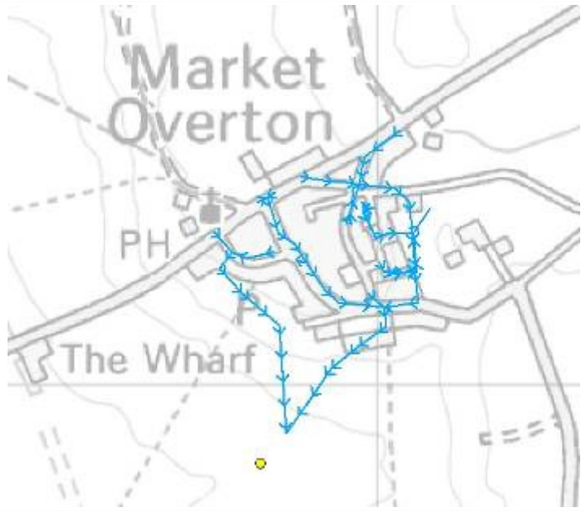
Caythorpe	Caythorpe WwTW	Caythorpe WwTW is situated in the north of the district and serves only the village of Caythorpe. The sewer network is a foul gravity system with mains laid at steep gradients. Depending on the location and spread on the new developments it is possible that some sewers in the network could take additional flows. There are two DG5s records on this system, near a main sewer with a steep gradient, no new houses should be connected to this area of the system unless the sewer is upgraded or re-laid at a more appropriate gradient. Further information on the system is required to confirm the above assumptions. Further information on the gradient of the main 225 mm diameter sewer draining the majority of the network is required, along with development locations and associated housing numbers.	
Grantham	Marston WwTW	The wastewater network connecting to Marston WwTW is a large combined system (Approximately 70% of the sewerage system is separate with the remaining 30% being combined) with gravity and pumped mains and several DG5 records of sewer flooding. Grantham and the surrounding villages, including Barkston, Syston, Barrowby and Great Gonerby, all drain to Marston WwTW. There are several large areas of land allocated for development on the outskirts of existing small villages. New development in these areas is likely to require new infrastructure of upgrades to existing infrastructure. Depending on the location and size of smaller developments it may be possible that only local upgrades are necessary. As the existing network is combined and pumped it will need to be modelled to confirm surface water flows and available capacity. The Grantham Stage 2b WCS[55] concluded that there are existing issues with overflow performance at Manthorpe Mill Lift station, which spills excess storm flows through a combined storm overflow to the Running Furrows watercourse before discharging to the River Witham. In addition, it was identified that further investigation of the sewer network is required to determine the most sustainable option to cater for the flows from the developments, including an update of the 1990 sewer model, built for SKDC's Grantham Sewer Study.	
Rutland			

[55] Grantham Stage 2b Detailed Study, Atkins, 2010.

Cottesmore	Cottesmore WwTW	This sewer network comprises gravity and pumped foul water mains. Cottesmore WwTW serves a few villages and a prison, the network is pumped between villages and to the WwTW from the east. The existing network is likely to need upgrading at Cottesmore and Greetham to take any additional flow, more information on the development location would confirm where upgrades were required New Infrastructure will be required to connect development at Market Overton to Cottesmore WwTW, due to the distance of the development from the WwTW and the small size of the existing sewer in Market Overton. There is one record of sewer flooding (DG5 records) in this area and future development could increase the frequency of flooding.	
Empingham	Empingham WwTW	Empingham STW takes wastewater from a number of small villages in the area, including Exton, Edith Weston and Manton all of which flow through the main sewer at Empingham towards Empingham STW. The sewer network in Empingham is a gravity system, and the surrounding villages are all dependant on a network of wastewater pumping stations. There are records of sewers flooding (DG5 record) in this area and future development could increase the likelihood and frequency of flooding. More information on the location of development and details about the pumping stations would be required to determine whether new or upgraded infrastructure would be required.	
Stamford	Great Casterton WwTW	The sewers draining to Great Casterton are small foul gravity sewers that are pumped up to the WwTW. Great Casterton takes foul water from only the very north west of the Stamford network. The majority of the network in Stamford drains to Stamford WwTW, Peterborough (just outside the South Kesteven District Boundary) to the South East of Stamford. The Stamford network draining to Stamford WwTW was assessed in the Peterborough WCS, which stated that 'existing foul sewers have capacity for known individual development sites'. However, it is noted from the SFRA that there are two DG5 sewer flooding records in the centre of the Stamford network, although it is possible that these are small, localised issues rather than an indication of the overall capacity in the sewer network. . Large parcels of land have been proposed for development in the north west and north east of Stamford. New Infrastructure would be required should any development from Stamford need to be connected to Great Casterton WwTW. Little Casterton has a small foul gravity system that is not currently connect to Great Casterton WwTW. New Infrastructure and possible local upgrades would be required to drain Little Casterton to Great Casterton WwTW.	

Ketton	Ketton WwTW	The wastewater network in Ketton is a foul system with pumped and gravity sewers draining to Ketton WwTW, located in the east of the district. The sewerage network in Ketton also takes wastewater from Tinwell by means of a pumped sewer, all of which gets pumped up to Ketton WwTW via one small pumped main that goes under the railway. Further information on the location of new housing would be required to determine whether the existing network would need upgrading. Information on the pumping stations would also be required to determine the capacity of the main sewer.	
North Luffenham	North STW Luffenham	North Luffenham is situated in the south east of the district. North Luffenham has a small foul gravity network that drains to North Luffenham STW. South Luffenham has a small foul gravity network that is pumped up to North Luffenham Sewage Treatment Works. Depending on the location and spread of the new development it is possible that only local infrastructure will need upgrading. The main sewers have capacity to take dry weather flow however will need upgrading to meet peak flow demands. There are no recorded DG5s in the catchment area Further information on housing locations is required to confirm the above. If any development is to take place in South Luffenham pump sizes will be required to determine the size of the pumped main from South Luffenham up to North Luffenham Sewage Treatment Works.	

Oakham	Oakham WwTW	The sewage network is mostly a combined gravity system that drains into Oakham WwTW located towards the west of the district. New properties are to be located in three parishes, Langham, Barleythorpe and Oakham. It is estimated that the proposed development in Oakham could increase flows by up to 20% from existing levels, therefore it is likely that the existing infrastructure will require upgrading. The proposed development in Langham parish at the former Ashwell depot site is located to the northeast of Oakham and is a fair distance away from the STW; new infrastructure will be required due to the distance from the WwTW and existing system. The closest main available to connect into is a small foul sewer that would need upgrading to take additional flow. The proposed development to the north west of Oakham is located between Barleythorpe and Oakham; the main sewer in this area is small and would require upgrading to take additional flow. There are records of sewers flooding (DG5 records) in this area and future development could increase the frequency of flooding. Further information and study is required to confirm the above. As the existing network is mostly combined it will need to be modelled to confirm surface water flows and available capacity once housing locations have been confirmed for Oakham.	
Ryhall	Ryhall WwTW	The wastewater network in Ryhall is mostly a gravity foul network that is pumped up to Ryhall WwTW, located in the North East of the district. There is one record of sewer flooding (DG5 record) near Essendine to the North of Ryhall WwTW and future development could increase the frequency of flooding in this area. Further information would be required to determine the capacity of the pumped sewer that pumps the gravity network draining Ryhall up to the WwTW. When the precise location of the new development is known, further study would be required in order to determine the possibility of connecting into the existing system or whether the infrastructure would need upgrading.	
Uppingham	Uppingham WwTW	The wastewater network in Uppingham is a combined system that drains into Uppingham WwTW, located in the south of the district. The north of the network is dependant on a couple of pumping stations and is mainly a foul system; the south of the network towards the STW becomes a large combined gravity system. Uppingham WwTW also serves Bisbrooke and Gladstone Villages by means of a pumped foul sewer. There are records of sewers flooding (DG5 record) in this area and future development could increase the frequency of flooding. The Strategic Flood Risk Assessment (SFRA) for Rutland also specifically mentions that there are capacity issues in Uppingham. Further study is required to determine the potential for connecting new development to the existing system. Further information is required on the pumping stations and housing locations and network modelling is needed to confirm surface water flows.	

Langham	Langham WwTW	Langham is located in the North East of the Rutland District. Langham has a pumped combined network with two pumping stations and the main sewers are 225mm in diameter. If the network is under capacity due to large amounts of surface water in the network, new infrastructure and/or sewer upgrades may be required. The existing network will need to be modelled to confirm surface water flows, pumped flows and available capacity once housing locations have been confirmed. Further information on the network is required including the DG5 register, the size of the pumping stations and the development locations and sizes.	
Market Overton	Market Overton WwTW	Market Overton is location in the North of the Rutland District. The network is a combined network that takes wastewater and surface water, the main sewers are 225mm and 150mm in diameter If the network is under capacity due to large amounts of surface water in the network, new infrastructure and/or sewer upgrades may be required. The existing network will need to be modelled to confirm surface water flows and available capacity once housing locations have been confirmed. Further information on the network is required including the DG5 register and details of whether the network is gravity or pumped. Development locations and sizes are also required.	

5.7 Conclusions

Twelve WwTW currently do not have current capacity to accept and treat any further wastewater from growth without requiring an increase in the volumes that they are consented to discharge. The catchments for these WwTW (and the towns they drain) are mapped in Figure 5-1. Any growth in these areas will require the consent parameters of the discharge to be reviewed and altered; suggested volumetric and quality limits are given above in Table 5-4.

Of the 12 WwTW listed above which will exceed their volumetric consent following the proposed growth, the majority will theoretically be able to improve their treatment levels within the limits of conventional wastewater treatment technology to allow for increased discharges from the works. Only Marston WwTW will be at the limits of conventional wastewater treatment technology for ammonia; Table 5-4 shows that discharge consent limits of 1 mg/l ammonia would be required to protect the water quality of the receiving waterbodies and ensure compliance with the WFD standards.

The exceptions to the above are the requirements for phosphate levels within the discharges for Cottesmore, Great Casterton, Ryhall, Donington, Deeping, Horbling, South Witham and Marston, where discharge consent limits of 1 mg/l phosphate would be required to protect the water quality of the receiving waterbodies and ensure compliance with the WFD standards. Of these works, the results for Great Casterton have been rounded up from those obtained by the Load Standstill Calculations, which produced suggested consent limits of 0.8 for housing scenarios 1 and 2 and 0.7 for housing scenario 3.

However, it is noted that the WFD target for phosphate is very stringent, and could possibly be thought of to be unrealistic in some instances. There has been much discussion with the Environment Agency, for the purposes of this and other studies, as to whether it is reasonable to limit growth to a particular treatment works on the grounds of high P levels in the receiving watercourse, as it is often not possible to directly attribute the high P levels to the discharge from the works. Other factors, most notably catchment-wide issues such as farming methods, can also be responsible for elevated P levels. It is therefore suggested that, pending further discussions between AWS and the Environment Agency, that the stringent P limits to these works not be considered to be a limiting factor to the proposed housing growth.

It can therefore be concluded that there is the theoretical possibility to increase wastewater flows to all of the works within the study area, although it must be noted that the actual expansion of the works would be subject to Environment Agency and planning approval. In addition, for watercourses which are already at full hydraulic capacity to convey flow from upstream to downstream, no additional water from the works should be discharged into the system. For works with limited DWF consent headroom and only small-scale growth proposed within the catchment, this may be accommodated without further re-consenting by reducing infiltration and driving down water consumption through water efficiency measures.

For the purposes of this assessment, it has been assumed that all development within Stamford would discharge to the Great Casterton WwTW. However, Stamford WwTW, which lies outside of the study area, could also treat flows from the proposed 814-1038 houses, particularly if these were located to the south of Stamford. The Peterborough WCS[56], stated there to be 11,500 m^3/day calculated headroom and 17,202 m^3/day measured headroom within the consented DWF at Stamford WwTW. A solution to the capacity issues at Great Casterton

[56] Opportunity Peterborough, Peterborough Water Cycle Study, Detailed Strategy, Hyder 2010

could therefore be to discharge some of the flows to Stamford WwTW, where the Peterborough WCS has highlighted there is capacity.

In 2008 a major commercial trader (food processing firms) ceased operating, which has had the effect of reducing the biological load and flow to the Marston works, as reported in the Grantham WCS[57]). This has released significant capacity; the Grantham WCS reports '*This substantial reduction of trade flows has freed up biological capacity equivalent to nearly 11,000 population equivalent. As a result of this load reduction AWS does not consider that major capital works are now required in the next five yearly Asset Management Plan (AMP5 2010-2015)*'. This capacity is now theoretically available to treat increased domestic flows from proposed development. However, it must be noted that while the trader has currently stopped operating due to the recession, should the economic climate improve in the future, the trader may resume operations. AWS has stated that it will not 'reserve' capacity in the WwTW or the network, but it should be noted that there may be further capacity issues in the future should the trader re-commence operations.

The Grantham WCS carried out an assessment to determine the most appropriate solution to deal with all of the development flows discharging to Marston STW. This stated that '*AWS has carried out an assessment of the works as part of the Periodic Review (PR09) of the works as it was reaching its flow consent limit and hence included in the AMP5 flow compliance project. The review concluded that the works operates in a satisfactory manner; however, there is a limited process capacity'. The report was carried out prior to the reduction in trade effluent which has subsequently freed up substantial spare biological capacity at the works*.'

The proposed development within Bourne (1,729 new dwellings) represents already committed development, to be located at a new development at Elsea Park, to the south of Bourne. It is understood from discussions with AWS that as planning permission has already been granted for this development, it has been taken into account in AWS's planning for future flow and treatment capacity requirements at Bourne WwTW.

This principle applies to all development, not just that in Bourne; as a general rule development which has been granted planning permission will have been included within AWS's planning growth forecasts.

A high level assessment of the existing wastewater network has been undertaken to determine whether there is likely to be sufficient capacity in the system to transmit additional wastewater flows from new development to the relevant wastewater treatment works. The assessment concluded that some potential growth location may be limited by sewer network capacity; see section 8 below for settlement specific assessments.

The Grantham WCS carried out an assessment to determine the most appropriate solution to deal with all of the development flows draining through the Grantham catchment, based on the sewer modelling carried out the conclusions of the study included the following major points:

- the discharge the Southern Quadrant development to a southern sewage treatment works will eliminate the need to upgrade the upstream sewer system to cater for the development;
- additional storage will be required upstream or at Manthorpe Mill Lift Station;
- provision of 220m3 of on-line storage in the Brownlow Street area and upsizing of the sewers; and

[57] South Kesteven District Council, Grantham WCS, Stage 2b Detailed Study, Atkins, 2010.

- it is not considered at this stage that upsizing of the sewers/pumping stations will be required at this stage as storm flows will be able to be accommodated in the storage tanks without impacting on the various overflows in the system;

Due to the flat topography of the study area, the sewer system relies on pumping stations (rather than free flowing gravity) to transmit wastewater flows. Many of the larger networks are also a combined system, which means that sewer capacity is taken up by rainwater as opposed to just waste water from properties. In order to accurately assess the available capacity in pumped and combined systems network modelling is required. Once potential development locations have been allocated the networks identified above as having potential capacity constraints can be modelled. The modelling results will enable a more detailed assessment of sewer capacity relative to development location.

It should be noted in general terms that the impact on the sewer network from the proposed growth would be dependent on the exact location of the proposed development. In all cases, development close to the WwTW would be more easily accommodated than development at some distance. There is limited capacity to transfer flows through existing towns and settlements in the existing networks and there are obvious difficulties with constructing a new sewer main through an already developed area. However, if a large new development were proposed close to a WwTW, it would be theoretically possible to construct a new sewer main to serve the new development, with the associated costs passed on to the developer. The phasing of new sewer mains and upgrades to existing infrastructure should be considered when planning the development of large sites.

6 Water Supply Strategy

6.1 Water Resources in the Study Area

The climate within the East of England is typified by low rainfall with little variation in the average amount throughout the year, averaging about 600 mm. The annual evapotranspiration averages 380 mm. Most of the evapotranspiration occurs during the summer months and exceeds rainfall totals over this period. However, winter rainfall and recharge provides the water required to offset this seasonal imbalance.

6.1.1 Geology and Hydrogeology

The underlying geology of the study area is roughly split between the east and west of the study area, with predominantly clay-based geology to the east in South Holland and the eastern edge of South Kesteven, but limestone and sandstone to the west in the majority of South Kesteven District and Rutland County.

The presence of groundwater within the study area corresponds to the underlying geology, with the east of the study area classed as 'Unproductive Strata' but with aquifers located to the west. A band of principal, secondary (A), secondary (B) and secondary (undifferentiated) aquifer runs north-south through the centre of South Kesteven and the east of Rutland.

There are a number of Source Protection Zones (SPZs) within this aquifer area. The Environment Agency designates SPZs around groundwater abstraction sources, to protect the abstraction from potentially polluting activities, by limiting discharges to ground (i.e. via soakaway) within the SPZ. Four Zones are designated:

- SPZ 1 – the area immediately around the source, which represents a 50-day travel time for groundwater from a point on the surface to the abstraction or a 50 m radius;
- SPZ2 - this represents a 400-day travel time for groundwater from a point on the surface to the abstraction;
- SPZ3 – this represents the entire catchment of the abstraction; and
- SPZ4 – this zone is sometimes designated as a Zone of Special Interest, where activities could impact upon the groundwater, despite lying outside of the catchment (as defined by SPZ3).

The location of SPZs within the study area can be viewed using the Environment Agency's SPZ mapping. Due to the regular updating of the SPZ mapping it is not felt appropriate to reproduce these maps here and reference should be made to the Environment Agency website[58].

6.1.2 Hydrology

The three major river systems in the study area are the Welland, the Nene and the Witham. The headwaters of the Welland are on the western boundary of the catchment upstream of Market Harborough. From Market Harborough down to Stamford a series of tributaries flow to the north bank of the Welland: River Glen, Langton Brook, Stonton Brook, Medbourne Brook, Eye Brook and the River Chater.

[58] www.environment-agency.gov.uk

The River Nene flows from its source in Northamptonshire to its outfall in the wash, with a catchment area of approximately 1,630 km^2. The River Witham rises in South Witham, south of Grantham, passes through Lincoln and drains in to The Wash at Boston, with a catchment area of approximately 3,100 km^2.

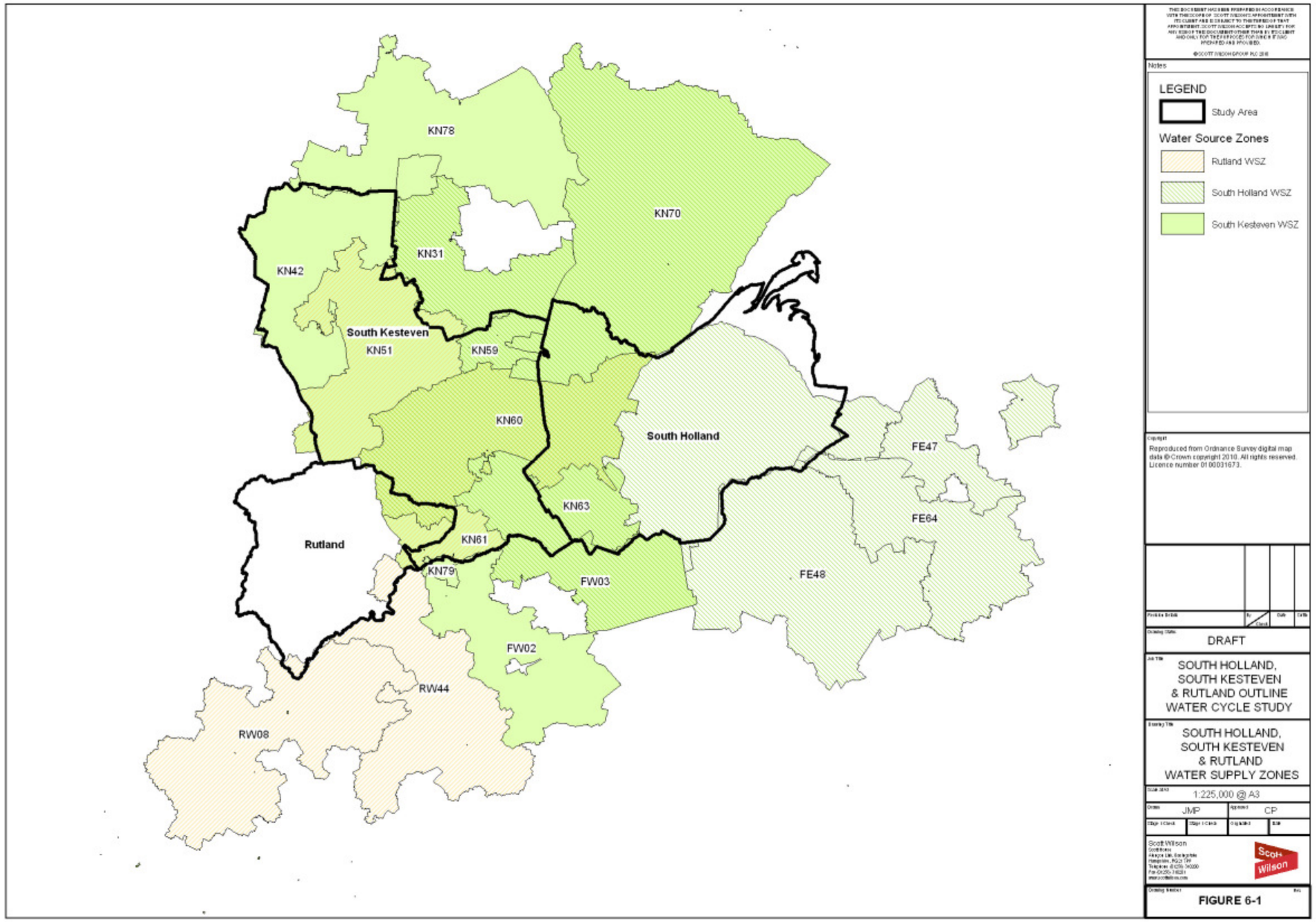
In addition to the above, there are a number of drainage channels and catchwater drains, as managed by a number of IDBs: South Holland IDB, Upper Witham IDB, Black Sluice IDB, Welland and Deepings IDB, Witham First IDB, Kings Lynn IDB and North Level IDB.

6.1.3 Water Supply

Water supply in the study area is the responsibility of two water supply companies: AWS and STWL. See Figure 6-1 below for the water supply areas and water resource zones (WRZ) for the two companies.

The WRZs are based on the existing water supply system and represent the largest area in which water resources can be shared, reflecting the Environment Agency's guideline for an area where customers experience the same risk of supply failure from a resource shortfall. The Planning Zones describe the geographical areas for which the companies' Water Resource Management Plans (WRMP) (see section 6.3.10 below) assesses the supply-demand forecast. Groups of PZs are aggregated to form a WRZ.

Figure 6-1: Water resource zones within the study area



6.2 Water Demand Calculations

In order to assess the water resources implications of the proposed growth in the study area, five water supply projections for future growth have been prepared based on different options for water use levels as follows:

- Projection 1 - Water Company average metered consumption (Reference 8) of **142 l/h/d**, this should be considered to be the 'business as usual' projection (assuming new homes will have the same level of water consumption as for metered properties currently);
- Projection 2 – Part G of the Building Regulations requirement (due to come in force on the 6th April 2010) of **125 l/h/d** (equivalent to the Code for Sustainable Homes (CfSH) Level 1/2 rating of 120 l/h/d plus 5 l/h/d for outdoor use);
- Projection 3 - the suggested policy projection of **105 l/h/d**, equivalent to the CfSH Level 3/4 rating;
- Projection 4 - Thames Gateway Water neutrality study recommendation[59] of **95 l/h/d**; and
- Projection 5 – CfSH Level 5/6 rating of **80 l/h/d**.

The above water consumption figures have been applied to the population figures for each of the three proposed housing growth scenarios given in Section 4 and the anticipated water demand has been calculated for each of the five water demand scenarios.

6.3 Water Efficiency

6.3.1 South Holland water demand strategies

The calculations, shown below in Figures 6-2 to 6-7, indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d of additional supply by 2026. This compares with the recommended policy projection (Projection 3), which would require between 0.97 and 2.10 Ml/d by 2026. These figures, and the water requirements and saving of the other water consumption strategies are displayed graphically below.

Figures 6-2 to 6-7 below display the anticipated water saving from each water consumption projection, as compared to the 'business as usual' projection (Projection 1) of metered water consumption. Demand can be reduced by between 0.21 and 1.63 Ml/d in 2026 by adopting more stringent water consumption approaches (Projections 2-5). The suggested policy projection gives a saving of between 0.45 and 0.97 Ml/d in 2026.

[59] While the Thames Gateway obviously lies outside of the study area, this is included as a benchmark study, which assessed the level of water saving that would be required to ensure sustainable growth in terms of water resources in a densely populated area and has therefore been included here as a point of comparison.

Figure 6-2: South Holland Water Demand Calculations – Housing Scenario 1

Scenario 1

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 1 - Annual Total (Completions and forecasts)	0	451	451	452	451	451	429	430	429	430	429	233	233	233	232	232	232
Cummulative Total	0	451	902	1,354	1,805	2,256	2,685	3,115	3,544	3,974	4,403	4,636	4,869	5,102	5,334	5,566	5,798
Occupancy Rate	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Domestic Population Increase (Annual)	0	947	947	949	947	947	901	903	901	903	901	489	489	489	487	487	487
Domestic Population Increase (Cumulative)	0	947	1,894	2,843	3,791	4,738	5,639	6,542	7,442	8,345	9,246	9,736	10,225	10,714	11,201	11,689	12,176

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.07	0.07	0.07	0.07	0.07	0.07
2 Building Regulations Part G	0.00	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.06	0.06	0.06	0.06	0.06	0.06
4 Suggested Policy Scenario	0.00	0.10	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.05	0.05	0.05	0.05	0.05	0.05
3 Thames Gateway Water Neutrality Study	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.05	0.05	0.05	0.05	0.05	0.05
5 CSH Level 5 & 6	0.00	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.04	0.04	0.04	0.04	0.04	0.04

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.13	0.27	0.40	0.54	0.67	0.80	0.93	1.06	1.19	1.31	1.38	1.45	1.52	1.59	1.66	1.73
2 Building Regulations Part G	0.00	0.12	0.24	0.36	0.47	0.59	0.70	0.82	0.93	1.04	1.16	1.22	1.28	1.34	1.40	1.46	1.52
4 Suggested Policy Scenario	0.00	0.10	0.20	0.30	0.40	0.50	0.59	0.69	0.78	0.88	0.97	1.02	1.07	1.12	1.18	1.23	1.28
3 Thames Gateway Water Neutrality Study	0.00	0.09	0.18	0.27	0.36	0.45	0.54	0.62	0.71	0.79	0.88	0.92	0.97	1.02	1.06	1.11	1.16
5 CSH Level 5 & 6	0.00	0.08	0.15	0.23	0.30	0.38	0.45	0.52	0.60	0.67	0.74	0.78	0.82	0.86	0.90	0.94	0.97

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
4 Suggested Policy Scenario	0.00	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
3 Thames Gateway Water Neutrality Study	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.02	0.02	0.02	0.02	0.02	0.02
5 CSH Level 5 & 6	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.03	0.03	0.03	0.03	0.03	0.03

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.02	0.03	0.05	0.06	0.08	0.10	0.11	0.13	0.14	0.16	0.17	0.17	0.18	0.19	0.20	0.21
2 Suggested Policy Scenario	0.00	0.04	0.07	0.11	0.14	0.18	0.21	0.24	0.28	0.31	0.34	0.36	0.38	0.40	0.41	0.43	0.45
4 Thames Gateway Water Neutrality Study	0.00	0.04	0.09	0.13	0.18	0.22	0.27	0.31	0.35	0.39	0.43	0.46	0.48	0.50	0.53	0.55	0.57
3 CSH Level 5 & 6	0.00	0.06	0.12	0.18	0.24	0.29	0.35	0.41	0.46	0.52	0.57	0.60	0.63	0.66	0.69	0.72	0.75

Figure 6-3: South Holland Water Demand Calculations – Housing Scenario 2

Scenario 2

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 2 - Annual Total (Completions and forecasts)	0	678	678	678	678	678	656	657	656	656	656	422	422	422	421	421	421
Cummulative Total	0	678	1,356	2,034	2,712	3,390	4,046	4,703	5,359	6,015	6,671	7,093	7,515	7,937	8,358	8,779	9,200
Occupancy Rate	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Domestic Population Increase (Annual)	0	1,424	1,424	1,424	1,424	1,424	1,378	1,380	1,378	1,378	1,378	886	886	886	884	884	884
Domestic Population Increase (Cumulative)	0	1,424	2,848	4,271	5,695	7,119	8,497	9,876	11,254	12,632	14,009	14,895	15,782	16,668	17,552	18,436	19,320

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.13	0.13	0.13	0.13	0.13	0.13
2 Building Regulations Part G	0.00	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.11	0.11	0.11	0.11	0.11	0.11
4 Suggested Policy Scenario	0.00	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.09	0.09	0.09	0.09	0.09	0.09
3 Thames Gateway Water Neutrality Study	0.00	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.08	0.08	0.08	0.08	0.08	0.08
5 CSH Level 5 & 6	0.00	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.07	0.07	0.07	0.07	0.07	0.07

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.20	0.40	0.61	0.81	1.01	1.21	1.40	1.60	1.79	1.99	2.12	2.24	2.37	2.49	2.62	2.74
2 Building Regulations Part G	0.00	0.18	0.36	0.53	0.71	0.89	1.06	1.23	1.41	1.58	1.75	1.86	1.97	2.08	2.19	2.30	2.42
4 Suggested Policy Scenario	0.00	0.15	0.30	0.45	0.60	0.75	0.89	1.04	1.18	1.33	1.47	1.56	1.66	1.75	1.84	1.94	2.03
3 Thames Gateway Water Neutrality Study	0.00	0.14	0.27	0.41	0.54	0.68	0.81	0.94	1.07	1.20	1.33	1.42	1.50	1.58	1.67	1.75	1.84
5 CSH Level 5 & 6	0.00	0.11	0.23	0.34	0.46	0.57	0.68	0.79	0.90	1.01	1.12	1.19	1.26	1.33	1.40	1.47	1.55

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
4 Suggested Policy Scenario	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03
3 Thames Gateway Water Neutrality Study	0.00	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06	0.04	0.04	0.04	0.04	0.04	0.04
5 CSH Level 5 & 6	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.05	0.05	0.05	0.05	0.05	0.05

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.02	0.05	0.07	0.10	0.12	0.14	0.17	0.19	0.21	0.24	0.25	0.27	0.28	0.30	0.31	0.33
2 Suggested Policy Scenario	0.00	0.05	0.11	0.16	0.21	0.26	0.31	0.37	0.42	0.47	0.52	0.55	0.58	0.62	0.65	0.68	0.71
4 Thames Gateway Water Neutrality Study	0.00	0.07	0.13	0.20	0.27	0.33	0.40	0.46	0.53	0.59	0.66	0.70	0.74	0.78	0.82	0.87	0.91
3 CSH Level 5 & 6	0.00	0.09	0.18	0.26	0.35	0.44	0.53	0.61	0.70	0.78	0.87	0.92	0.98	1.03	1.09	1.14	1.20

Figure 6-4: South Holland Water Demand Calculations – Housing Scenario 3

Scenario 3

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 3 - Annual Total (Completions and forecasts)	0	898	899	897	898	898	877	876	876	876	876	605	605	605	605	604	605
Cummulative Total	0	898	1,797	2,694	3,592	4,490	5,367	6,243	7,119	7,995	8,871	9,476	10,081	10,686	11,291	11,895	12,500
Occupancy Rate	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Domestic Population Increase (Annual)	0	1,886	1,888	1,884	1,886	1,886	1,842	1,840	1,840	1,840	1,840	1,271	1,271	1,271	1,271	1,268	1,271
Domestic Population Increase (Cumulative)	0	1,886	3,774	5,657	7,543	9,429	11,271	13,110	14,950	16,790	18,629	19,900	21,170	22,441	23,711	24,980	26,250

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

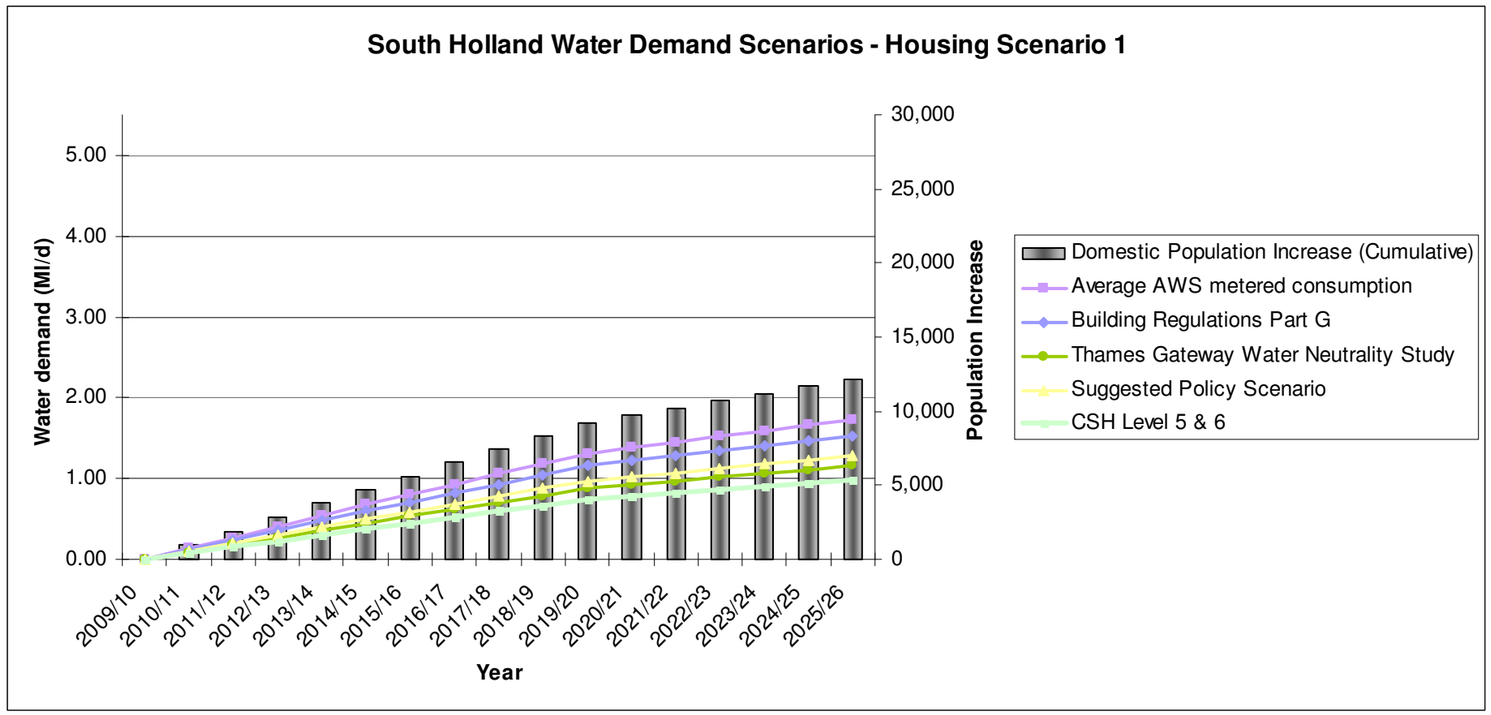
Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.27	0.27	0.27	0.27	0.27	0.26	0.26	0.26	0.26	0.26	0.18	0.18	0.18	0.18	0.18	0.18
2 Building Regulations Part G	0.00	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.16	0.16	0.16	0.16	0.16	0.16
4 Suggested Policy Scenario	0.00	0.20	0.20	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.13	0.13	0.13	0.13	0.13	0.13
3 Thames Gateway Water Neutrality Study	0.00	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.12	0.12	0.12	0.12	0.12	0.12
5 CSH Level 5 & 6	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.10	0.10	0.10	0.10	0.10	0.10

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.27	0.54	0.80	1.07	1.34	1.60	1.86	2.12	2.38	2.65	2.83	3.01	3.19	3.37	3.55	3.73
2 Building Regulations Part G	0.00	0.24	0.47	0.71	0.94	1.18	1.41	1.64	1.87	2.10	2.33	2.49	2.65	2.81	2.96	3.12	3.28
4 Suggested Policy Scenario	0.00	0.20	0.40	0.59	0.79	0.99	1.18	1.38	1.57	1.76	1.96	2.09	2.22	2.36	2.49	2.62	2.76
3 Thames Gateway Water Neutrality Study	0.00	0.18	0.36	0.54	0.72	0.90	1.07	1.25	1.42	1.60	1.77	1.89	2.01	2.13	2.25	2.37	2.49
5 CSH Level 5 & 6	0.00	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.34	1.49	1.59	1.69	1.80	1.90	2.00	2.10

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
4 Suggested Policy Scenario	0.00	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.05	0.05
3 Thames Gateway Water Neutrality Study	0.00	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.06	0.06	0.06	0.06	0.06	0.06
5 CSH Level 5 & 6	0.00	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.08	0.08	0.08	0.08	0.08	0.08

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.03	0.06	0.10	0.13	0.16	0.19	0.22	0.25	0.29	0.32	0.34	0.36	0.38	0.40	0.42	0.45
2 Suggested Policy Scenario	0.00	0.07	0.14	0.21	0.28	0.35	0.42	0.49	0.55	0.62	0.69	0.74	0.78	0.83	0.88	0.92	0.97
4 Thames Gateway Water Neutrality Study	0.00	0.09	0.18	0.27	0.35	0.44	0.53	0.62	0.70	0.79	0.88	0.94	0.99	1.05	1.11	1.17	1.23
3 CSH Level 5 & 6	0.00	0.12	0.23	0.35	0.47	0.58	0.70	0.81	0.93	1.04	1.16	1.23	1.31	1.39	1.47	1.55	1.63

Figure 6-5: South Holland Water Demand and Saving - Housing Scenario 1



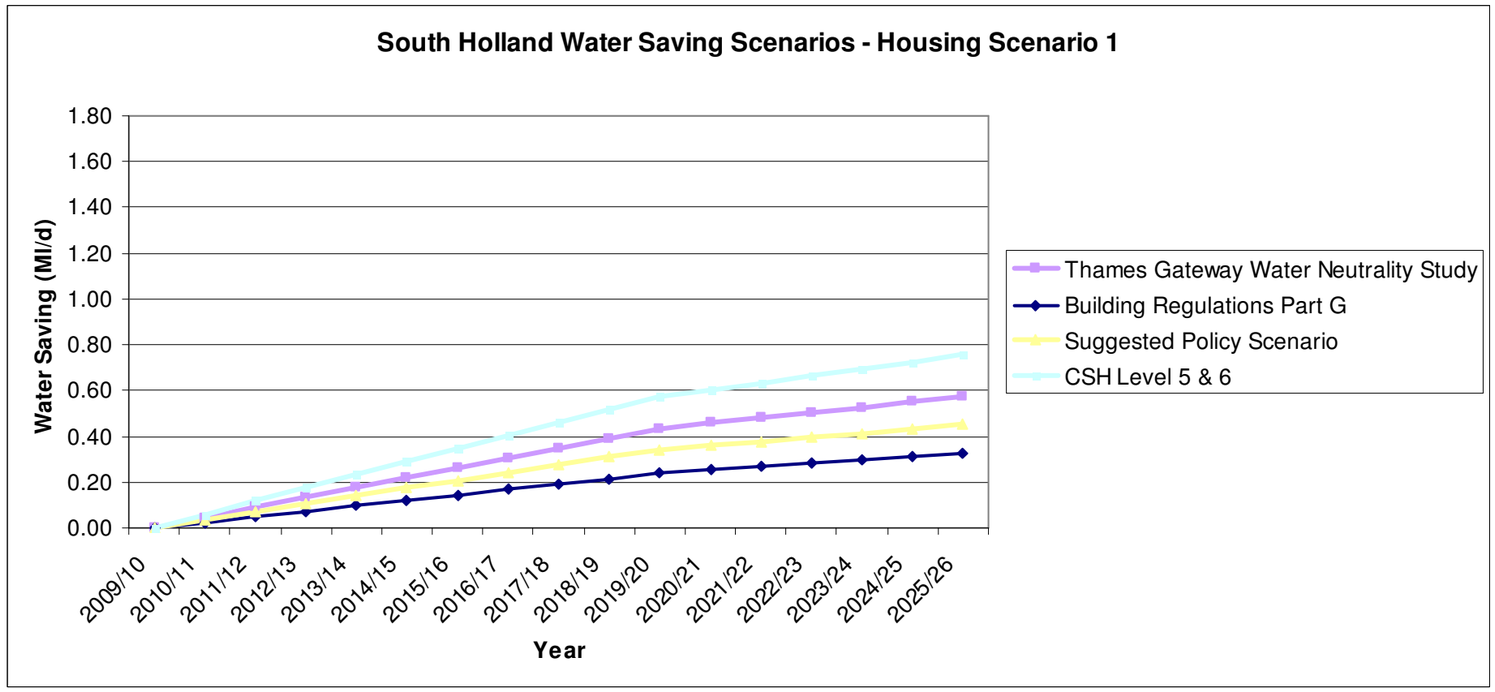
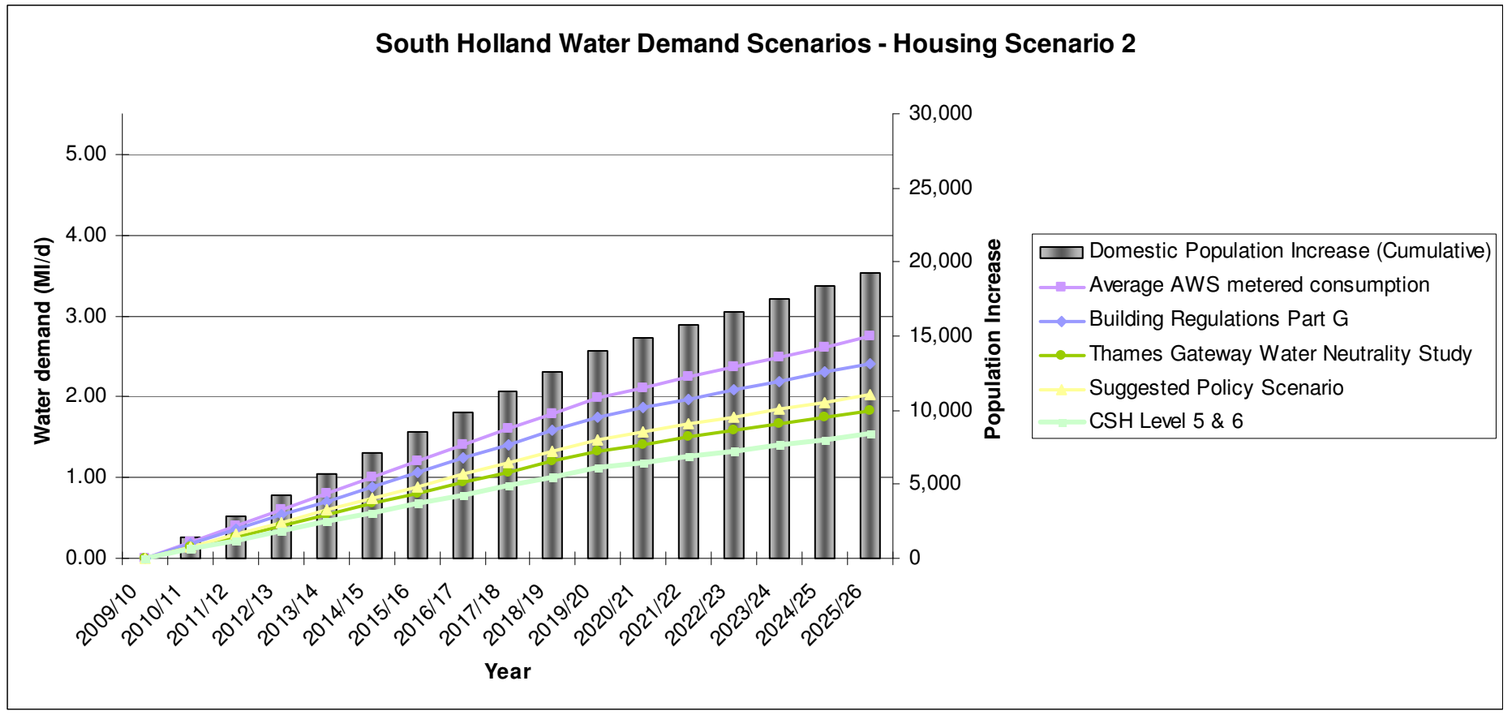


Figure 6-6: South Holland Water Demand and Saving - Housing Scenario 2



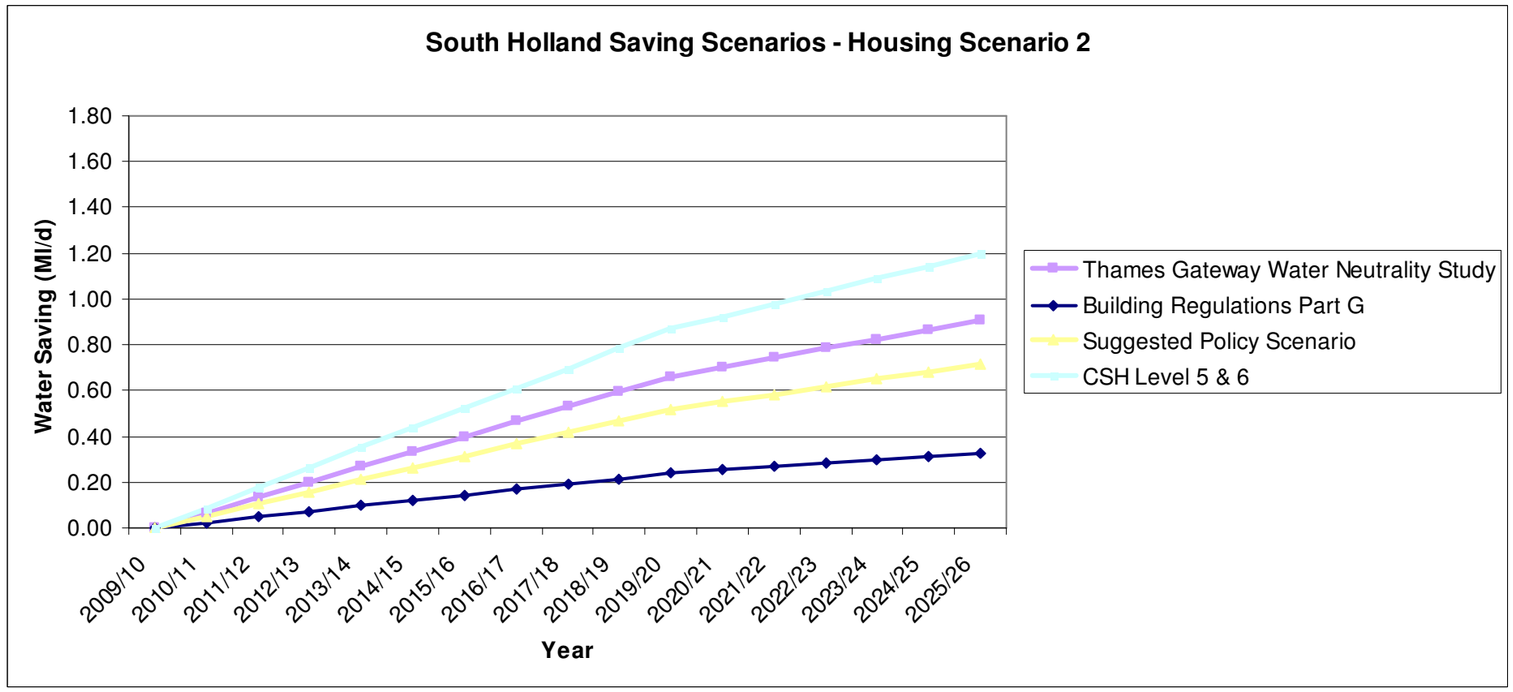
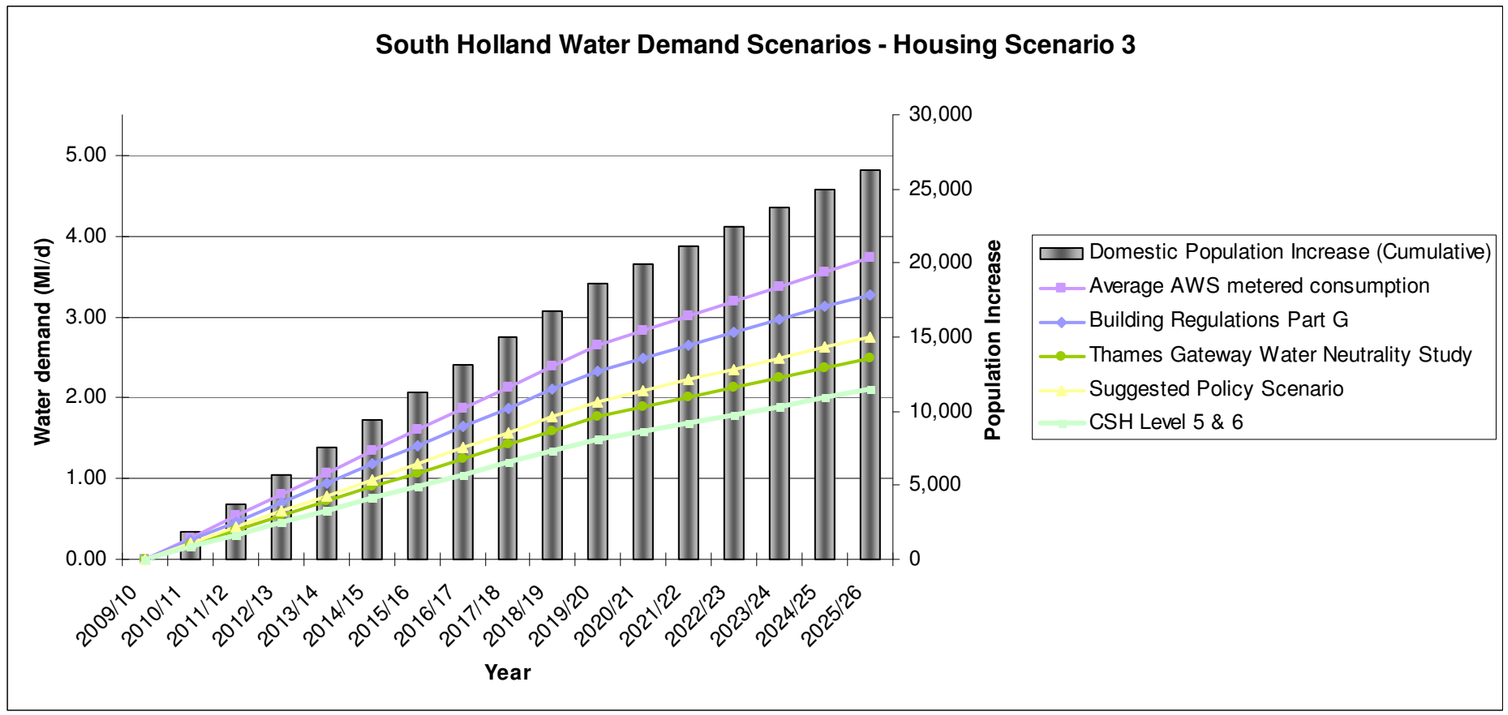
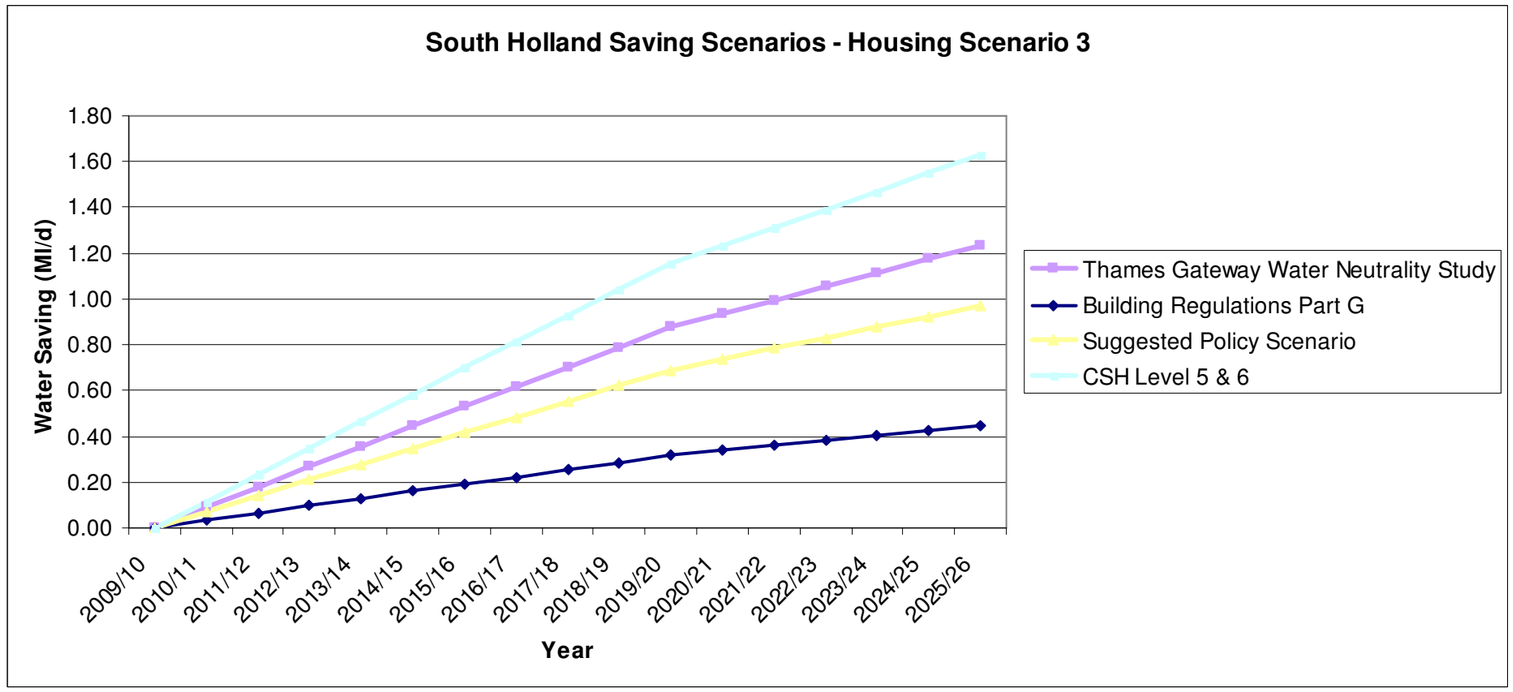


Figure 6-7: South Holland Water Demand and Saving - Housing Scenario 3





6.3.2 South Kesteven water demand strategies

The calculations, shown below in Figures 6-8 to 6-13, indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 3.29 and 3.69 Ml/d by 2026. This compares with the Projection 3), which would require between 2.43 and 2.73 Ml/d by 2026. These figures, and the water requirements and saving of the other water consumption strategies are displayed graphically below.

Figures 6-8 to 6-13 below display the anticipated water saving from each water consumption projection, as compared to the 'business as usual' projection (Projection 1) of metered water consumption. Demand can be reduced by between 0.39 and 1.61 Ml/d in 2026 by adopting more stringent water consumption approaches (Projections 2-5). The suggested policy projection gives a saving of between 0.86 and 0.96 Ml/d in 2026.

Figure 6-8: South Kesteven Water Demand Calculations – Housing Scenario 1

Scenario 1

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 1 - Annual Total (Completions and forecasts)	0	523	584	626	656	550	734	716	734	737	737	737	737	737	737	737	737
Cummulative Total	0	523	1,107	1,733	2,389	2,939	3,673	4,389	5,123	5,860	6,597	7,334	8,071	8,808	9,545	10,282	11,019
Occupancy Rate	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Domestic Population Increase (Annual)	0	1,098	1,226	1,315	1,378	1,155	1,541	1,504	1,541	1,548	1,548	1,548	1,548	1,548	1,548	1,548	1,548
Domestic Population Increase (Cumulative)	0	1,098	2,325	3,639	5,017	6,172	7,713	9,217	10,758	12,306	13,854	15,401	16,949	18,497	20,045	21,592	23,140

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.16	0.17	0.19	0.20	0.16	0.22	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
2 Building Regulations Part G	0.00	0.14	0.15	0.16	0.17	0.14	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
4 Suggested Policy Scenario	0.00	0.12	0.13	0.14	0.14	0.12	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
3 Thames Gateway Water Neutrality Study	0.00	0.10	0.12	0.12	0.13	0.11	0.15	0.14	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
5 CSH Level 5 & 6	0.00	0.09	0.10	0.11	0.11	0.09	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.16	0.33	0.52	0.71	0.88	1.10	1.31	1.53	1.75	1.97	2.19	2.41	2.63	2.85	3.07	3.29
2 Building Regulations Part G	0.00	0.14	0.29	0.45	0.63	0.77	0.96	1.15	1.34	1.54	1.73	1.93	2.12	2.31	2.51	2.70	2.89
4 Suggested Policy Scenario	0.00	0.12	0.24	0.38	0.53	0.65	0.81	0.97	1.13	1.29	1.45	1.62	1.78	1.94	2.10	2.27	2.43
3 Thames Gateway Water Neutrality Study	0.00	0.10	0.22	0.35	0.48	0.59	0.73	0.88	1.02	1.17	1.32	1.46	1.61	1.76	1.90	2.05	2.20
5 CSH Level 5 & 6	0.00	0.09	0.19	0.29	0.40	0.49	0.62	0.74	0.86	0.98	1.11	1.23	1.36	1.48	1.60	1.73	1.85

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
4 Suggested Policy Scenario	0.00	0.04	0.05	0.05	0.05	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
3 Thames Gateway Water Neutrality Study	0.00	0.05	0.06	0.06	0.06	0.05	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
5 CSH Level 5 & 6	0.00	0.07	0.08	0.08	0.09	0.07	0.10	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.02	0.04	0.06	0.09	0.10	0.13	0.16	0.18	0.21	0.24	0.26	0.29	0.31	0.34	0.37	0.39
2 Suggested Policy Scenario	0.00	0.04	0.09	0.13	0.19	0.23	0.29	0.34	0.40	0.46	0.51	0.57	0.63	0.68	0.74	0.80	0.86
4 Thames Gateway Water Neutrality Study	0.00	0.05	0.11	0.17	0.24	0.29	0.36	0.43	0.51	0.58	0.65	0.72	0.80	0.87	0.94	1.01	1.09
3 CSH Level 5 & 6	0.00	0.07	0.14	0.23	0.31	0.38	0.48	0.57	0.67	0.76	0.86	0.95	1.05	1.15	1.24	1.34	1.43

Figure 6-9: South Kesteven Water Demand Calculations – Housing Scenario 2

Scenario 2

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 2 - Annual Total (Completions and forecasts)	0	548	613	655	689	574	780	762	783	786	786	786	786	786	786	786	786
Cummulative Total	0	548	1,161	1,816	2,505	3,079	3,859	4,621	5,404	6,190	6,976	7,762	8,548	9,334	10,120	10,906	11,692
Occupancy Rate	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Domestic Population Increase (Annual)	0	1,151	1,287	1,376	1,447	1,205	1,638	1,600	1,644	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651
Domestic Population Increase (Cumulative)	0	1,151	2,438	3,814	5,261	6,466	8,104	9,704	11,348	12,999	14,650	16,300	17,951	19,601	21,252	22,903	24,553

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.16	0.18	0.20	0.21	0.17	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
2 Building Regulations Part G	0.00	0.14	0.16	0.17	0.18	0.15	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
4 Suggested Policy Scenario	0.00	0.12	0.14	0.14	0.15	0.13	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
3 Thames Gateway Water Neutrality Study	0.00	0.11	0.12	0.13	0.14	0.11	0.16	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
5 CSH Level 5 & 6	0.00	0.09	0.10	0.11	0.12	0.10	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.16	0.35	0.54	0.75	0.92	1.15	1.38	1.61	1.85	2.08	2.31	2.55	2.78	3.02	3.25	3.49
2 Building Regulations Part G	0.00	0.14	0.30	0.48	0.66	0.81	1.01	1.21	1.42	1.62	1.83	2.04	2.24	2.45	2.66	2.86	3.07
4 Suggested Policy Scenario	0.00	0.12	0.26	0.40	0.55	0.68	0.85	1.02	1.19	1.36	1.54	1.71	1.88	2.06	2.23	2.40	2.58
3 Thames Gateway Water Neutrality Study	0.00	0.11	0.23	0.36	0.50	0.61	0.77	0.92	1.08	1.23	1.39	1.55	1.71	1.86	2.02	2.18	2.33
5 CSH Level 5 & 6	0.00	0.09	0.20	0.31	0.42	0.52	0.65	0.78	0.91	1.04	1.17	1.30	1.44	1.57	1.70	1.83	1.96

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
4 Suggested Policy Scenario	0.00	0.04	0.05	0.05	0.05	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
3 Thames Gateway Water Neutrality Study	0.00	0.05	0.06	0.06	0.07	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5 CSH Level 5 & 6	0.00	0.07	0.08	0.09	0.09	0.07	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.02	0.04	0.06	0.09	0.11	0.14	0.16	0.19	0.22	0.25	0.28	0.31	0.33	0.36	0.39	0.42
2 Suggested Policy Scenario	0.00	0.04	0.09	0.14	0.19	0.24	0.30	0.36	0.42	0.48	0.54	0.60	0.66	0.73	0.79	0.85	0.91
4 Thames Gateway Water Neutrality Study	0.00	0.05	0.11	0.18	0.25	0.30	0.38	0.46	0.53	0.61	0.69	0.77	0.84	0.92	1.00	1.08	1.15
3 CSH Level 5 & 6	0.00	0.07	0.15	0.24	0.33	0.40	0.50	0.60	0.70	0.81	0.91	1.01	1.11	1.22	1.32	1.42	1.52

Figure 6-10: South Kesteven Water Demand Calculations – Housing Scenario 3

Scenario 3

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 3 - Annual Total (Completions and forecasts)	0	574	642	685	722	599	826	809	833	837	837	837	837	837	837	837	837
Cummulative Total	0	574	1,216	1,901	2,623	3,222	4,048	4,857	5,690	6,527	7,364	8,201	9,038	9,875	10,712	11,549	12,386
Occupancy Rate	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Domestic Population Increase (Annual)	0	1,205	1,348	1,439	1,516	1,258	1,735	1,699	1,749	1,758	1,758	1,758	1,758	1,758	1,758	1,758	1,758
Domestic Population Increase (Cumulative)	0	1,205	2,554	3,992	5,508	6,766	8,501	10,200	11,949	13,707	15,464	17,222	18,980	20,738	22,495	24,253	26,011

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

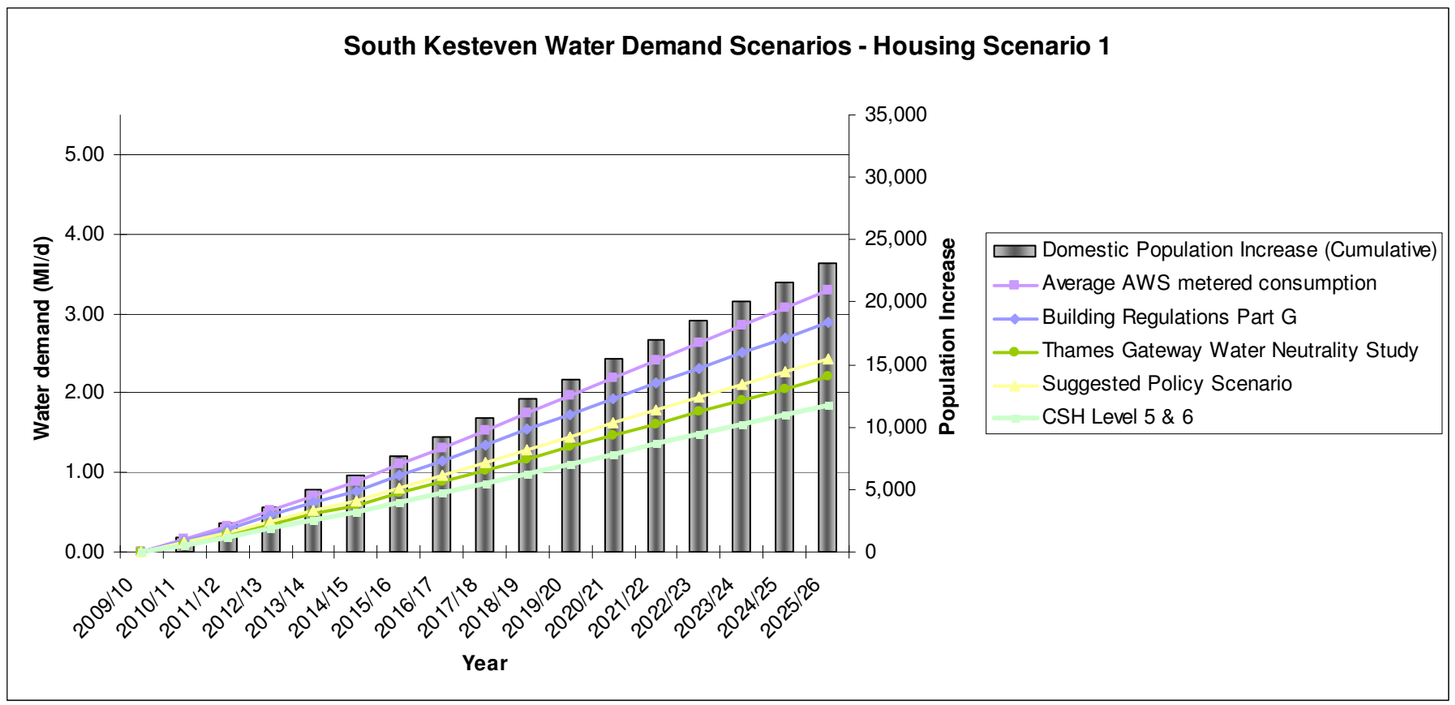
Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.17	0.19	0.20	0.22	0.18	0.25	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
2 Building Regulations Part G	0.00	0.15	0.17	0.18	0.19	0.16	0.22	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
4 Suggested Policy Scenario	0.00	0.13	0.14	0.15	0.16	0.13	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
3 Thames Gateway Water Neutrality Study	0.00	0.11	0.13	0.14	0.14	0.12	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
5 CSH Level 5 & 6	0.00	0.10	0.11	0.12	0.12	0.10	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.17	0.36	0.57	0.78	0.96	1.21	1.45	1.70	1.95	2.20	2.45	2.70	2.94	3.19	3.44	3.69
2 Building Regulations Part G	0.00	0.15	0.32	0.50	0.69	0.85	1.06	1.27	1.49	1.71	1.93	2.15	2.37	2.59	2.81	3.03	3.25
4 Suggested Policy Scenario	0.00	0.13	0.27	0.42	0.58	0.71	0.89	1.07	1.25	1.44	1.62	1.81	1.99	2.18	2.36	2.55	2.73
3 Thames Gateway Water Neutrality Study	0.00	0.11	0.24	0.38	0.52	0.64	0.81	0.97	1.14	1.30	1.47	1.64	1.80	1.97	2.14	2.30	2.47
5 CSH Level 5 & 6	0.00	0.10	0.20	0.32	0.44	0.54	0.68	0.82	0.96	1.10	1.24	1.38	1.52	1.66	1.80	1.94	2.08

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
4 Suggested Policy Scenario	0.00	0.04	0.05	0.05	0.06	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
3 Thames Gateway Water Neutrality Study	0.00	0.06	0.06	0.07	0.07	0.06	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
5 CSH Level 5 & 6	0.00	0.07	0.08	0.09	0.09	0.08	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.02	0.04	0.07	0.09	0.12	0.14	0.17	0.20	0.23	0.26	0.29	0.32	0.35	0.38	0.41	0.44
2 Suggested Policy Scenario	0.00	0.04	0.09	0.15	0.20	0.25	0.31	0.38	0.44	0.51	0.57	0.64	0.70	0.77	0.83	0.90	0.96
4 Thames Gateway Water Neutrality Study	0.00	0.06	0.12	0.19	0.26	0.32	0.40	0.48	0.56	0.64	0.73	0.81	0.89	0.97	1.06	1.14	1.22
3 CSH Level 5 & 6	0.00	0.07	0.16	0.25	0.34	0.42	0.53	0.63	0.74	0.85	0.96	1.07	1.18	1.29	1.39	1.50	1.61

Figure 6-11: South Kesteven Water Demand and Saving - Housing Scenario 1



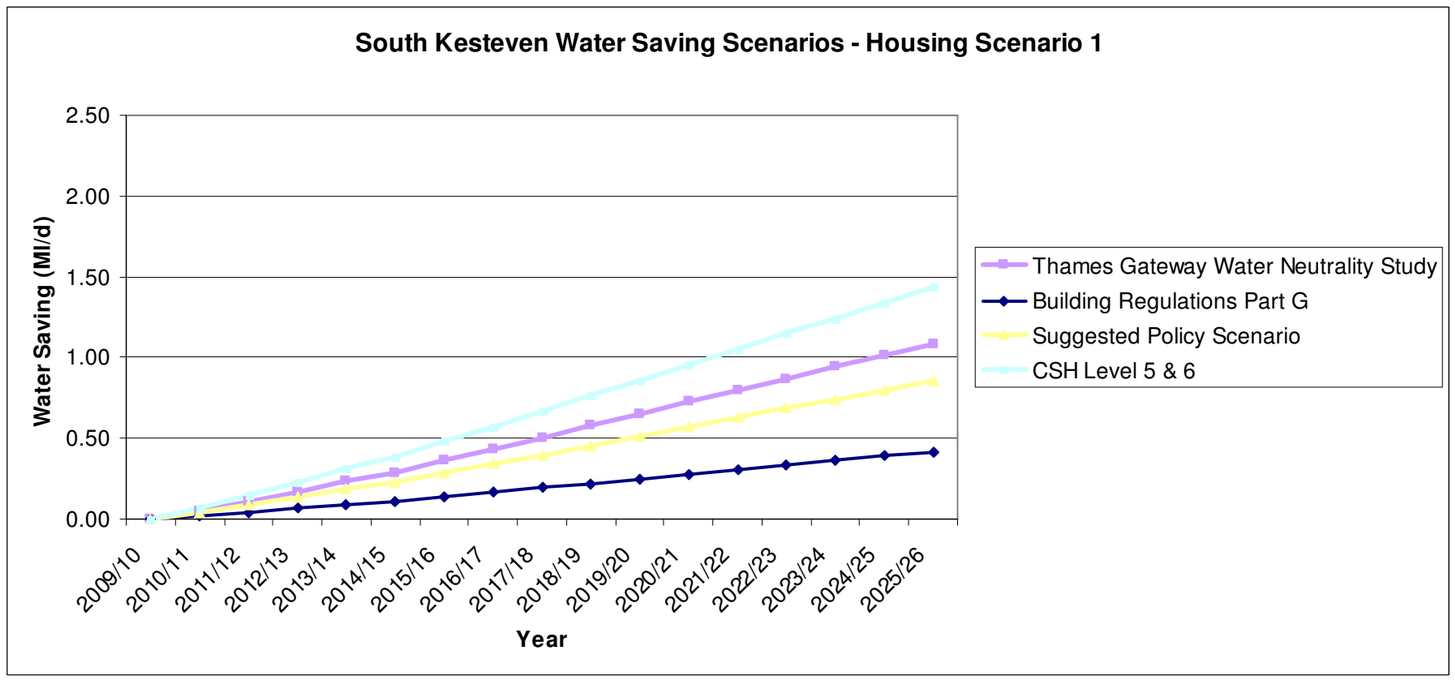
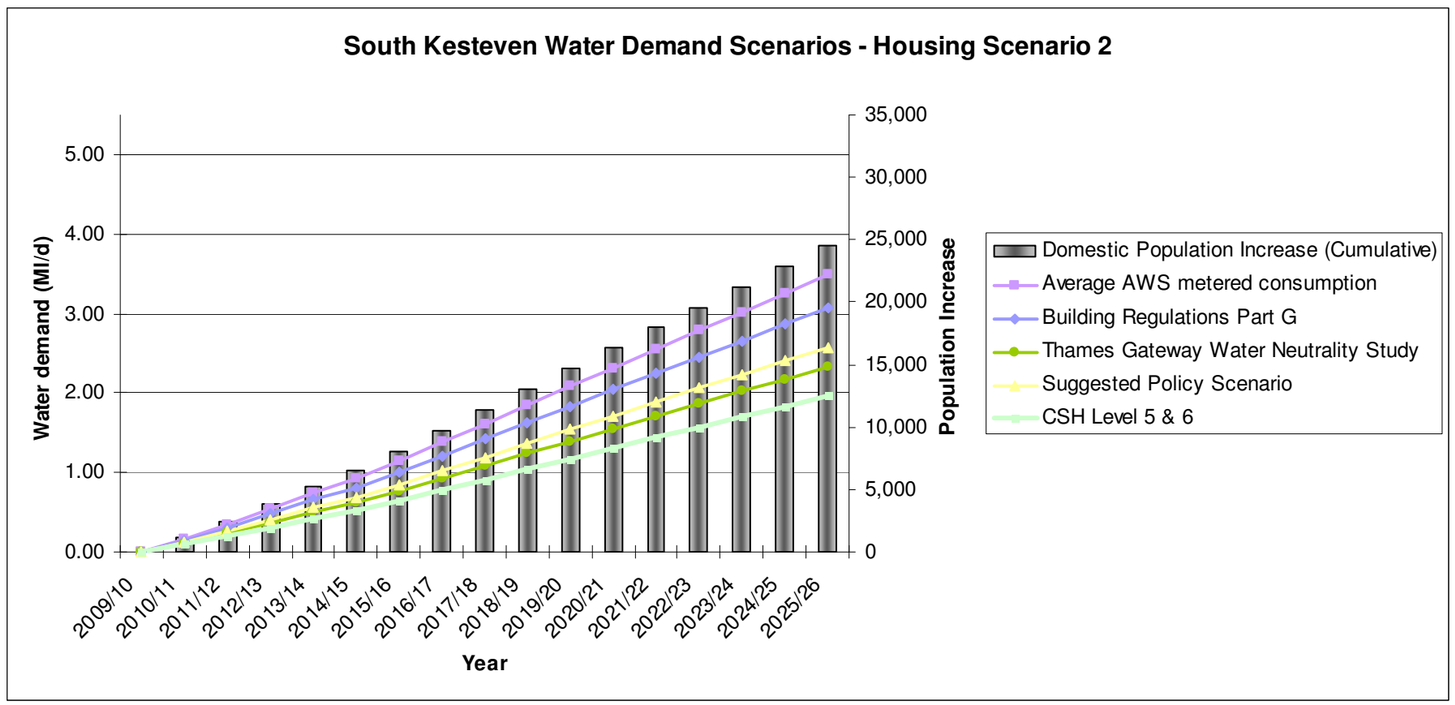


Figure 6-12: South Kesteven Water Demand and Saving - Housing Scenario 2



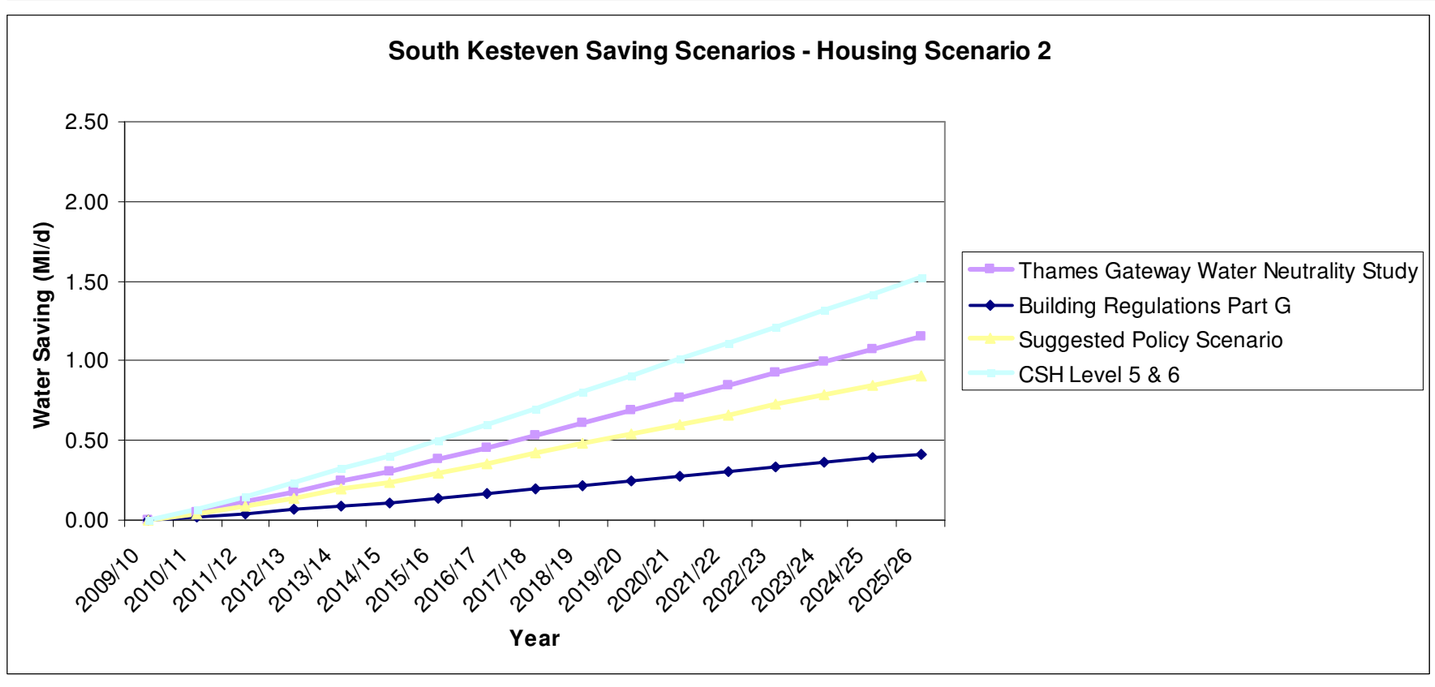
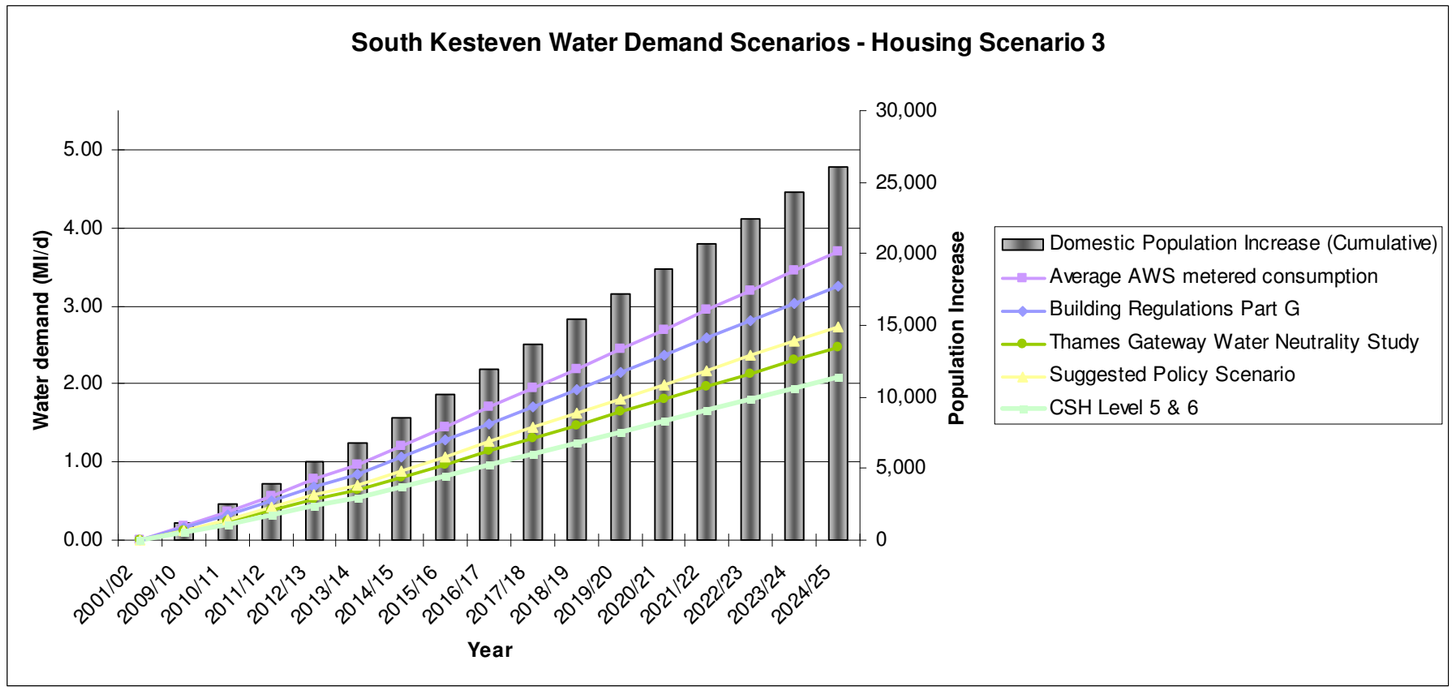
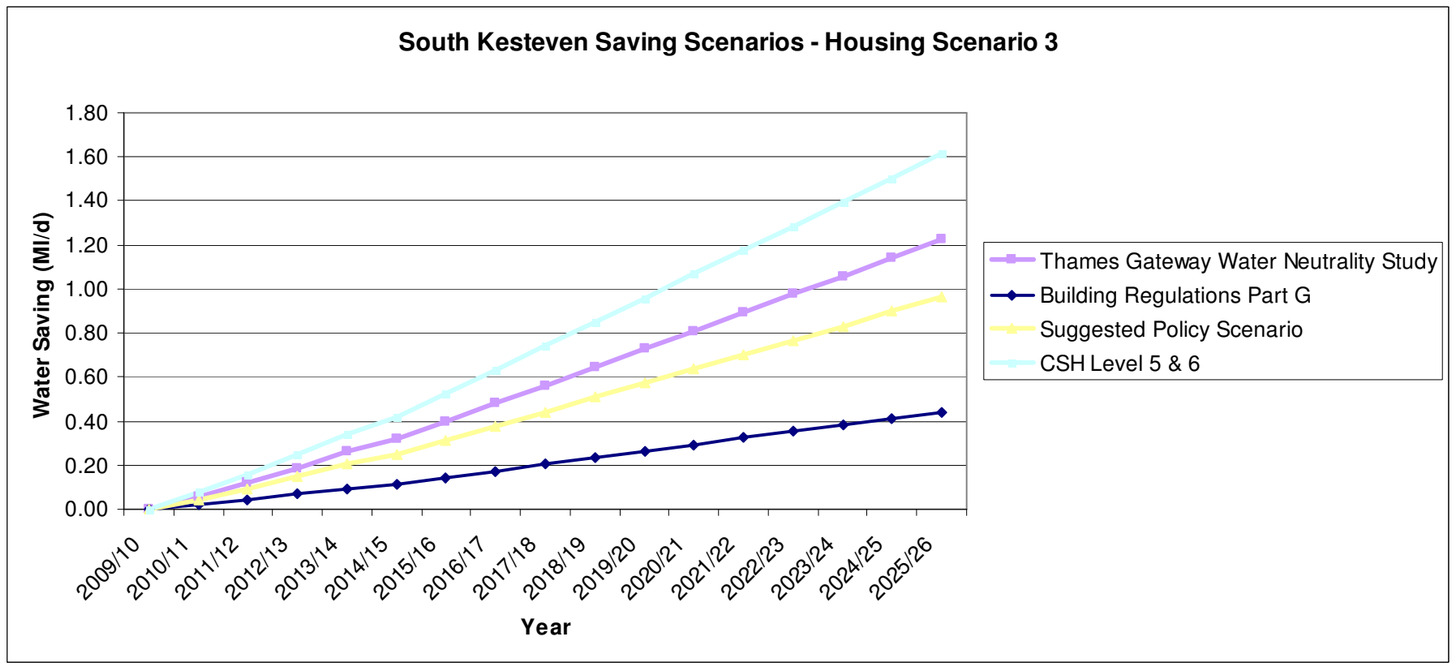


Figure 6-13: South Kesteven Water Demand and Saving - Housing Scenario 3





6.3.3 Rutland water demand strategies

The calculations, shown below in Figures 6-14 to 6-19, indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 0.77 and 1.13 Ml/d by 2026. This compares with Projection 3, which would require between 0.57 and 0.84 Ml/d by 2026. These figures, and the water requirements and saving of the other water consumption strategies are displayed graphically below.

Figures 6-14 to 6-19 below display the anticipated water saving from each water consumption projection, as compared to the 'business as usual' projection (Projection 1) of metered water consumption. Demand can be reduced by between 0.09 and 0.49 Ml/d in 2026 by adopting more stringent water consumption approaches (Projections 2-5). The suggested policy projection gives a saving of between 0.20 and 0.29 Ml/d in 2026.

Figure 6-14: Rutland Water Demand Calculations – Housing Scenario 1

Scenario 1

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	20014/15	20015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 1 - Annual Total (Completions and forecasts)	0	94	66	181	267	252	223	160	160	155	148	148	148	148	147	147	147
Cummulative Total	0	94	160	341	608	860	1,083	1,243	1,403	1,558	1,706	1,854	2,002	2,150	2,297	2,444	2,591
Occupancy Rate	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Domestic Population Increase (Annual)	0	197	139	380	561	529	468	336	336	326	311	311	311	311	309	309	309
Domestic Population Increase (Cumulative)	0	197	336	716	1,277	1,806	2,274	2,610	2,946	3,272	3,583	3,893	4,204	4,515	4,824	5,132	5,441

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	134.27	125.94	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.03	0.02	0.05	0.08	0.08	0.07	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
2 Building Regulations Part G	0.00	0.02	0.02	0.05	0.07	0.07	0.06	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
4 Suggested Policy Scenario	0.00	0.02	0.01	0.04	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
3 Thames Gateway Water Neutrality Study	0.00	0.02	0.01	0.04	0.05	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
5 CSH Level 5 & 6	0.00	0.02	0.01	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.03	0.05	0.10	0.18	0.26	0.32	0.37	0.42	0.46	0.51	0.55	0.60	0.64	0.68	0.73	0.77
2 Building Regulations Part G	0.00	0.02	0.04	0.09	0.16	0.23	0.28	0.33	0.37	0.41	0.45	0.49	0.53	0.56	0.60	0.64	0.68
4 Suggested Policy Scenario	0.00	0.02	0.04	0.08	0.13	0.19	0.24	0.27	0.31	0.34	0.38	0.41	0.44	0.47	0.51	0.54	0.57
3 Thames Gateway Water Neutrality Study	0.00	0.02	0.03	0.07	0.12	0.17	0.22	0.25	0.28	0.31	0.34	0.37	0.40	0.43	0.46	0.49	0.52
5 CSH Level 5 & 6	0.00	0.02	0.03	0.06	0.10	0.14	0.18	0.21	0.24	0.26	0.29	0.31	0.34	0.36	0.39	0.41	0.44

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4 Suggested Policy Scenario	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3 Thames Gateway Water Neutrality Study	0.00	0.01	0.01	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
5 CSH Level 5 & 6	0.00	0.01	0.01	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.09	0.09
2 Suggested Policy Scenario	0.00	0.01	0.01	0.03	0.05	0.07	0.08	0.10	0.11	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.20
4 Thames Gateway Water Neutrality Study	0.00	0.01	0.02	0.03	0.06	0.08	0.11	0.12	0.14	0.15	0.17	0.18	0.20	0.21	0.23	0.24	0.26
3 CSH Level 5 & 6	0.00	0.01	0.02	0.04	0.08	0.11	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34

Figure 6-15: Rutland Water Demand Calculations – Housing Scenario 2

Scenario 2

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 2 - Annual Total (Completions and forecasts)	0	98	70	193	295	279	247	172	172	167	160	160	160	160	160	160	159
Cummulative Total	0	98	168	361	656	935	1,182	1,354	1,526	1,693	1,853	2,013	2,173	2,333	2,493	2,653	2,812
Occupancy Rate	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Domestic Population Increase (Annual)	0	206	147	405	620	586	519	361	361	351	336	336	336	336	336	336	334
Domestic Population Increase (Cumulative)	0	206	353	758	1,378	1,964	2,482	2,843	3,205	3,555	3,891	4,227	4,563	4,899	5,235	5,571	5,905

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.03	0.02	0.06	0.09	0.08	0.07	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
2 Building Regulations Part G	0.00	0.03	0.02	0.05	0.08	0.07	0.06	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
4 Suggested Policy Scenario	0.00	0.02	0.02	0.04	0.07	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
3 Thames Gateway Water Neutrality Study	0.00	0.02	0.01	0.04	0.06	0.06	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
5 CSH Level 5 & 6	0.00	0.02	0.01	0.03	0.05	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.03	0.05	0.11	0.20	0.28	0.35	0.40	0.46	0.50	0.55	0.60	0.65	0.70	0.74	0.79	0.84
2 Building Regulations Part G	0.00	0.03	0.04	0.09	0.17	0.25	0.31	0.36	0.40	0.44	0.49	0.53	0.57	0.61	0.65	0.70	0.74
4 Suggested Policy Scenario	0.00	0.02	0.04	0.08	0.14	0.21	0.26	0.30	0.34	0.37	0.41	0.44	0.48	0.51	0.55	0.58	0.62
3 Thames Gateway Water Neutrality Study	0.00	0.02	0.03	0.07	0.13	0.19	0.24	0.27	0.30	0.34	0.37	0.40	0.43	0.47	0.50	0.53	0.56
5 CSH Level 5 & 6	0.00	0.02	0.03	0.06	0.11	0.16	0.20	0.23	0.26	0.28	0.31	0.34	0.37	0.39	0.42	0.45	0.47

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4 Suggested Policy Scenario	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3 Thames Gateway Water Neutrality Study	0.00	0.01	0.01	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
5 CSH Level 5 & 6	0.00	0.01	0.01	0.03	0.04	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.00	0.01	0.01	0.02	0.03	0.04	0.05	0.05	0.06	0.07	0.07	0.08	0.08	0.09	0.09	0.10
2 Suggested Policy Scenario	0.00	0.01	0.01	0.03	0.05	0.07	0.09	0.11	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.21	0.22
4 Thames Gateway Water Neutrality Study	0.00	0.01	0.02	0.04	0.06	0.09	0.12	0.13	0.15	0.17	0.18	0.20	0.21	0.23	0.25	0.26	0.28
3 CSH Level 5 & 6	0.00	0.01	0.02	0.05	0.09	0.12	0.15	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.35	0.37

Figure 6-16: Rutland Water Demand Calculations – Housing Scenario 3

Scenario 3

Housing Development	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
Scenario 3 - Annual Total (Completions and forecasts)	0	113	88	258	394	367	326	234	234	229	222	222	222	222	220	220	220
Cummulative Total	0	113	201	459	853	1,220	1,546	1,780	2,014	2,243	2,465	2,687	2,909	3,131	3,351	3,571	3,791
Occupancy Rate	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
Domestic Population Increase (Annual)	0	237	185	542	827	771	685	491	491	481	466	466	466	466	462	462	462
Domestic Population Increase (Cumulative)	0	237	422	964	1,791	2,562	3,247	3,738	4,229	4,710	5,177	5,643	6,109	6,575	7,037	7,499	7,961

Water Demand Scenario - Cumulative Water Consumption (l/h/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142
2 Building Regulations Part G	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125
4 Suggested Policy Scenario	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
3 Thames Gateway Water Neutrality Study	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95
5 CSH Level 5 & 6	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80

Annual Water Demand Calculations (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.03	0.03	0.08	0.12	0.11	0.10	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
2 Building Regulations Part G	0.00	0.03	0.02	0.07	0.10	0.10	0.09	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
4 Suggested Policy Scenario	0.00	0.02	0.02	0.06	0.09	0.08	0.07	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
3 Thames Gateway Water Neutrality Study	0.00	0.02	0.02	0.05	0.08	0.07	0.07	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04
5 CSH Level 5 & 6	0.00	0.02	0.01	0.04	0.07	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04

Water Demand Calculations (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Average AWS metered consumption	0.00	0.03	0.06	0.14	0.25	0.36	0.46	0.53	0.60	0.67	0.74	0.80	0.87	0.93	1.00	1.06	1.13
2 Building Regulations Part G	0.00	0.03	0.05	0.12	0.22	0.32	0.41	0.47	0.53	0.59	0.65	0.71	0.76	0.82	0.88	0.94	1.00
4 Suggested Policy Scenario	0.00	0.02	0.04	0.10	0.19	0.27	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84
3 Thames Gateway Water Neutrality Study	0.00	0.02	0.04	0.09	0.17	0.24	0.31	0.36	0.40	0.45	0.49	0.54	0.58	0.62	0.67	0.71	0.76
5 CSH Level 5 & 6	0.00	0.02	0.03	0.08	0.14	0.20	0.26	0.30	0.34	0.38	0.41	0.45	0.49	0.53	0.56	0.60	0.64

Annual Water Savings (against planned water company consumption - Scenario 1) (Ml/d)	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
2 Building Regulations Part G	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4 Suggested Policy Scenario	0.00	0.01	0.01	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
3 Thames Gateway Water Neutrality Study	0.00	0.01	0.01	0.03	0.04	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
5 CSH Level 5 & 6	0.00	0.01	0.01	0.03	0.05	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Water Savings (against planned water company consumption - Scenario 1) (Ml/d) - CUMULATIVE	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26
1 Building Regulations Part G	0.00	0.00	0.01	0.02	0.03	0.04	0.06	0.06	0.07	0.08	0.09	0.10	0.10	0.11	0.12	0.13	0.14
2 Suggested Policy Scenario	0.00	0.01	0.02	0.04	0.07	0.09	0.12	0.14	0.16	0.17	0.19	0.21	0.23	0.24	0.26	0.28	0.29
4 Thames Gateway Water Neutrality Study	0.00	0.01	0.02	0.05	0.08	0.12	0.15	0.18	0.20	0.22	0.24	0.27	0.29	0.31	0.33	0.35	0.37
3 CSH Level 5 & 6	0.00	0.01	0.03	0.06	0.11	0.16	0.20	0.23	0.26	0.29	0.32	0.35	0.38	0.41	0.44	0.46	0.49

Figure 6-17: Rutland Water Demand and Saving - Housing Scenario 1

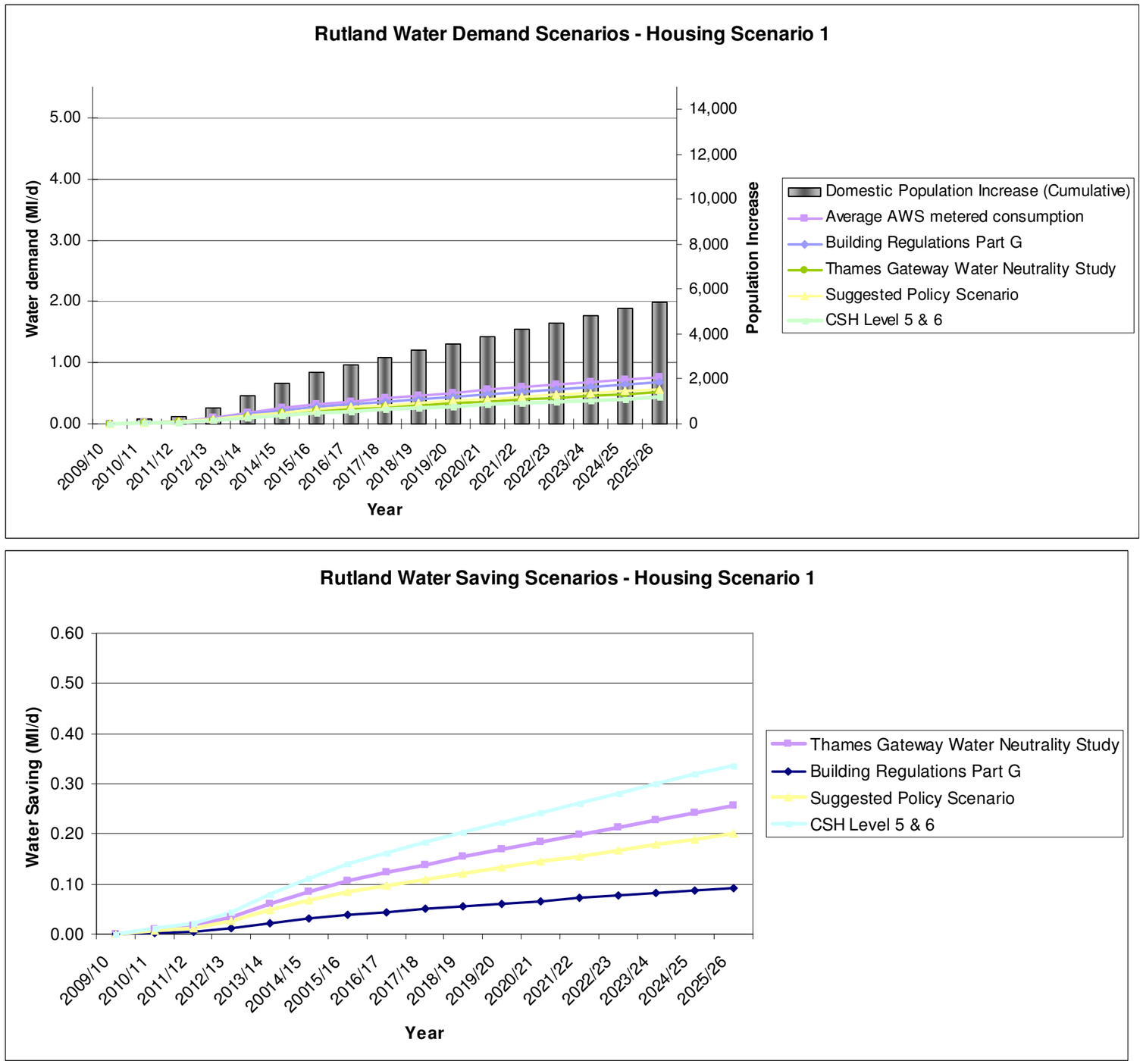
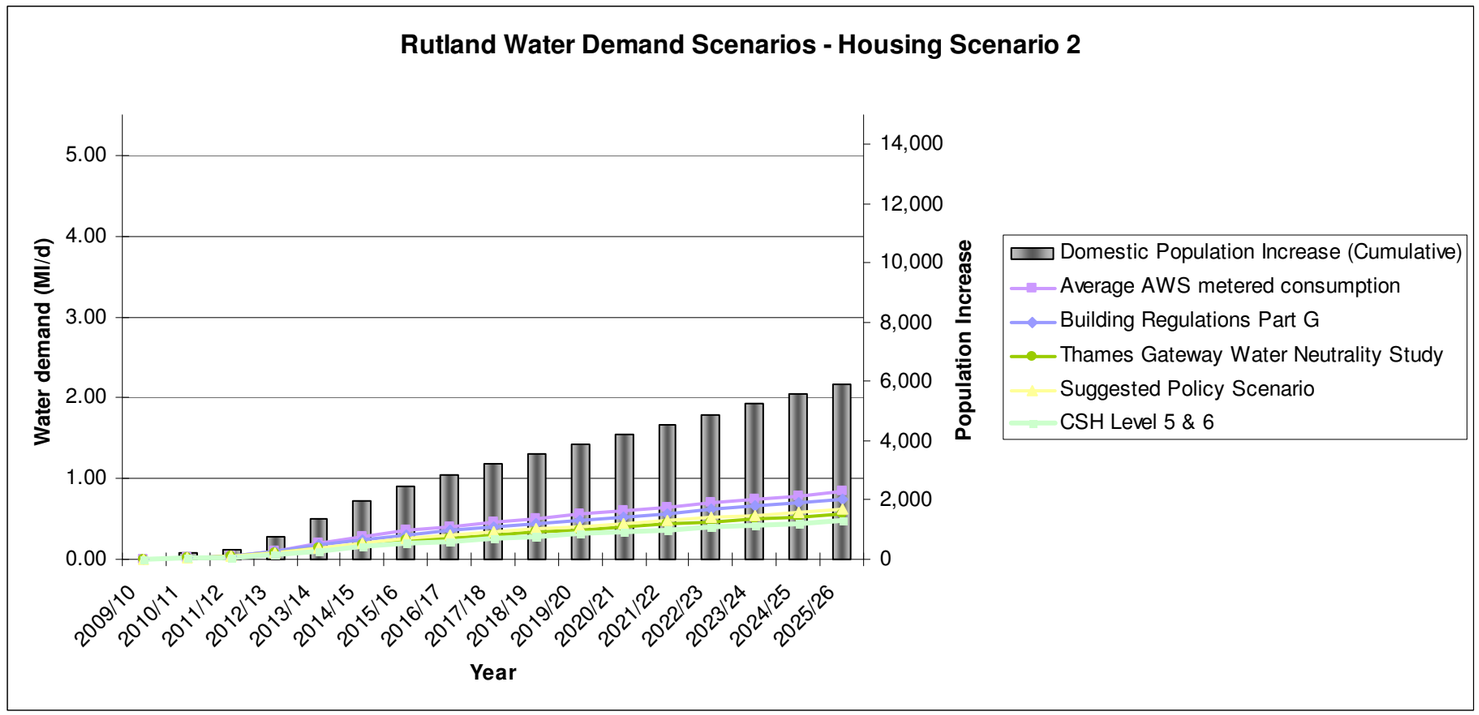


Figure 6-18: Rutland Water Demand and Saving - Housing Scenario 2



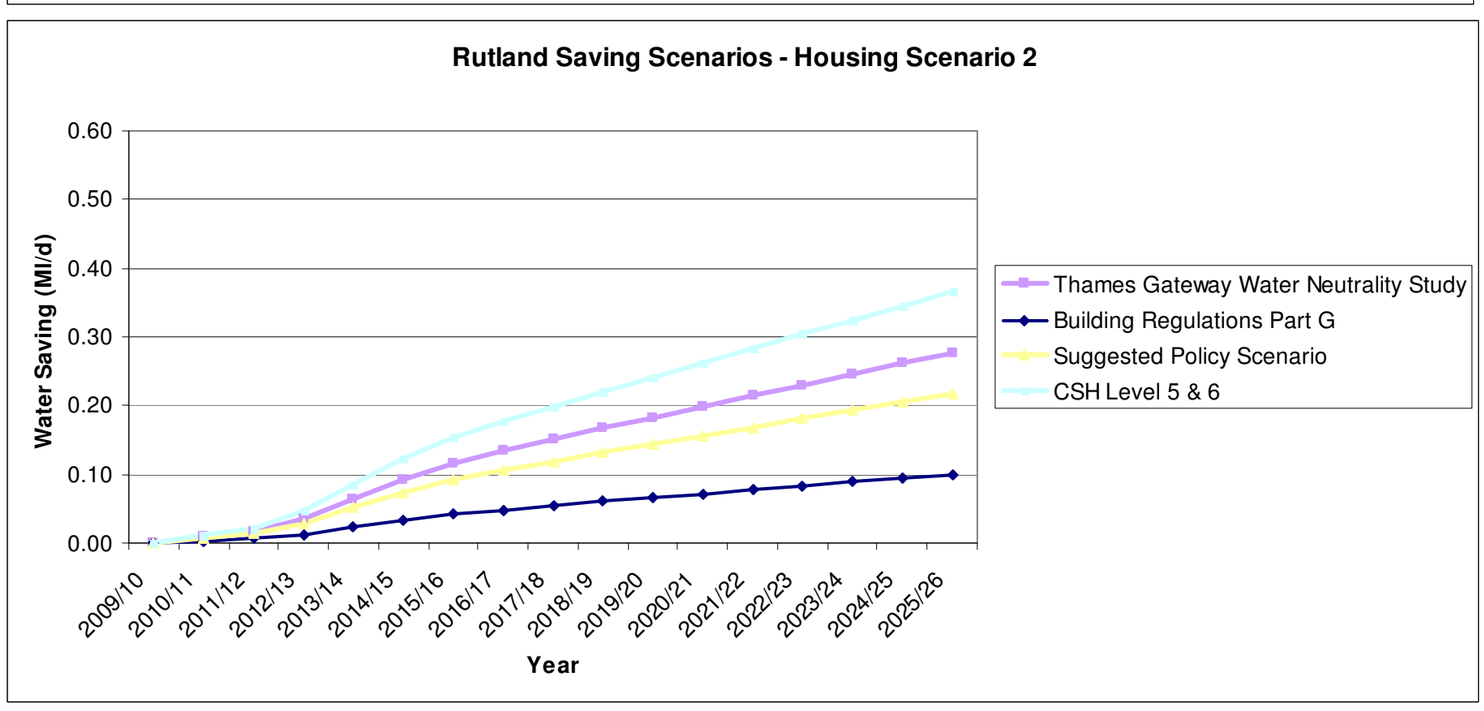
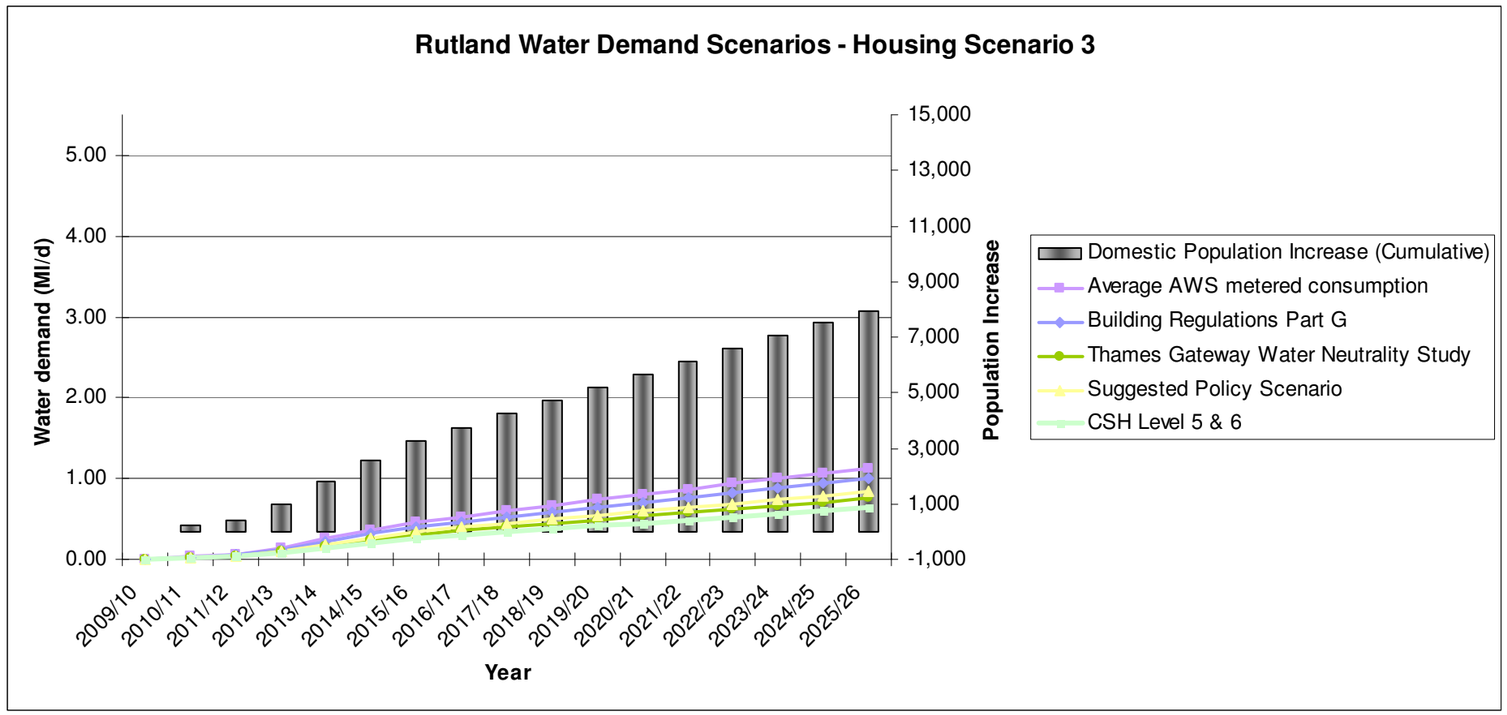
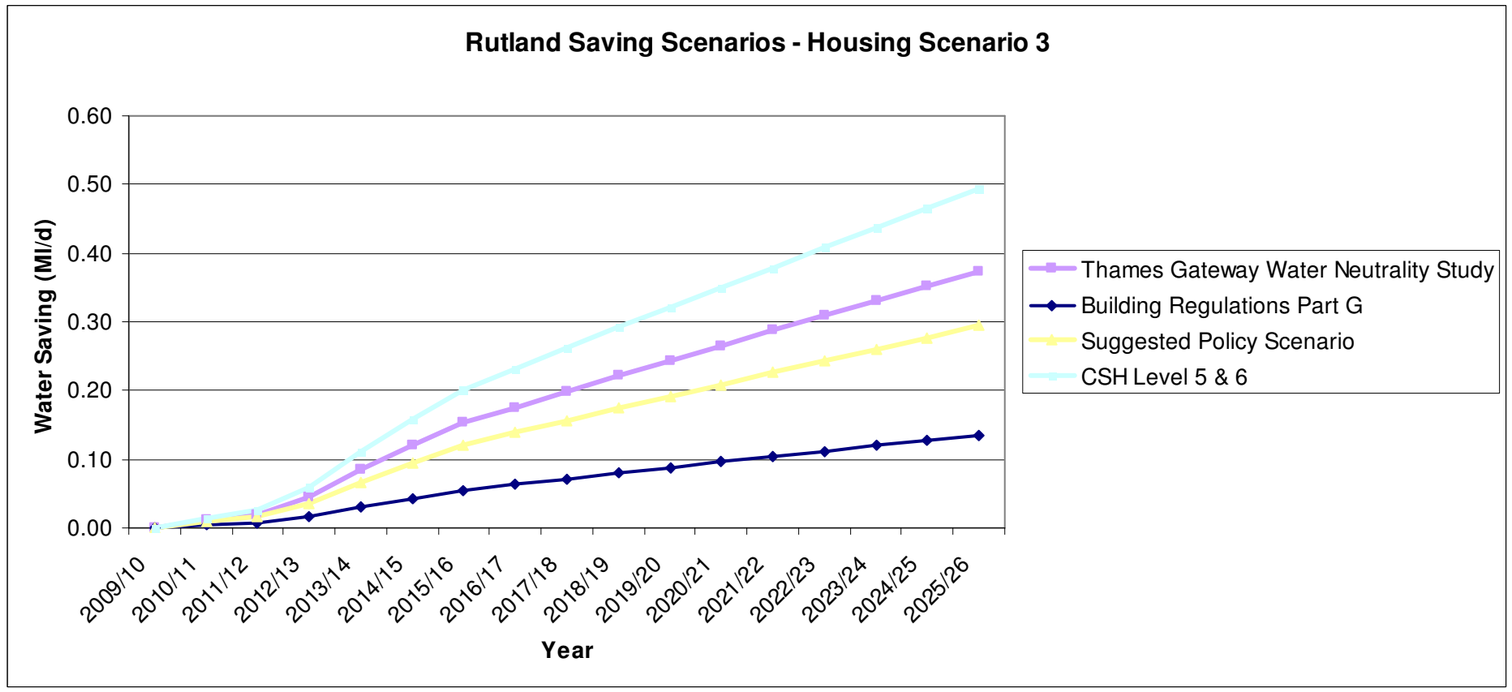


Figure 6-19: Rutland Water Demand and Saving - Housing Scenario 3





6.3.4 Water Resources Management Plans

Water companies produce WRMP on a statutory basis covering 25 year planning horizons. WRMPs set out how a water company plans to provide and invest in existing and new water resource schemes (e.g. reservoirs, desalination) to meet increases in demand for potable supply, as a result of new development, population growth and climate change over the next 25 year period.

Anglian Water WRMP

AWS's current WRMP[60] was finalised in 2010 and has been used in this WCS. The WRMP sets out how the Company intends to balance supply and demand over the next 25 years up to 2031, taking account of expected levels of per capita consumption and forecast population at a zonal level.

The study area has two WRZs:

- the southeastern part of the study area is supplied by water resources in the Lincolnshire Fens (WRZ4) water resource zone; and
- the northwestern part of the study area is supplied by water resources in the Lincoln (WRZ2) water resources zone.

The Lincoln WRZ uses groundwater resources from the Sherwood Sandstone aquifer to the west of Lincoln and local sources in the Lincolnshire Limestone aquifer to the north and south of the city. Water is imported to the zone from Elsham WTW in the South Humberside WRZ to north Lincoln. Historically the increasing nitrate level in the Lincolnshire Limestone aquifer has been managed by developing groundwater sources in the confined limestone aquifer or by blending with water from sourceworks with lower nitrate. Some sourceworks require treatment to reduce the level of iron and manganese to meet the required standards and to remove pesticides.

The Lincolnshire Fens WRZ is predominantly supplied by local abstraction from the Southern Lincolnshire Limestone aquifer. The abstraction boreholes are all located in the confined aquifer beneath the Fens, which receives recharge through the narrow outcrop that runs north–south through Stamford. The yield of boreholes in the confined aquifer is prolific and licensed abstractions are limited by the need to restrict drawdown in the aquifer to maintain confined discharges from natural springs, such as those at Horbling and Billingborough, and man-made 'wild bores' across the Fens. It is also necessary to protect the aquifer against inducing the flow of connate saline water from the east during periods of low groundwater recharge and hence low groundwater levels. A number of licences have specific conditions to restrict abstraction when water levels are low while retaining security and flexibility for public water supplies.

Severn Trent Water WRMP

STWL's WRMP[61] was published in June 2010. The plan shows that the western edge of Rutland is supplied by drinking water from STWL's East Midlands (WRZ6) Water Resource Zone, which covers Derbyshire, Nottinghamshire, Leicestershire and Rutland. Water resource issues affect both ground and surface water in this water resource zone. The WRZ uses

[60] Anglian Water, Water Resource Management Plan, Main Report, February 2010.
[61] Severn Trent Water , Water Resources Management Plan, Final version, June 2010

groundwater from the aquifer in Nottinghamshire as well as surface water abstractions from the Rivers Derwent and Dove, Carsington Reservoir and the Charnwood reservoirs. Water is also imported in to the WRZ from Anglian Water's treatment works at Wing (Rutland Water).

6.3.5 Water Resource Zone Forecast Supply-Demand Balance

In order to assess the potential environmental constraints within which future growth needs to be accommodated, it is necessary to identify the baseline situation (i.e. to identify any deficits in the forecast supply-demand balance) in each water resource zone.

Lincolnshire Fens WRZ (AWS)

The Lincolnshire Fens WRZ has a forecast deficit of available water against target headroom from early in the planning period. The Bourne Planning Zone has a forecast average deficit of 6.83 Ml/d and the Boston Planning Zone has a forecast average deficit of 4.96 Ml/d. AWS propose to meet the supply demand through the use of intra-WRZ transfers, enhanced metering and pressure reduction. The following specific schemes were proposed in the WRMP to meet the supply demand deficit:

- Covenham WTW transfer (15.6 Ml/d); and
- New Boston WTW (15.6 Ml/d).

The transfer of up to 15.6 Ml/d from Covenham WTW to the Lincolnshire Fens WTW will use existing spare capacity of potable water. It will require major reinforcement and extension of the existing transfer from Covenham reservoir in the South Humberside WRZ to the Lincolnshire Coastal WRZ. The link would complement the existing link from the South Humberside WRZ to the south of the Lincoln WRZ, developing a strategic water resources and supply network between the Lincolnshire WRZs to match that of Ruthamford WRZ with its benefits for security of supplies and resilience.

The potential new WTW close to Boston would use surface water from the Lower River Witham, supported during low flows by transfers and the increased discharges arising from Canwick WwTW from growth in Lincoln. The transfers of water are already complex, with water supplied in the Lincoln WRZ derived from water resources outside the catchment through the import of water from Rutland Water to supply Grantham, and from the Sherwood Sandstone aquifer and the River Ancholme, via Elsham WTW, to supply Lincoln. Raw water resources are then transferred from the Lincoln WRZ to the Lincolnshire Fens WRZ by the River Witham.

However, AWS's water resources strategy requires the redistribution of groundwater licences by the Environment Agency. In addition, the Environment Agency has informed AWS of the potential for sustainability changes to abstraction licences, which could result in significant sustainability reductions. These and/or a failure to successfully redistribute groundwater resources could trigger the requirement for major water resources schemes. In addition, the WRMP may need to change to reflect new estimates of water resource availability when the outputs from the latest climate change models, published in June 2009, are incorporated into groundwater and surface water resource models[62].

[62] Anglian Water, Water Resource Management Plan, Main Report, February 2010

East Midlands WRZ (STWL)

The projected supply / demand balance for STWL's East Midlands WRZ is shown to be in deficit from 2015 onwards. STWL's WRMP[63] uses a variety of planning certainty values (80%, 80%, 70%, 60%, 50% for each five year period from 2010 to 2035) to assess the baseline supply-demand balance position, which will be positive until 2015/16, and negative thereafter. At the end of AMP6 (2019/20) the supply shortfall is predicted to be 35 Ml/d and by the end of the planning period (2034/35) the supply shortfall is predicted to be 65 Ml/d.

The WRMP then identifies and evaluates the range of options available for managing the supply / demand balance over time. These options are:

- customer demand management options (the use of water by customers), including promoting water saving and conservation for domestic and non-domestic users, increased penetration levels for household metering penetration and tariff management;
- distribution options (activities between the input of water to the distribution system at the water treatment works), which include leakage management, Supply integration via new distribution links (intra company), bulk transfers of treated water (inter company), manage leakage by mains replacement or renewal, or by pressure reduction and increased and increased resilience (for example new distribution pipelines may have the added benefit of increasing the flexibility of the transfer of water around the network);
- production management options (policies targeted at activities between the point of resource abstraction and input into the distribution system), which include Treatment improvements (capacity or new process), Reducing WTW process losses and WTW maintenance; and
- resource management) options (policies affecting deployable output), which could include Construction of a new reservoir to be filled in the wetter winter months, Direct abstraction from a river or groundwater, Raw water transfers (from outside operating area), desalination, Water reuse, canal transfers and Intra company transfers.

STWL's strategy for the East Midlands is to strengthen the strategic distribution links to maximise the sustainable use of existing water resources. The key component of this is the scheme to duplicate a section of the Derwent Valley Aqueduct in order to increase its capacity to deploy water from a number of existing treatment works to locations across the WRZ.

6.4 Water Supply Infrastructure

As with the sewer network, impacts on the potable water distribution network from the proposed growth would be dependent on the exact location of the proposed development. There is limited capacity to transfer increased flows through existing towns and settlements in the existing networks (although potable water mains have more capacity than wastewater network) and there are obvious difficulties with constructing a new main through an already developed area. However, if a large new development were proposed close to an existing supply main, it would be theoretically possible to construct a new pipeline to serve the new development, with the associated costs passed on to the developer. The phasing of new infrastructure and upgrades to existing infrastructure should be considered when planning the development of large sites.

[63] Severn Trent Water , Water Resources Management Plan, Final version, June 2010

6.5 Environmental and Ecological Impact

Figure 5-8 in Section 5 shows the location of designated conservation sites.

The Wash SPA/Ramsar site and The Wash & North Norfolk Coast SAC

Part of the study area receives its potable water supply from STWL's East Midlands WRZ. The East Midlands WRZ involves Rutland Water reservoir (which is also a Special Protection Area and Ramsar site) which in turn stores water abstracted from the Rivers Nene and Welland which drains into The Wash SPA/Ramsar site and Wash & North Norfolk Coast SAC.

According to the Environment Agency's Review of Consents (RoC) for The Wash SPA/Ramsar site, the risk of impact on SPA and SAC features sensitive to changes in water levels is considered to be low, with the exception of Lagoons and common tern, which are considered to be at high risk. Water level changes could result from reduced freshwater flow inputs due to surface and groundwater abstractions. The RoC concluded that the risk of impact from both surface and groundwater abstraction on the terrestrial component of the SPA features sensitive to changes in the flow or velocity is low, whilst for SAC features (otters), it is considered medium.

Table 6-3: Triggers used to identify abstractions (daily quantities Ml/d) which are considered to potentially affect The Wash.

River Systems	Non Consumptive Abstractions[64]		Consumptive Abstractions (Summer)[65]	
	With mcf[oo]	Without mcf	With mcf	Without mcf
Principal Rivers (Great Ouse, Nene, Welland & Witham)	≥ 250	≥ 100	≥ 50	≥ 20
Other Rivers (Wolferton/Ingol, Heacham & Steeping)	≥ 100	≥ 20	≥ 10	≥ 5

Rutland Water SPA & Ramsar site

Rutland Water is heavily managed by AWS who try to balance abstraction and replenishment in line with a normal operating curve. This management has effectively created the conditions which has lead to Rutland Water being awarded its various environmental classifications. It is expected that if Rutland Water was managed in a similar fashion in the future there would be no degradation of the integrity of the site due to water resource issues alone. Although it is understood that abstraction from the reservoir is likely to increase associated with the extension at Wing Water Treatment Works (which could change in the reservoir level management regime) it is also understood that an Appropriate Assessment of the effects of increased abstraction has been will be undertaken by Anglian Water, however this was not available for the purposes of this Outline study and should be assessed further at the Detailed WCS stage.

[64] Non consumptive abstractions exclude those described below providing the operation does not involve net export to another catchment either through abstraction or residual effluent discharge. As such, TWAS operations in the Witham and GOGS operations in the Ely Ouse are considered as non-consumptive

[65] Consumptive abstractions undertaken during summer are summarised as follows with NALD codes given in parenthesis; Evaporative Cooling (080); General Cooling (120); Other high Loss (150); Spray Irrigation - Direct (400). In addition, any operation potentially involving large-scale export from the catchment should be considered as consumptive and therefore NALD codes 340, 430, 440 & 450 should be checked. As such, EOETS operations from the Cut Off Channel are considered as consumptive. Additionally, non-licensed slacker transfer operations should also be regarded as consumptive.

[66] MCF = Minimum Control Flow (often referred to as Hands Off Flow)

To meet increased water supply demand AWS has recently invested more than £115 million on:

- expanding the water treatment works at Wing;
- constructing more than 40 kilometres of new pipelines; and
- creating new wetland lagoons.

This will allow Anglian Water to abstract up to 90 million extra litres of water a day from the reservoir to meet growing demand in the region. The scheme will provide an additional 41 km of new pipeline, extension of the water treatment works at Wing, and 84 ha of lagoons and wetland areas to safeguard the large numbers and diversity of wildfowl that depend on the reservoir. The new wetland areas will be maintained by an independent water supply, ensuring that wildlife is not disturbed if water levels in the main reservoir fluctuate.

SSSIs (other than those which are already covered by the international designations above)

There are two SSSIs in South Holland District, however as Cowbit Wash SSSI is designated for its archaeological interest features rather than water dependent ecological features, it will not be considered further as part of this WCS. Surfleet Lows SSSI is one of the few remaining wet alluvial meadows in Lincolnshire which has not been subjected to agricultural improvement. Meadows of this type are now rare throughout lowland Britain and Surfleet Lows displays a typical range of meadow plants is present as well as a number of species more characteristic of coastal locations. Surfleet Lows SSSI is current in Favourable condition and it can therefore be assumed that it is not currently being adversely affected by potable water abstractions. AWS propose to meet the supply demand through the use of intra-WRZ transfers, enhanced metering and pressure reduction, which will not impact upon the interest features of the SSSI.

Rutland has numerous SSSIs but (other than Rutland Water itself) only Empingham Marshy Meadows SSSI is particularly hydrologically sensitive and it is not connected with any WwTWs or public water supply abstraction points. There are several SSSIs in South Kesteven District but only three (Baston & Thurlby Fens, Langtoft Gravel Pits and Deeping Gravel Pits) are particularly hydrologically sensitive. Of these, only Baston & Thurlby Fens SSSI is connected with the fluvial regime, but this site is not connected with any abstractions for the Public Water Supply that are likely to be subject to any increase. Horbling Fen SSSI, as with Cowbit fen, is designated for its archaeological interest features rather than water dependent ecological features and will therefore not be considered further as part of this WCS.

Shacklewell Hollows SSSI contains a range of semi-natural plant communities which have developed along the valley of a small tributary of the River Gwash. The tributary itself is a clean-water stream which drains strata of the Jurassic Lincolnshire Limestones and Northampton sands[67]. No impacts on groundwater levels and therefore on the SSSI are anticipated as a result of increased potable water demands, as the key component of STWL's water supply planning is to duplicate a section of the Derwent Valley Aqueduct in order to increase its capacity to deploy water from a number of existing treatment works to locations across the WRZ.

Therefore, no further investigation of impacts on Sites of Special Scientific Interest should be required as part of the detailed WCS.

[67] http://www.sssi.naturalengland.org.uk/citation/citation_photo/1001268.pdf

Eyebrook Reservoir SSSI lies to the west of the study area, in Leicestershire. The site is a major wetland area which combines an extensive sheet of open water with a complex of wetland and lakeside habitats including mudflats, marsh, pasture, broad-leaved woodland, and broad-leaved, mixed and coniferous plantations. In autumn and winter the site attracts large numbers of ducks most notably Wigeon, Mallard, Teal and Pochard, while in spring and autumn flocks of a wide variety of wading birds on passage use the area for feeding[68]. The site is heavily dependent on groundwater and could therefore be subject to impacts from the proposed development. However, no impacts on groundwater levels are anticipated as a result of increased potable water demands, as the key component of STWL's water supply planning is to duplicate a section of the Derwent Valley Aqueduct in order to increase its capacity to deploy water from a number of existing treatment works to locations across the WRZ.

The water resource assessment of the WCS has identified that there are water resource deficits predicted to occur over the plan period. However, the mechanisms to resolve this are identified in the Water Resource Management Plans for AWS and STWL, which have been agreed with statutory consultees including the Environment Agency and do not involve adverse effects on European sites.

6.6 Conclusions

Both AWS and STWL are predicting supply / demand balance deficits during the plan period, although both companies have proposed measures to deal with these deficits. AWS propose to meet the supply demand through the use of intra-WRZ transfers, enhanced metering and pressure reduction. STWL's strategy for the East Midlands is to strengthen the strategic distribution links to maximise the sustainable use of existing water resources. The key component of this is the scheme to duplicate a section of the Derwent Valley Aqueduct in order to increase its capacity to deploy water from a number of existing treatment works to locations across the WRZ. As the WRMPs run for a 25 year period, the proposed schemes will cover several AMP periods.

No adverse effects on designated conservation sites are anticipated as a result of these schemes and the availability of water resources should not be considered to be a constraint to development for any of the proposed development locations. Despite this, it is important that water efficiency measures be incorporated into all new development, to ensure the most sustainable use of existing resources.

As with the sewer network, impacts on the potable water distribution network from the proposed growth would be dependent on the exact location of the proposed development.

[68] http://www.sssi.naturalengland.org.uk/citation/citation_photo/1004428.pdf

7 Flood Risk Management

It is important for the WCS to include an assessment of the constraints of, and the infrastructure required to mitigate, the impacts of flood risk to proposed growth. Both flood risk to, and flood risk from development needs to be considered in the overall assessment of growth as proposed in each of the authorities' LDFs.

7.1 Flood Risk to Development

7.1.1 Planning Policy Statement 25

Planning Policy Statement 25: Development and Flood Risk (PPS25) sets out guidance and requirements for the assessment of flood risk. While this does not directly form part of the guidance for carrying out a WCS, it has been used during the production of this report. The guidance set out within PPS25 must be applied in order to address flood risk from all sources (fluvial, pluvial, tidal, groundwater, artificial and sewer).

PPS25 states that the Sequential Test must be applied by local authorities when allocating new development sites, in order to steer development away from the areas of greatest flood risk. The Sequential Test is a planning principle that seeks to identify, allocate or develop land in low flood risk zones before land in high flood risk zones. When a development type is not compatible with flood risk in a particular location, the Exception Test may be applied if there are valid reasons as to why the development should proceed, as set out in PPS25.

In addition, development in Flood Zones 3, 2 and sites greater than 1ha in area within Flood Zone 1 should be subject to a PPS25 compliant FRA. The FRA should also ensure compliance with the detailed WCS, Level 2 SFRA and SWMP. PPS25 also sets out the requirements for local authorities to carry out Strategic Flood Risk Assessments (SFRAs).

7.1.2 Strategic Flood Risk Assessments

SFRAs have been carried out for the three Councils, which have formed the basis of the assessment of flood risk presented in this WCS. The SFRA considers and maps the sources of flood risk to potential development throughout the authority areas according to the requirements of PPS25. The three SFRAs are as follows:

- South Holland District Level 2 SFRA[69], initially carried out by Royal Haskoning in 2002 and updated by Royal Haskoning in 2010;
- South Kesteven District Level 1 SFRA completed 2009[70] and Level 2 to be completed October 2010; and
- Rutland SFRA, carried out by Entec in 2009[71].

The SKDC SFRA is currently being updated and is due to be published at the beginning of 2011.

[69] South Holland District SFRA, Royal Haskoning, 2010
[70] South Kesteven District, SFRA, Entec, 2009
[71] Rutland County SFRA, Entec, 2009

7.1.3 Catchment Flood Management Plans

In addition to the SFRAs, Catchment Flood Management Plans (CFMPs) have been produced by the Environment Agency for the Welland[72] and Nene[73] catchments. The CFMPs assess inland flood risk from rivers, ground water, surface water and tidal flooding, but not coastal flooding directly from the sea as this is covered by Shoreline Management Plans (SMPs). The CFMP were published in December 2009 and the conclusions of the studies were therefore available for use within the South Holland and South Kesteven SFRAs, although not the Rutland SFRA.

The Fens policy area of the Nene CFMP is relevant to the SHDC area. The CFMP lists the following policy that is applicable to the study area;

- *Policy 4 - Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.*

The Upper Tributaries (Policy 2), Welland and Glens (Policy 2), Fenland (Policy 4), Oakham (Policy 3), Stamford (Policy 3), Spalding (Policy 4) and Surfleet (Policy 5) policy areas of the Welland CFMP are relevant to the SKDC and RCC areas. The CFMP lists the following policies that are applicable:

- *Policy 2 - Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions. This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management actions being taken so that they are proportionate to the level of risk.*
- *Policy 3 - Areas of low to moderate flood risk where we are generally managing existing flood risk effectively This policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood risk management actions, to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term.*
- *Policy 4 - Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further*

[72] River Welland CFMP, Environment Agency 2009, http://publications.environment-agency.gov.uk/pdf/GEAN1209BRIZ-e-e.pdf
[73] River Nene CFMP, Environment Agency 2009, http://publications.environment-agency.gov.uk/pdf/GEAN0909BPCD-e-e.pdf

appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

- *Policy 5 - Areas of moderate to high flood risk where we can generally take further action to reduce flood risk This policy will tend to be applied to those areas where the case for further action to reduce flood risk is most compelling, for example where there are many people at high risk, or where changes in the environment have already increased risk. Taking further action to reduce risk will require additional appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.*

7.1.4 Lincolnshire Coastal Study

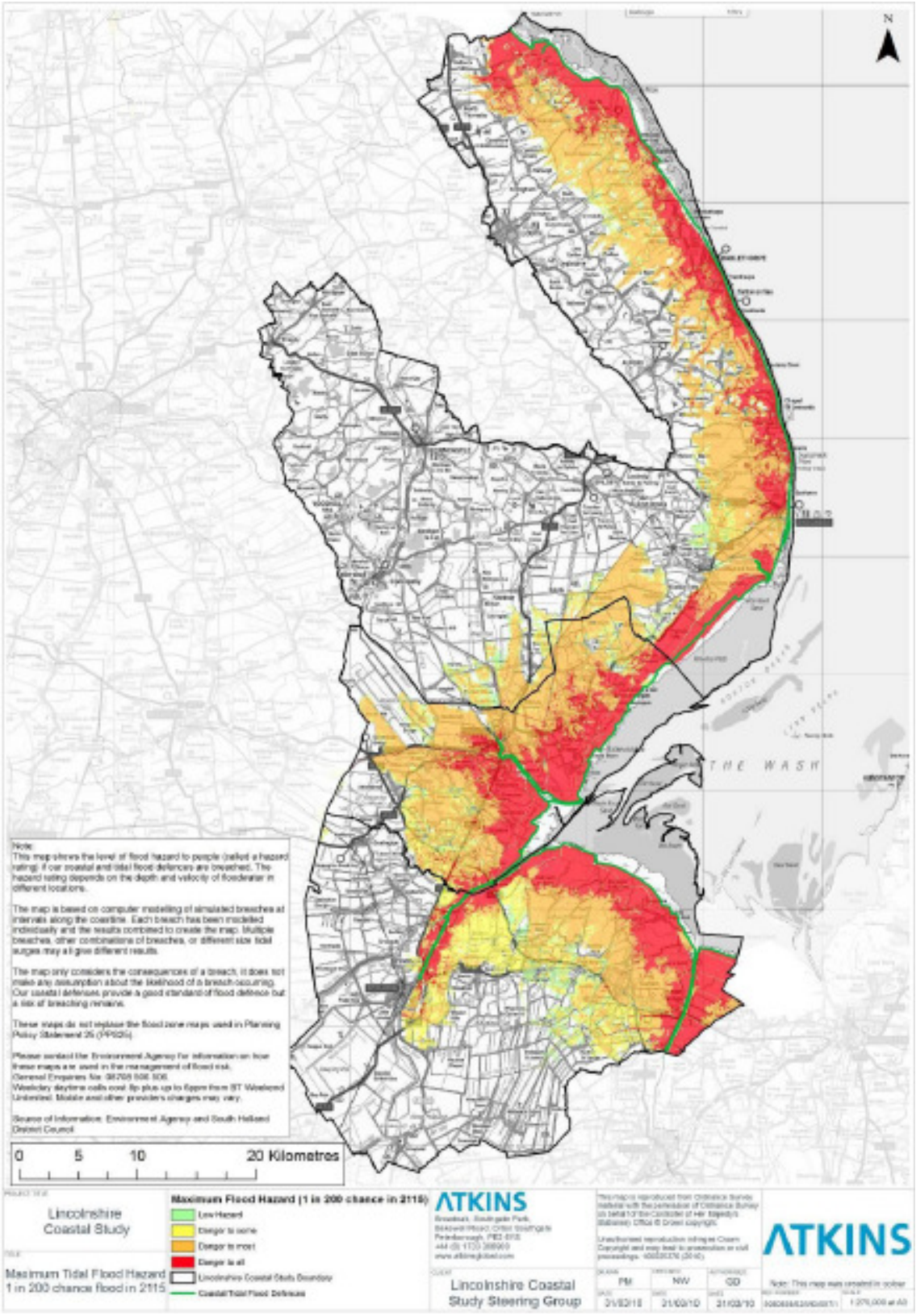
The Lincolnshire Coastal Study[74] aims to produce and evaluate a set of long-term options for the sustainable spatial development of Lincolnshire's coastal communities. In Tasks 3 and 4, a series of Principles to guide spatial development and Options for new development in the Study Area, taking into account flood risk, have been developed and evaluated using sustainability criteria. The study mapped residual flood risk, based on the following assumptions:

- Use of a 1 in 200 year return period event (0.5% annual probability event, APE);
- Use of DEFRA's guidance of October 2006 on sea level rise, which for the Lincolnshire Coast is a 1.13m rise in mean relative sea level between 2006 and 2115;
- Modelling based on breaches of defences occurring as indicated (i.e. 100% defence failure probability at the 1 in 200 year water level). This takes a precautionary view; and
- Use of modelling based on existing defences (despite the SMP policy, although the breach results would be similar whatever the defence standard of protection because they assume failure).

The study produced the mapping shown in Figure 7-1 below. It should be noted that the map only relates to breaching (which is generally more severe than overtopping). The map is largely based on the modelling commissioned by the Environment Agency for this Study, but in the area of the tidal Welland, data from South Holland District Council was also used.

[74] Lincolnshire Coastal Study, Task 3 & 4 Report: Principles and Options, Atkins 2010

Figure 7-1: Residual coastal flood hazard map



7.1.5 Key Flood Risk issues in South Holland

Both the 2010 SFRA and the 2010 Lincolnshire Coastal Study[75] concluded that the principle flood risks to the District are from the sea, from the rivers and from any shortfalls in capacity in the internal drainage network. The District is reliant on flood protection given by the various defence systems and related flood risk management measures, which currently sustain a largely satisfactory level of flood risk within the District. However, the SFRA concluded that if the currently projected effects of climate change materialise (with higher sea levels and increased river flows), but the defence systems are not upgraded from their present form, there will be significant flood risk within the District by the Year 2115, with impact in the main urban areas as well as in agricultural areas. The flood risk to people would become unacceptable. A lesser, but notable, increase in flood risk would also be apparent by the Year 2055.

The SFRA mapped this level of flood risk, to show the areas of the District which may be at risk of flooding in the future. The actual risk extent for 2055, for a 1% fluvial/0.5% tidal event probability shows the area adjacent to the coast of the Wash to be most at risk. A large area to the north west of Spalding, along with the east of the town adjacent to the Coronation Channel, is also at risk. The flood mapping for the actual risk extent for 2115, for a 1% fluvial/0.5% tidal event probability, show a much larger area of the District to be affected by flooding. The 2055 and 2115 extents are shown in Figures 7-2 and 7-3 below (taken from the SFRA). . The Lincolnshire Coastal Study also mapped residual flood risk, which shows the consequences assuming any part of the raised defences may fail, regardless of apparent standard, together with the consequences of overtopping that would occur. This gives a wider potential flood risk area than arises when considering Actual Risk, as displayed above in Figure 7-1.

The SHDC SFRA also assessed and mapped flood hazard across the District. Flood hazard is a function of the depth and velocity of flood water and is used to reflect potential danger to people that may arise during a flood event. This has been assessed using the advice given in the Defra/Environment Agency report FD2320 TR2[76]. The hazard calculation was made only for the Spalding and Sutton Bridge areas, these being the larger centres of population most exposed to a threat of flooding as well as being where most new development is envisaged.

The SFRA concluded that taken overall, under present-day conditions, the risk to people is low except, as may be expected, in the event of an extreme (0.1% AP) tidal or fluvial flood event. However, for the future 2115 scenario, the hazard within Spalding and Pinchbeck would be significant, becoming extreme around the power station area near the tidal River Welland. The area having significant hazard would extend through the site of the new hospital currently under construction near Pinchbeck Road. In the Sutton Bridge area, the town centre and parts near the power station would have a hazard rating of extreme. Overall, the hazard ratings show that the risk to people would become unacceptable in the future if the assumed climate change effects materialise and no measures are taken to counter them.

[75] Lincolnshire Coastal Study, Task 3 & 4 Report: Principles and Options, Atkins 2010

[76] R & D Technical Report FD2320/TR2.Flood Risk Assessment Guidance for New Development Phase 2 – Full Documentation and Tools. Defra/Environment Agency, October 2005

Figure 7-2: actual risk extent for 2055, for a 1% fluvial/0.5% tidal event probability

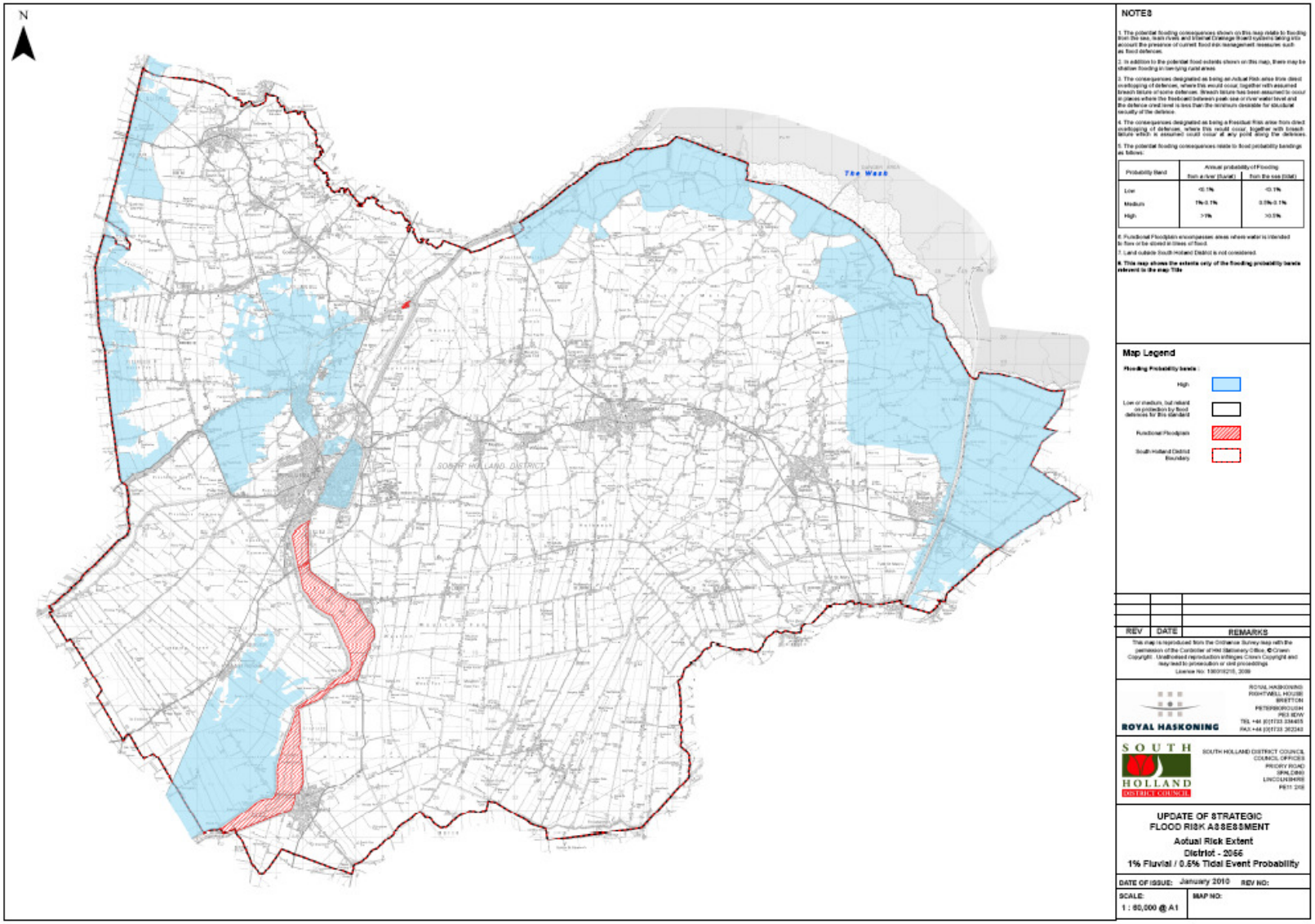
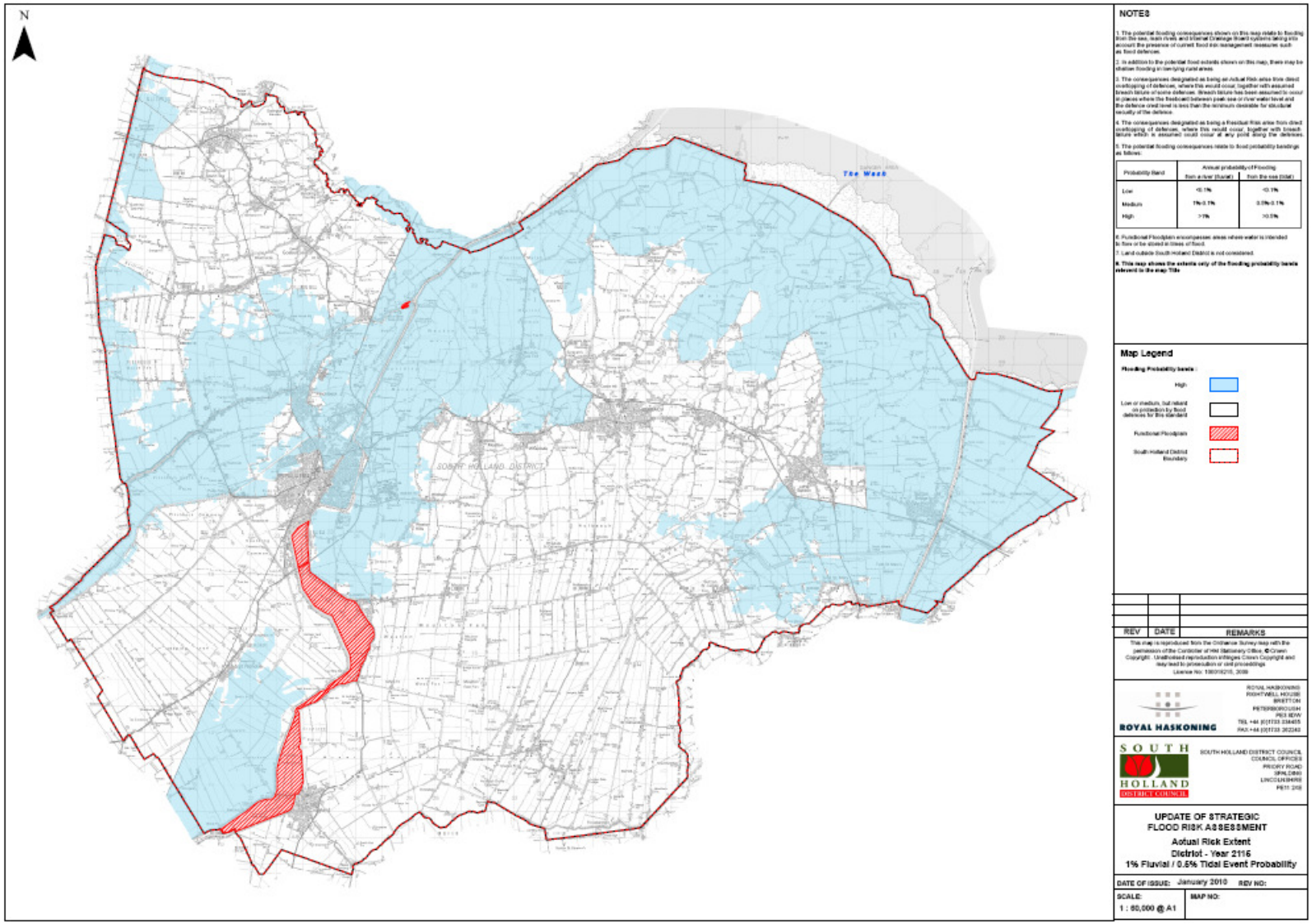


Figure 7-3: actual risk extent for 2115, for a 1% fluvial/0.5% tidal event probability



7.1.6 Key Flood Risk issues in South Kesteven

The SFRA concluded that the areas most at risk from fluvial flooding were associated with the main rivers systems in the District, namely the Catchment of the Welland and the Witham (including tributaries). There are also some areas of surface water flood risk, associated with inadequate or blocked drainage, and groundwater flooding or infrastructure failure.

The SFRA mapped the Flood Zones in the South Kesteven District, as shown below in Figures 7-4 and 7-5 (taken from the SFRA). These maps shows the flood risk to be limited to narrow strips adjacent to the main river channels and a larger area to the east of the District, along the border with South Holland District. This area is associated with the low lying Fen area to the east and reflects the extensive areas of Flood Zone 3 located here.

Figure 7-4: Flood Zones in South Kesteven District – north

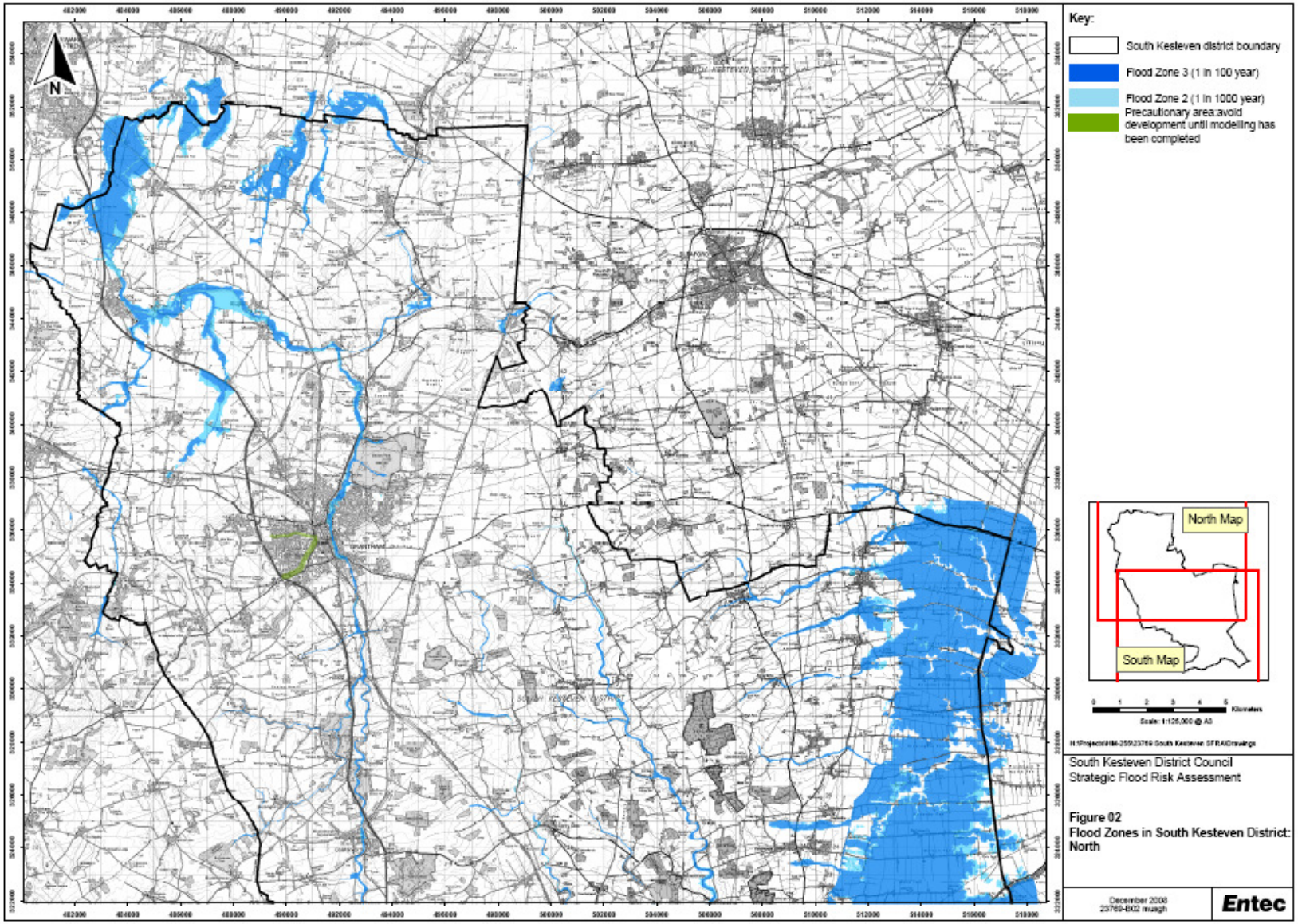
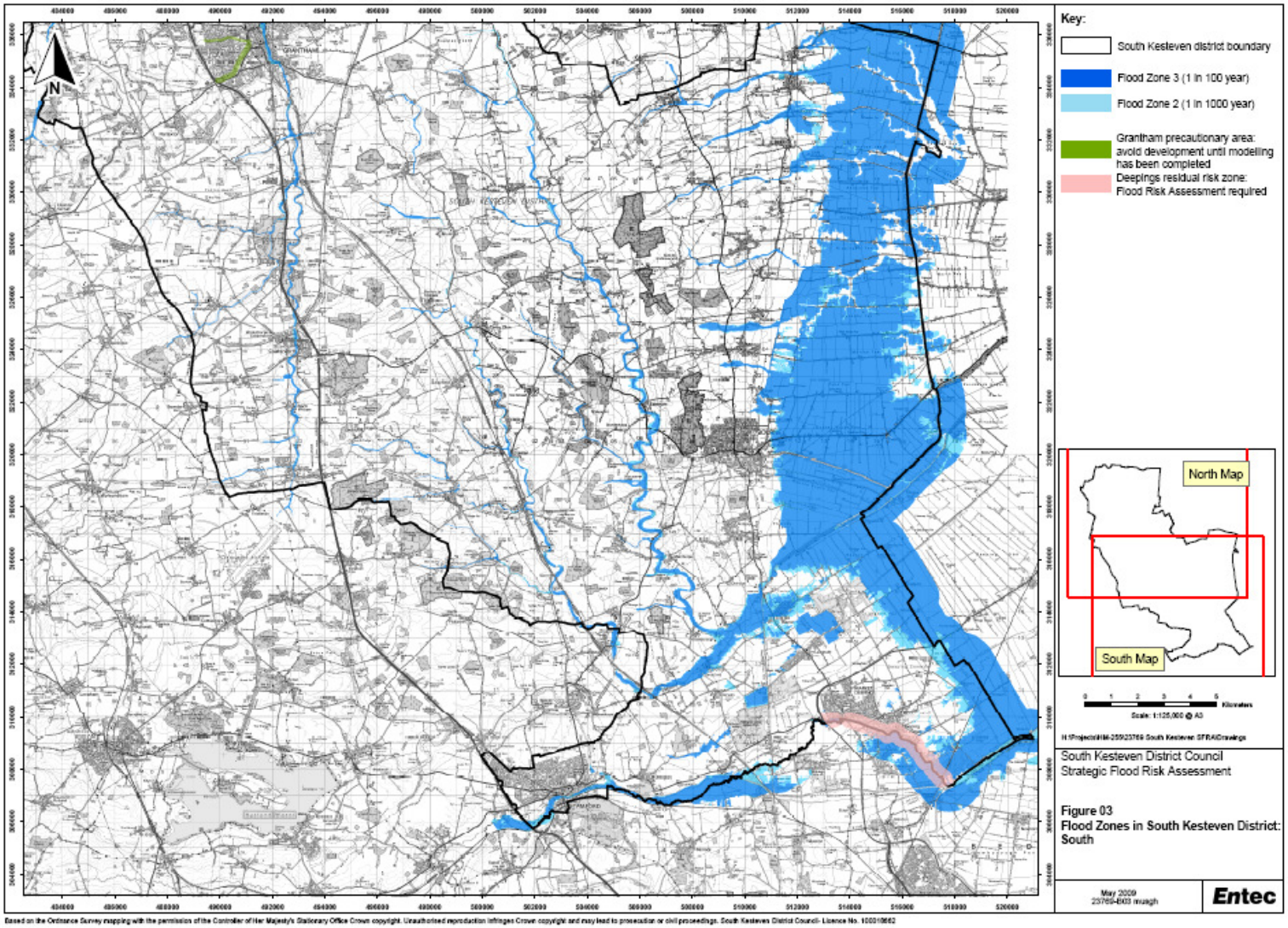


Figure 7-5: Flood Zones in South Kesteven District – south

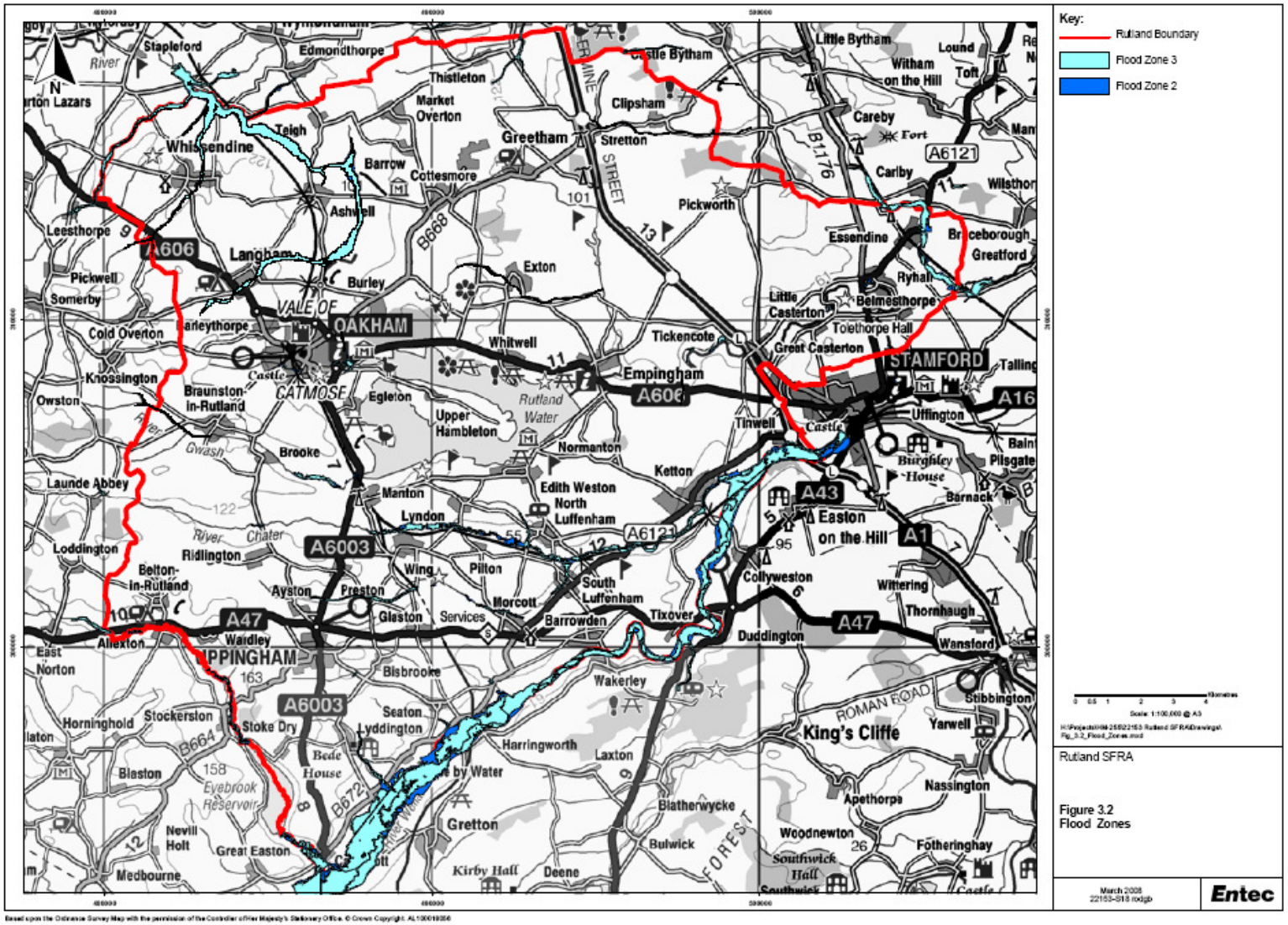


7.1.7 Key Flood Risk issues in Rutland

Flood mapping produced for the SFRA indicated that fluvial flood risk is of limited spatial extent within the County and that the majority of the higher risk Flood Zones (2 and 3) are located in rural areas away from the built environment. See Figure 7-6 below (Taken from the SFRA). There are a few small settlements where the flood map shows properties at risk and these include Langham, Whissendine, Cottesmore, Ryhall, Ketton and parts of Oakham.

The SFRA has shown that there is the potential for quite extensive flooding along the main River Welland; however this does not constitute a major risk to existing development as there are minimal receptors in the floodplain. Much of Rutland is located in upland areas with many small watercourses in well defined channels. As such, Flood Zones are limited in extent and it is likely that there is sufficient room for new development to be located outside of higher risk Flood Zones. Residual risk from reservoir dam failure has been a considered within the SFRA. The SFRA advised against development downstream of raised reservoirs such as Rutland Water and Eyebrook Reservoir.

Figure 7-6: Flood Zones in Rutland County



7.2 Flood Risk from Development – Surface Water Management

Surface Water Management is a key consideration when assessing development within large areas. PPS25 requires that new development does not increase the risk of flooding elsewhere by managing surface water runoff generated as a result of developing land. Altering large areas of land by urbanising it fundamentally alters the way in which rainfall drains to watercourses and has the potential to increase the rate and amount of water that enters watercourses causing an increase in flood risk.

Surface water management is a key consideration in the study area due to the fact that a large proportion of land put forward for development, particularly within the South Holland District, will be within areas where surface water runoff is managed via complex pumping systems to ensure that surface water flooding does not inundate generally low lying urban areas and high grade agricultural land. New development must consider the impact of further urbanisation on the existing pumped system, and discharge of surface water must be mitigated within the pumped limitations of the drained system.

In many cases, the management of surface water is achieved via a requirement to restrict runoff from developed sites to that which occurs from the pre-development site usage and this is achieved by incorporating a range of Sustainable Drainage Systems (SuDS) which aim to maximise the amount of rainwater which is returned to the ground (infiltration) and then to hold back (attenuate) excess surface water. Incorporating SuDS often requires a large amount of space and for large developments often requires the consideration of large scale strategic features such as balancing ponds which can attenuate and store large volumes of water generated during very heavy rain storms to prevent flood risk downstream. It is therefore essential that surface water drainage is managed separately from wastewater, both to reduce impact on the existing combined system and to meet the requirements of national and regional policy.

At the present point in the planning process, it has not been possible to determine outline requirements of the SuDS features that could be possible at each of the growth areas. This is because specific site details are not known and hence it is not possible to consider potential sizes of surface water attenuation features or specific topographic/geological constraints at each site. However, a strategic scale SuDS suitability assessment has been undertaken for growth towns.

7.2.1 Internal Drainage Boards

The Environment Agency has jurisdiction over designated main rivers under the Water Resources Act 1991 (WRA) and the Land Drainage and Sea Defence Byelaws. Under the above legislation, Flood Defence Consent is required prior to the erection of any structure in, over or under a watercourse which is part of a main river, (indicated with a red line as part of the Flood Zones held by the Local Planning Authority), and any work carried out within 9 metres of the bank of a main river. This is to ensure that they neither interfere with our work, nor adversely affect the environment, fisheries, wildlife and flood defence in the locality.

Under Section 23 of the Land Drainage Act 1991, Flood Defence Consent is also required for any works that affect the flow, (I.e.; culverting, weirs or dams), of an Ordinary watercourse (i.e. non-main river).

There are numerous Internal Drainage Boards (IDBs) within the study area, which are responsible for the maintenance and management of certain watercourses, usually heavily managed and often pumped systems, which do not fall under the jurisdiction of the Environment Agency.

The following IDBs were consulted as part of this WCS:

- South Holland IDB;
- Black Sluice IDB;
- Upper Witham IDB;
- Welland and Deepings IDB;
- Witham First IDB;
- Kings Lynn IDB;
- North Level IDB.

Comments received from the Upper Witham IDB[77] has indicated the following points which they would wish to see taken into consideration when designing drainage systems and carrying out site specific FRAs:

- SuDS systems are now expected in all cases. Emphasis should be given to future maintenance needs and that systems must be practical.
- In addition the Board wishes to highlight the premise within PPS25 where developers, where possible, reduce flood risk overall (paragraph 22) and that, as far as is practicable, surface water arising from a developed site should be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development (paragraph F6). This should be considered whether the surface water discharge arrangements from the site are to connect to a public or private sewer before outfalling into a watercourse or to outfall directly into a watercourse and should be considered as a minimum requirement (see below).
- Consideration should be given to the premise that developers should be required to design to stricter criteria, for example the area of hardstanding/roof area should be increased by a percentage to allow for permitted development rights, such as conservatories, extensions etc. This should be considered during the design of any drainage system for a proposed new development.
- For previously developed and brownfield sites, where a new connection to a watercourse is proposed (either directly or via a surface water sewer), the maximum discharge rate should be equal to greenfield runoff rate.
- A minimum 30% reduction to existing discharge rates up to a 1 in 100 year (1% annual probability) is expected to be achieved for those sites with an existing connection to a watercourse or a sewer that discharges to a watercourse.
- For greenfield sites, where a new connection to a watercourse is proposed (either directly or via a surface water sewer), the maximum discharge rate should be less than greenfield runoff rate.

[77] Kenneth J Pratt, Engineer to Board, Upper Witham IDB, Personal Communication, 7th July 2010.

- For discharges of foul effluent to a watercourse, the rates of discharge from this source must be included within the surface water discharge rates for the site as a whole and not be in addition to such rates.

It should be noted that the above requirements for restriction of run-off rates are over and above the requirements of PPS25. However, consultation with the relevant IDBs is essential when planning new developments which drain to an IDB watercourse.

Comments received from South Holland IDB[78] also indicated that maintenance of SuDS was a concern for the IDB. Maintenance agreement must be made before properties are sold, to ensure that the systems are correctly maintained. Without regular upkeep, some SuDS systems can become ineffective in as little as 10 years. The IDB indicated that it would prefer to see new development connected to an IDB drain, as then future maintenance could be guaranteed.

While these comments are noted, the 2010 Flood and Water Management Act makes the Lead Local Flood Authority (in this case – Rutland and Lincolnshire County Councils) responsible for adopting and maintaining SuDS. This will supersede the above comments made by Upper Witham and South Holland IDBs.

It was also noted that in areas with a high water table SuDS could exacerbate any existing groundwater flooding issues, although no examples of settlements where this may be a particular issue were given.

No comments were received from the other IDBs that were consulted for this WCS.

7.2.2 SuDS suitability

In order to give an indication of SuDS suitability for the WCS, the likely capacity for infiltration type SuDS for the growth towns has been considered. A high level assessment has therefore been made based on the geological conditions of the main growth areas as a whole. In summary the assessment has been made on the following criteria:

- the presence of an aquifer underneath the site and the requirement to protect groundwater used as potable supply through the designation of SPZs; and
- the rate at which water is able to pass through the soil and underlying geology (referred to as its permeability).

Due to the reliance of the southern area of the study area on abstractions from groundwater, consideration of the protection of groundwater from pollution as a result of above ground development is a key and hence the SuDS suitability assessment has used information on 'Source Protections Zones' and areas of 'Groundwater Vulnerability'.

The SFRAs have been used in this WCS to inform the assessment of SuDS type and this assessment is included within section 9 of this report (Growth Towns Assessments) where the water environment and water infrastructure constraints for each key growth location are summarised.

[78] Carl Vines, Drainage Engineer, South Holland IDB, Personal Communication, 17th June 2010.

7.2.3 South Holland

The western part of the District, broadly west of Holbeach, is underlain by Oxford clay, with Ampthill clay/Kimmeridge clay underlying the eastern part. This solid geology is at a considerable depth below the surface. Above it, the geology is classified as alluvium, with areas of peat near the South Forty Foot Drain and in the very south of the District. The surface soils are fenland in character, predominantly deep silty clay or clay.

As the geology underlying this district is predominantly clay and not able to readily transmit water there are no designated aquifers. Given the impermeable nature of the geology, attenuation SuDS are likely to be the most commonly used for new developments. These could include wetlands, attenuation ponds and/or basins. In some places it may be possible to use a combination of attenuation and infiltration techniques but this would be subject to a ground investigation.

7.2.4 South Kesteven

There is a band of limestone aquifer running through the District, from the eastern edge of Grantham to Stamford in the south. There are a number of springs located in this area and flooding may develop in low-lying areas when high groundwater levels reach the surface, although some areas are overlain by less permeable drift deposits. Either side of the limestone band, to the west and east, the geology is dominated by clays and mudstones, although there are areas where permeable drift and superficial sediments are found near the surface. As the geology in this area varies all the SuDS techniques may be suitable and a ground investigation will be needed to determine the indicative permeability underlying a site.

In the southeast of the District, around the Deepings, the superficial geology is dominated by permeable sands. In this area it is likely that the underlying geology would be suitable for the use of infiltration SuDS that could include permeable paving, infiltration trenches or filter drains. Although, it is likely that these areas are also located on a designated “principal or secondary aquifer” and restrictions on the discharge to it are likely to be imposed specifically to a site.

7.2.5 Rutland

The geology underlying Oakham consists largely of Jurassic Lias Clays and Marlstones. Clays are present particularly in areas upstream of Oakham. The relatively impermeable nature of the geology gives rise to rapid runoff following heavy rain.

In areas such as western Rutland with large areas of impermeable geology attenuation SuDS are likely to be the most commonly used for new developments. These could include wetlands, attenuation ponds and/or basins. In some places it may be possible to use a combination of attenuation and infiltration techniques but this would be subject to a ground investigation.

7.3 Flood Risk from Development - Increased WwTW Discharges

Increased discharges from WwTW due to development may adversely affect flood risk downstream. PPS25 requires that there is no increase in flood risk downstream due to development. Mitigation measures may be required where:

- there is a quantifiable increase in frequency of spill from storm storage tanks due to additional foul flows; or

- the receiving watercourse and associated flood risk area is particularly sensitive to changes in flows.

AWS should consult with the Environment Agency to identify and agree an appropriate policy for identifying suitable locations and methods for mitigation measures. For example, mitigation for the increase in treated wastewater flows could be to provide additional storage volume in any flood attenuation facilities near to the WwTW. To allow further evaluation of options for combining storage in strategic flood attenuation facilities, the approximate volume of compensation storage that could mitigate the increase in flows from each WwTW should be estimated within the detailed Water Cycle Study. The potential impacts should be assessed for the treatment works that will receive most of the projected growth.

7.4 Climate Change

Climate change impacts such as changing rainfall patterns and increased river flows and sea levels are key considerations to future flood risk, surface water management and development planning throughout the study area. Climate change is the main driver for increasing future flood risk in the South Holland, South Kesteven and Rutland area.

The Welland and Nene CFMPs and the three SFRAs produced for each of the client authorities have taken climate change into consideration, in accordance with the requirements of PPS25. The flood and hazard mapping used for this WCS therefore includes the effects of climate change, as does the overall assessment of flood risk and within this WCS.

7.5 Conclusion

Due to the low lying nature of the eastern part of the study area and the presence of pumped watercourses, there are large areas of the study area that lie within Flood Zones 2 and 3. In accordance with PPS25 and the Sequential Test, development should be directed away from areas of flood risk and new development should be located in Flood Zone 1. Residential development should not be located in Flood Zones 2 and 3 unless there are no suitable sites available in Flood Zone 1. If there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development (according to Table D.2, Annex D of PPS25) can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3.

Reference should be made to the mapping contained within the SFRAs for each of the Districts and the Lincolnshire Coastal Study, to ensure planned development is located away from the areas of flood risk; see section 9 below for an individual assessment of flood risk to the proposed growth locations. In addition, site specific Flood Risk Assessments will be required for all proposed development sites within Flood Zones 2 and 3, and for all sites in Flood Zone 1 which are greater than 1 hectare in area.

In all areas, consideration should be given to the risk of increased flood risk from the development. Foul and surface water should be separated wherever possible, to reduce the flows to be treated at WwTW. Surface water should be attenuated and treated with SuDS, using the hierarchy given in section 7.3 above. The future maintenance needs for SuDS systems must be considered, as must the practicality of systems. Consultation with the Environment Agency and/or the relevant IDBs should be undertaken on a site specific basis, to ensure run-off rates to watercourses are acceptable and will not increase the risk of flooding elsewhere.

8 Growth Locations Assessment

8.1 Introduction

The WCS report has identified constraints in terms of proposed growth within South Holland, South Kesteven and Rutland in relation to the six key 'water cycle' areas:

- water resources;
- wastewater treatment;
- wastewater transmission;
- ecology;
- flood risk; and
- surface water management.

The resultant outcome was the formulation of a constraints matrix for each of the key development areas. The matrix has been designed so that the amount of subjective interpretation of the data is minimised, and hence the traffic lights allocated are based on factual and quantitative data where possible.

The most relevant and important constraints have been identified to aid in the assessment of development within South Holland, South Kesteven and Rutland. For the purpose of the constraints matrices these were amalgamated and put into generic colour coded categories, as outlined in the following town assessments.

In relation to above colour coding, it is important to note that a colour coding of red does not necessarily mean that the proposed development cannot take place, merely that if development were to take place here greater, more significant, and potentially costly constraints would have to be overcome which would likely involve a higher level of infrastructure investment or greater strategic planning.

The constraints matrix and traffic light colour coding has been applied to each of the major settlements in the South Holland, South Kesteven and Rutland where significant levels of growth are proposed, as described further in the subsequent sections and shown below in Table 8-1.

Table 8-1: Generalised Constraint Traffic Lights

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management & SuDS Potential	Surface Water Management
There is an existing raw water source with spare licence capacity, and/or There is water available based on CAMS Methodology Classification.	The development can be accommodated within existing available headroom at WwTW and in wastewater network. Existing River Quality classification is High/Good under Water Framework Directive.	No environmental constraints were identified or development levels are considered sufficiently small that they are unlikely to materially increase impacts on European sites.	There is little or no perceived risk of flooding to the development area.	The site is Groundwater Source Protection Zone 3 (therefore more suitable for infiltration SuDS) or has permeable underlying geology
There is an existing raw water source but with no spare capacity and/or There is no water available based on CAMS Methodology Classification.	WwTW has capacity to accommodate the proposed development but the wastewater network is unlikely to have the capacity and therefore may need upgrading. Preliminary assessment suggests that minor upgrade of existing WwTW will suffice to accommodate housing option. Existing River Quality classification is Moderate under Water Framework Directive.	Medium risk of significant adverse effects as a result of development. Site is downstream of or in close proximity to European sites and may impact upon site if not mitigated.	There is a perceived medium risk of flooding to the development area.	The site is in Groundwater Source Protection Zone 1 or 2 with moderately or has variably or impermeable underlying geology
There is no existing raw water source nearby and/or; Water sources are over abstracted/over licensed based on CAMS Methodology Classification.	Major/significant upgrade of WwTW and/or wastewater network is required to accommodate the proposed development. Pumping of wastewater is required to transfer it to a WwTW with spare capacity. Existing River Quality is Poor/Bad under Water Framework Directive.	High risk of significant adverse effects as a result of development. Site is downstream of or in close proximity to European sites and is likely to impact upon site if not mitigated.	There is a perceived high risk of flooding to the development area.	SuDS provision should not be considered to be an absolute constraint to development.

8.2 South Holland District

The following areas were assessed because they have been identified as settlements with a proposed growth of greater than 50 houses or with a cumulative impact on an individual works of 50 houses, including existing commitments, as presented in Table 8-2. Some of these growth areas are connected to a common wastewater treatment works and so the assessments are the same; this has been highlighted in the text and also presented in Table 8-2.

Table 8-2: Growth locations in the South Holland District and relevant WwTW catchment

Growth Location	WwTW Catchment	Growth Location	WwTW Catchment	Growth Location	WwTW Catchment
Cowbit	Cowbit	Gosberton	Gosberton	Spalding (including Pode Hole)	Spalding
Crowland (including Postland)	Crowland	Holbeach	Holbeach	Surfleet	Spalding
Donington	Donington	Long Sutton (including Crosses)	Sutton Bridge	Sutton Bridge	Sutton Bridge
Fleet	Holbeach	Moulton (including Loosegate)	Moulton	Weston (including Wykeham)	Moulton
Gedney	Holbeach	Pinchbeck	Spalding	Whaplode (including Saracens Head and Shepeau Stow)	Moulton

Summary tables of the assessments for each of the growth areas in South Holland District are given in Tables 8-3 to 8-17 below.

Table 8-3: Cowbit

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Cowbit WwTW would have the capacity to accommodate the small amount of growth proposed.	The site lies upstream of the Wash & North Norfolk Coast Natura 2000 site. However, any increases in flow from Spalding WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Cowbit Wash SSSI lies upstream of the works and is designated for its archaeological features; it will therefore not be affected by the proposed growth.	Cowbit lies with EA Flood Zones 1, 2 and 3, with the majority of the village in EA Flood Zone 2. It is reliant on flood managements such as pumped drainage system and flood storage areas such as Crowland and Cowbit Washes. Cowbit lies adjacent to the Crowland and Cowbit Washes and there is therefore a residual risk of flooding to the village in the event of a failure of flood defences. This should be taken into account in site specific FRAs for individual developments. Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-4: Crowland (including Postland)

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	This outline assessment has found that Crowland WwTW has volumetric capacity to accommodate housing scenario 1 within the limits of the current consent conditions. However, to accommodate housing scenarios 2 and 3 it will need to increase in DWF consent (see Table 5-5). The shortfall in volumetric capacity is small (10 m^3/d for scenario 2 and 70 m^3/day for scenario 3) and is therefore likely to occur towards the end of the plan period (2020-2026).	The site lies upstream of the Wash & North Norfolk Coast Natura 2000 site. However, any increases in flow from Crowland WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Crowland lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. It is reliant on flood managements such as pumped drainage system and flood storage areas such as Crowland and Cowbit Washes. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-5: Donington

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	This outline assessment has shown that Donington WwTW does not have sufficient volumetric capacity for the proposed growth in the current consent limits. It will need to increase in DWF consent (see Table 5-5). The shortfall in volumetric capacity will occur from the start of the plan period, as a variation to increase the consented DWF is already proposed. This variation relates to the current flow at the works (and seasonal variations) and does not consider growth and the works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Donington WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Donington lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. It benefits from a flood risk management system comprising of a pumped drainage system, flood defences and flood storage areas. The SFRA concluded that if the currently projected effects of climate change materialise (with higher sea levels and increased river flows), but the defence systems are not upgraded from their present form, there will be significant flood risk within the District by the Year 2115. Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-6: Fleet

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	This outline assessment has found that Holbeach WwTW has volumetric capacity to accommodate housing scenarios 1 and 2 within the limits of the current consent conditions. However, to accommodate housing scenario 3 it will need to increase in DWF consent (see Table 5-5). The shortfall in volumetric capacity is small (49 m^3/day for scenario 3) and is therefore likely to occur towards the end of the plan period (2020-2026).	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Holbeach WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Fleet lies entirely within EA Flood Zone 3 and has therefore been assessed as having greater than a 0.5% (1 in 200 year) of flooding from tidal sources. Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-7: Gedney

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	This outline assessment has found that Holbeach WwTW has volumetric capacity to accommodate housing scenarios 1 and 2 within the limits of the current consent conditions. However, to accommodate housing scenario 3 it will need to increase in DWF consent (see Table 5-5). The shortfall in volumetric capacity is small (49 m^3/day for scenario 3) and is therefore likely to occur towards the end of the plan period (2020-2026).	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Holbeach WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Gedney lies entirely within EA Flood Zone 3, although the SFRA mapped actual risk from flooding, which showed that the area to the west of the town is defended to the 1 in 100 year standard. Development within the town will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-8: Gosberton

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Gosberton WwTW would have the capacity to accommodate the small amount of growth proposed.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Gosberton WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Gosberton lies within EA Flood Zone 1, 2 and 3, although it benefits from a flood risk management system comprising of a pumped drainage system, flood defences and flood storage areas. The SFRA concluded that if the currently projected effects of climate change materialise (with higher sea levels and increased river flows), but the defence systems are not upgraded from their present form; there will be significant flood risk within the District by the Year 2115. Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-9: Holbeach

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	This outline assessment has found that Holbeach WwTW has volumetric capacity to accommodate housing scenarios 1 and 2 within the limits of the current consent conditions. However, to accommodate housing scenario 3 it will need to increase in DWF consent (see Table 5-5). The shortfall in volumetric capacity is small (49 m^3/day for scenario 3) and is therefore likely to occur towards the end of the plan period (2020-2026). However, it should also be noted that there is a proposed first time rural sewerage for Holbeach in AMP5. If this scheme goes ahead, it could use up the majority of the spare capacity at Holbeach WwTW.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Holbeach WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Holbeach lies partially within EA Flood Zone 1 (less than 0.1% (1 in 1000 year) risk of flooding but predominantly within Flood Zone 3 (greater than 0.5% (1 in 200 year) risk of tidal flooding). Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-10: Long Sutton (including Sutton Crosses)

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	This outline assessment has indicated that Sutton Bridge WwTW has sufficient consented volumetric capacity to accommodate the prospective growth in Long Sutton.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Sutton Bridge WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Long Sutton lies entirely within EA Flood Zone 3 and has therefore been assessed as having greater than a 0.5% (1 in 200 year) of flooding from tidal sources. Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-11: Moulton (including Loosegate)

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Moulton WwTW would have the capacity to accommodate the small amount of growth proposed.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Moulton WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Moulton lies partially within EA Flood Zone 1 (less than 0.1% (1 in 1000 year) risk of flooding, partially within Flood Zone 2 (between 1 in 200 annual probablitiy of sea flooding (0.5% and 0.1%) and partially within EA Flood Zone 3 (greater than 0.5% (1 in 200 year) risk of tidal flooding). Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-12: Pinchbeck

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Spalding WwTW has headroom for approximately 30,019 households in its current DWF consent. The sanitary determinand limits on the consent are very relaxed (120 mg/l BOD & 60A mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Spalding WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Pinchbeck lies entirely within EA Flood Zone 3 and has therefore been assessed as having greater than a 0.5% (1 in 200 year) of flooding from tidal sources. Development within the village will be affected by the outcomes of the Coastal Strategy. Hazard mapping shows the hazard within Pinchbeck in 2115 to be significant. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-13: Spalding (including Pode Hole)

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Spalding WwTW has headroom for approximately 30,019 households in its current DWF consent. The sanitary determinand limits on the consent are very relaxed (120 mg/l BOD & 60A mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Spalding WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Spalding lies entirely within EA Flood Zone 3, although the SFRA mapped actual risk from flooding, which showed that the area to the west of the town is defended to the 1 in 100 year standard. However, there is a residual risk of flooding in the event of a failure of defences. Development within the town will be affected by the outcomes of the Coastal Strategy. Hazard mapping shows the hazard within Spalding in 2115 to be significant. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-14: Surfleet

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Spalding WwTW has headroom for approximately 30,019 households in its current DWF consent. The sanitary determinand limits on the consent are very relaxed (120 mg/l BOD & 60A mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Spalding WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Surfleet lies entirely within EA Flood Zone 3 and has therefore been assessed as having greater than a 0.5% (1 in 200 year) of flooding from tidal sources. Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-15: Sutton Bridge

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Sutton Bridge WwTW has headroom for approximately 7,265 households in its current DWF consent. The sanitary determinand limits on the consent are very relaxed (230 mg/l BOD & 230A mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Sutton Bridge WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Sutton Bridge lies entirely within EA Flood Zone 3 and has therefore been assessed as having greater than a 0.5% (1 in 200 year) of flooding from tidal sources. Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-16: Weston (including Wykeham)

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Moulton WwTW would have the capacity to accommodate the small amount of growth proposed.	The site lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Moulton WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	The majority of Weston lies within EA Flood Zone 1 and has therefore been assessed as having less than 0.1% annual probability of flooding. However, some areas of Weston lie with EA Flood Zone 2 or 3. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-17: Whaplode

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. Calculations indicate that the 'business as usual' projection (Projection 1) of metered water consumption would require between 1.73 and 3.73 Ml/d by 2026. This compares with the recommended policy projection (Projection 5), which would require between 1.28 and 2.76 Ml/d by 2026.	Moulton WwTW would have the capacity to accommodate the small amount of growth proposed.	Whaplode lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Moulton WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Whaplode lies partially within EA Flood Zone 1 (less than 0.1% (1 in 1000 year) risk of flooding and and partially within EA Flood Zone 3 (greater than 0.5% (1 in 200 year) risk of tidal flooding). Development within the village will be affected by the outcomes of the Coastal Strategy. Developers should consider the SHDC SFRA for further site specific information and development should be subject to a site specific FRA	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

8.3 South Kesteven District

The following areas were assessed because they have been identified as settlements with a proposed growth of greater than 50 houses or with a cumulative impact on an individual works of 50 houses, including existing commitments, as obtained from the Districts LDF and presented in Table 8-18. Some of these growth areas are connected to a common wastewater treatment works and so the assessments are the same; this has been highlighted in the text and also presented in Table 8-18.

Table 8-18: Growth locations in the South Kesteven District and relevant WwTW catchment

Growth Location	WwTW Catchment	Growth Location	WwTW Catchment
Bourne	Bourne	Colsterworth	Colsterworth
Deepings (Deeping St. James and Market Deeping)	Deeping	Corby Glen	Corby Glen
Stamford	Great Casterton	Great Gonerby	Marston
Ancaster	Ancaster	Harlaxton	Harlaxton
Barkston and Syston	Marston	Langtoft	Deeping
Barrowby	Marston	Long Bennington	Long Bennington
Baston	Deeping	Morton	Bourne
Billingborough and Horbling	Horbling	South Witham	South Witham
Caythorpe	Caythorpe	Thurlby	Bourne
Castle Bytham	Little Bytham		

Summary tables of the assessments for each of the growth areas in South Kesteven District are given in Tables 8-19 to 8-37.

Table 8-19: Bourne

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	The proposed development within Bourne (1,729 new dwellings) represents already committed development, to be located at a new development at Elsea Park, to the south of Bourne. It is understood from discussions with AWS that as planning permission has already been granted for this development, it has been taken into account in AWS's planning for future flow and treatment capacity requirements at Bourne WwTW.	Bourne lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Bourne WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Bourne lies within EA Flood Zone 1, although there are areas of EA Flood Zones 2 and 3 from tidal flooding to the east of the town. However flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	The site is underlain by clay, with only small areas of limestone, and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-20: The Deepings (Deeping St James and Market Deeping)

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Market Deeping lies within the catchment of Deeping WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period.	The Deepings lie upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Deeping WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	The majority of Market Deeping lies within EA Flood Zone 1, although there are areas of Flood Zones 2 and 3 from tidal flooding to the south and east of the town. However flood risk should therefore not be a major constraint, proving development is directed away from these areas. Developers should consider the SKDC SFRA for further site specific information.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-21: Stamford

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Stamford lies within the catchment of Great Casterton WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period. However, the Peterborough WCS identified that Stamford WwTW, which lies outside of the study area has 11,500 m^3/day calculated headroom and 17,202 m^3/day measured headroom. A solution to the capacity issues at Great Casterton could therefore be to divert flows to Stamford WwTW.	Stamford lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	There are thin areas of EA Flood Zones 2 and 3 associated with the channel of the River Welland, although the majority of the town lies within EA Flood Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	Stamford is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are large areas of groundwater Source Protection Zones in the town and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-22: Ancaster

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Ancaster WwTW has headroom for approximately 316 households in its current DWF consent and will therefore be able to accommodate the proposed level of growth.	Ancaster lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Marston WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	There are thin areas of EA Flood Zones 2 and 3 associated with the river channel, although the majority of the town lies within EA Flood Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	Ancaster is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are large areas of groundwater Source Protection Zone 3 and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-23: Barkston and Syston

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Barkston and Syston lies within the catchment of Marston WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period. The proposed consent limit for Marston is not within the limits of conventional treatment (considered by AWS to be 8 mg/l for BOD). Further water quality modelling, in conjunction with discussions with the Environment Agency, should be carried out for Marston WwTW. More detailed assessment may allow the proposed consent limits to be relaxed.	Barkston and Syston lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from Marston WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	There are thin areas of EA Flood Zones 2 and 3 associated with the river channel, although the majority of the town lies within EA Flood Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	Barkston and Syston is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-24: Barrowby

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Barrowby lies within the catchment of Marston WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period. The proposed consent limit for Marston is not within the limits of conventional treatment (considered by AWS to be 8 mg/l for BOD). Further water quality modelling, in conjunction with discussions with the Environment Agency, should be carried out for Marston WwTW. More detailed assessment may allow the proposed consent limits to be relaxed.	Barrowby lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Barrowby lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	Barrowby is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-25: Baston

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Baston lies within the catchment of Deeping WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period.	Baston lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. There is no hydraulic connectivity between the proposed development and nearby Baston Fen SAC, which will therefore not be impacted on by the proposed development.	Baston lies with EA Flood Zones 1, 2 and 3 and development within the village should be steered away from the areas of higher flood risk. . Flood risk should not be a major constraint to development, providing the recommendation of the SFRA are noted and subject to site specific FRAs has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-26: Billingborough and Horbling

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Billingborough and Horbling lies within the catchment of Horbling WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period.	Billingborough and Horbling lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Billingborough and Horbling lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-27: Castle Bytham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Castle Bytham lies within the catchment of Little Bytham WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will occur from the start of the plan period.	Castle Bytham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Castle Bytham lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	Castle Bytham is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, the town and surrounding area lie entirely within groundwater Source Protection Zones in the town and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-28: Caythorpe

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Caythorpe lies within the catchment of Caythorpe WwTW, which has headroom for approximately 650 households in its current DWF consent.	Caythorpe lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Caythorpe lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	Caythorpe is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-29: Colsterworth

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Colsterworth WwTW has headroom for approximately 674 households in its current DWF consent. The sanitary determinand limits on the consent are currently not at the limits of conventional wastewater treatment technology (25A mg/l BOD & 40 mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	Colsterworth lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	There are thin areas of EA Flood Zones 2 and 3 associated with the river channel, although the majority of the town lies within EA Flood Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	Colsterworth is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are large areas of groundwater Source Protection Zones in the town and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-30: Corby Glen

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Corby Glen WwTW would have the capacity to accommodate the small amount of growth proposed.	Corby Glen lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Corby Glen lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	Corby Glen is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are large areas of groundwater Source Protection Zones in the town and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-31: Great Gonerby

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Great Gonerby lies within the catchment of Marston WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period. The proposed consent limit for Marston is not within the limits of conventional treatment (considered by AWS to be 8 mg/l for BOD). Further water quality modelling, in conjunction with discussions with the Environment Agency, should be carried out for Marston WwTW. More detailed assessment may allow the proposed consent limits to be relaxed.	Great Gonerby lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Great Gonerby lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	Great Gonerby is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-32: Harlaxton

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Harlaxton WwTW would have the capacity to accommodate the small amount of growth proposed.	Harlaxton lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Harlaxton lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	Harlaxton is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-33: Langtoft

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Langtoft lies within the catchment of Deeping WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period.	Langtoft lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	There are small areas of EA Flood Zones 2 and 3 to the west of the village, although the majority lies within Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage.

Table 8-34: Long Bennington

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Long Bennington WwTW has headroom for approximately 1,295 households in its current DWF consent. The sanitary determinand limits on the consent are relaxed (60 mg/l BOD & 90 mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	Long Bennington lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	There are thin areas of EA Flood Zones 2 and 3 associated with the river channel to the east of the town, although the town itself lies within EA Flood Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	Long Bennington is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-35: Morton

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Morton lies within the catchment of Bourne WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will therefore occur from the start of the plan period.	Morton lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the STW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Morton lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	Morton is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are large areas of groundwater Source Protection Zones in the town and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-36: South Witham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	This outline assessment has indicated that South Witham WwTW will need to increase in DWF consent (see Table 5-5) to accommodate the prospective growth, which shows a shortfall of 7 m^3/day. The shortfall in volumetric capacity will occur from the start of the plan period, as a variation to increase the consented DWF is already proposed. This variation relates to the current flow at the works (and seasonal variations) and does not consider growth and the works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows.	South Witham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	There are thin areas of EA Flood Zones 2 and 3 associated with the river channel, although the majority of the town lies within EA Flood Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the SKDC SFRA for further site specific information.	South Witham is underlain by limestone and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-37: Thurlby

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Thurlby lies within the catchment of Bourne WwTW, for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will occur from the start of the plan period.	Thurlby lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC.	Thurlby lies with EA Flood Zone 1 and has therefore been assessed as having a less than 0.1% (1 in 1000 year) risk of tidal or fluvial flooding. Developers should consider the SKDC SFRA for further site specific information.	The site is underlain by clay and it is likely that infiltration SUDS will therefore not be suitable. This should be investigated by the developer. New development will need to ensure post development runoff rates do not exceed pre-development runoff rates and that sufficient attenuation can be provided on site. Discussions with the IDB and/or EA should be sought at an early stage. Details regarding the maintenance of the surface water system should be provided at the site-specific FRA stage. Should infiltration SuDS be feasible (following on-site testing), there are large areas of groundwater Source Protection Zones .in the town and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

8.4 Rutland County

The following areas were assessed because they have been identified as settlements with a proposed growth of greater than 50 houses or with a cumulative impact on an individual works of 50 houses, including existing commitments, as presented in Table 8-38. Some of these growth areas are connected to a common wastewater treatment works and so the assessments are the same; this has been highlighted in the text and also presented in Table 8-38.

Table 8-38: Growth locations in the Rutland County and relevant WwTW catchment

Growth Location	WwTW Catchment	Growth Location	WwTW Catchment	Growth Location	WwTW Catchment
Barleythorpe	Oakham	Ketton	Ketton	Oakham	Oakham
Cottesmore	Cottesmore	Langham	Oakham	Ryhall	Ryhall
Edith Weston	Empingham	Little Casterton	Great Casterton	Uppingham	Uppingham
Empingham	Empingham	Market Overton	Cottesmore		
Greetham	Cottesmore	North Luffenham	Oakham		

Summary tables of the assessments for each of the growth areas in Rutland County are given in Tables 8-39 to 8-52.

Table 8-39: Barleythorpe

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Barleythorpe is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	Oakham WwTW has headroom for approximately 6,379 households in its current DWF consent. The sanitary determinand limits on the consent are relaxed (40A mg/l BOD & 60 mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	Barleythorpe lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-40: Cottesmore

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Cottesmore is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	This outline assessment has indicated that Cottesmore WwTW will need to increase in DWF consent (see Table 5-5) to accommodate the prospective growth, which shows a shortfall of between 63 and 89 m^3/day. The shortfall in volumetric capacity will occur from the start of the plan period, as a variation to increase the consented DWF is already proposed. This variation relates to the current flow at the works (and seasonal variations) and does not consider growth and the works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows.	Cottesmore lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are areas of groundwater Source Protection Zones in the village and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-41: Edith Weston

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Edith Weston is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	Empingham WwTW has headroom for approximately 2,339 households in its current DWF consent. The sanitary determinand limits on the consent (20 mg/l BOD & 40 mg/l TSS) should allow for the possibility of treating to a tighter standard if required.	Edith Weston lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are areas of groundwater Source Protection Zones in the village and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-42: Empingham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Empingham is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	Empingham WwTW has headroom for approximately 2,339 households in its current DWF consent. The sanitary determinand limits on the consent (20 mg/l BOD & 40 mg/l TSS) should allow for the possibility of treating to a tighter standard if required.	Empingham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-43: Greetham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Greetham is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	This outline assessment has indicated that Cottesmore WwTW will need to increase in DWF consent (see Table 5-5) to accommodate the prospective growth, which shows a shortfall of between 63 and 89 m^3/day. The shortfall in volumetric capacity will occur from the start of the plan period, as a variation to increase the consented DWF is already proposed. This variation relates to the current flow at the works (and seasonal variations) and does not consider growth and the works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows.	Greetham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. However, the North Brook flows through the centre of Greetham and a small proportion of this is culverted. In addition, the channel is small and development through the town should take extra care to ensure that proposals do not exacerbate flood risk and pose a increased threat to third parties Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are areas of groundwater Source Protection Zones in the village and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-44: Ketton

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Ketton WwTW has headroom for approximately 1,482 households in its current DWF consent. The sanitary determinand limits on the consent are relaxed (50A mg/l BOD & 100 mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	Ketton lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are areas of groundwater Source Protection Zones in the village and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-45: Langham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Langham is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	Langham WwTW has headroom for approximately 194 households in its current DWF consent. The sanitary determinand limits on the consent (25 mg/l BOD & 45 mg/l TSS) should allow the possibility of treating to a tighter standard if required.	Langham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	There are areas of EA Flood Zones 2 and 3 associated with the river channel, although the majority of the village lies within Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-46: Little Casterton

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	Great Casterton WwTW has headroom for approximately 174 households in its current DWF consent. However, following the proposed growth there would be a capacity shortfall of between 170 and 200 m^3/day and an increase to the consented DWF will therefore be required.	Little Casterton lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the STW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-47: Market Overton

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Market Overton is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	Market Overton WwTW has headroom for approximately 263 households in its current DWF consent. The sanitary determinand limits on the consent (25 mg/l BOD & 45 mg/l TSS) should allow the possibility of treating to a tighter standard if required.	Market Overton lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-48: North Luffenham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
North Luffenham is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	North Luffenham WwTW is one of the works for which a variation to the consented DWF is proposed; this variation relates to the current flow at the works (and seasonal variations) and does not consider growth. The works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows. The shortfall in volumetric capacity will occur from the start of the plan period.	North Luffenham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions. However, there are areas of groundwater Source Protection Zones in the village and consultation with the Environment Agency will be required to ensure soakaways do not cause pollution of groundwater.

Table 8-49: Oakham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Oakham is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	Oakham WwTW has headroom for approximately 6,379 households in its current DWF consent. The sanitary determinand limits on the consent are relaxed (40A mg/l BOD & 60 mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	Oakham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-50: Uppingham

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
Uppingham is within the East Midlands WRZ, supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives a number of proposed methods to meet the deficit.	Uppingham WwTW has headroom for approximately 928 households in its current DWF consent. The sanitary determinand limits on the consent are relaxed (20A mg/l BOD & 40A mg/l TSS) and there should be the possibility of treating to a tighter standard if required.	Uppingham lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The town lies within EA Flood Zone 1 and therefore Flood risk is not perceived to constrain development. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-51: Ryhall

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The Lincolnshire and Fens WRZ is forecast to have a deficit of available water against target headroom from early in the planning period, for the Bourne planning zone this is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit.	This outline assessment has indicated that Ryhall WwTW will need to increase in DWF consent (see Table 5-5) to accommodate the prospective growth, which shows a shortfall of between 18 and 27 m^3/day. The shortfall in volumetric capacity will occur from the start of the plan period, as a variation to increase the consented DWF is already proposed. This variation relates to the current flow at the works (and seasonal variations) and does not consider growth and the works can therefore be considered to be operating at its consented DWF limit and further variations will be required to treat additional flows.	Ryhall lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	There are areas of EA Flood Zones 2 and 3 associated with the river channel, although the majority of the village lies within Zone 1. Flood risk should therefore not be a major constraint to development, subject to site specific FRAs. Developers should consider the RCC SFRA for further site specific information.	The underlying geology is generally permeable and it is likely that infiltration SuDS will therefore be suitable, subject to individual site conditions.

Table 8-52: Outlying settlements

Water Resources	Wastewater Treatment and Transmission	Ecology	Flood Risk Management	Surface Water Management & SuDS Potential
The eastern part of Rutland lies within Anglian Water's Lincolnshire and Fens WRZ, which is forecast to have a deficit of available water against target headroom from early in the planning period. For the Bourne planning zone the average forecast deficit in 2036-37 is 6.83 Ml/d. AWS's WRMP gives a number of proposed schemes to meet the deficit. The west of Rutland lies within the East Midlands WRZ and is supplied by Severn Trent Water. It is expected to experience a supply shortfall after 2011/12. The shortfall is predicted at 75 Ml/d by 2019/20 increasing to 110 Ml/d by 2034/35. STW's WRMP gives some proposed methods to meet the deficit.	Several of the WwTW serving the outlying settlements have new proposed DWF consents; these variations relate to the current flow at the works (and seasonal variations) and do not consider growth. These works can therefore be considered to be operating at their consented DWF limit and further variations will be required to treat additional flows. Further assessment should be carried out once individual growth sites are known.	The district lies upstream of the Wash & North Norfolk coast Natura 2000 site. However, any increases in flow from the WwTW would be unlikely to lead to a significant adverse effect on The Wash SPA/Ramsar site or Wash & North Norfolk Coast SAC. Continuing the existing levels of management of Rutland Water SPA will ensure there would be no degradation of the integrity of the site due to water resource issues alone.	The land adjacent to the River Welland, and localised areas adjacent to Langham Brook (Ashwell) and Whissendine Brook (Whissendine) lie within EA Flood Zone 2 and 3. The rest of Rutland lies within Flood Zone 1. Developers should consider the RCC SFRA for further site specific information.	The suitability for SuDS is variable and will need to be assessed on a site-by-site basis once individual growth sites are known. The east of the Rutland district is total catchment or outer zone Groundwater source protection zone.

9 Outline Policy Guidance

9.1 Introduction

The following policy recommendations are made to ensure that the emerging Local Development Frameworks and Core Strategies for the three authorities consider potential limitations (and opportunities) presented by the water environment and water infrastructure on growth, and phasing of growth. The policy is also recommended as a starting point to the replacement of the regional WAT (water based) policies of the revoked RSS.

9.2 Water Cycle Policy

This section draws on the various assessments undertaken in this Outline WCS study and suggests direction for policies to be included in the LDFs of each of the authorities, to help to ensure that the aims of this WCS and a sustainable water environment are achieved.

9.2.1 General

Policy Recommendation 1: Development Phasing

New homes should not be built until agreement has been reached with the water and wastewater provider that sufficient capacity in existing or future water services infrastructure is available in accordance with the South Holland, South Kesteven and Rutland Outline WCS.

Reason: The WCS has demonstrated some capacity within existing infrastructure; however this capacity is limited and upgrades (or new) infrastructure is required in some places to deliver full housing requirements up to 2026. Development must not be permitted to develop until the water services infrastructure is in place to service it.

9.2.2 Wastewater treatment

Policy Recommendation 2: Strategic Wastewater Treatment

Recognition is made that the provision of upgrades to wastewater treatment facilities at the following WwTWs in each district is required in order for demands of future growth to be met. Increased DWF consents, and possibly expansion of the following works will be required:

- Cottesmore;
- Great Casterton;
- North Luffenham;
- Ryhall;
- Crowland;
- Donington;
- Holbeach;
- Deeping;
- Horbling;

- South Witham; and
- Marston; and
- Little Bytham.

Reason: The WCS has demonstrated that some of the WwTW will need increases to consented DWF (with the possibility of the requirement for the addition of process streams or expansion the capacity of processes in order to treat the additional flow or to higher standards to meet current and future water legislation, namely WFD and HD standards). The LDFs need to ensure that the expansion of WwTW sites, where required, is fully supported.

9.2.3 Water Resources & Supply

Policy Recommendation 3: Protection of Water Resources

New development will not be permitted in Source Protection Zones, as mapped by the Environment Agency[79], unless the Environment Agency is satisfied that the risk is acceptable.

Reason: The WCS has highlighted that there are numerous Source Protection Zones in the study area and as such, it is important to continue to protect the areas that recharge the groundwater through suitable management of surface activities. Several Development locations are likely to over or close to source protection zones around abstraction boreholes and hence Environment Agency agreement will need to be achieved for some development types in these areas.

Policy Recommendation 4: Water demand management

New development should aim to achieve the water use target under Code Levels 3 & 4 of the Code for Sustainable Homes, and where possible achieve the Environment Agency target for water neutrality of 95 litres per head per day.

Reason: The WCS has highlighted that higher levels of growth will require new development to use less water than current policy or legislative requirements and all new development must be as efficient as possible

9.2.4 Flood risk and drainage

Policy Recommendation 5: Site drainage

All new development, including that on brownfield development, should be served by separate surface water and wastewater drainage. No new development will be permitted to discharge runoff to foul drainage connections. Consideration must be given to the requirements of the various IDBs and an assessment carried out on all receiving watercourses (regardless of whether it lies within an IDB area) to ensure adequate capacity is available.

Reason: The WCS has highlighted that sewer flooding and Combined Sewer Overflows are an existing concern in several growth areas in both districts and that with climate change, capacity will be limited. Therefore further discharges of surface water to foul or combined drainage should not be permitted to prevent exacerbation of existing problems. Wherever possible, improvement should be sought to the existing system.

[79] http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=drinkingwater

Policy Recommendation 6: Strategic Flood Risk Assessments

All new development should adhere to the recommendations of the relevant Strategic Flood Risk Assessment for the District/County.

Reason: To ensure a coordinated approach to flood risk management across the WCS area, in accordance with the requirements of PPS25.

Policy recommendation 7: Lincolnshire Coastal Study

All new development should adhere to the recommendations of Lincolnshire Coastal Study.

Reason: To ensure a coordinated approach to flood risk management across the WCS area, in accordance with the requirements of PPS25.

10 Developer checklist

The overall intention is that all Developers would be asked to use the water cycle developer checklist as part of the planning application process and to submit a completed version with their planning applications. The Environment Agency is a statutory consultee with regards to flood risk and the water environment and as such it will need to sign up to the checklist, as will SHDC, SKDC and RCC, Natural England and the local water undertakers AWS and STWL. The checklist provided in this WCS has been developed from examples used in previous WCS as well as the Environment Agency's national standard checklist available on their website. The checklist refers to different levels of policy to make it clearer to the developer as to which are driven by mandatory national policy, which are driven by Environment Agency requirements and which are driven by local policy.

This checklist has been provided as a 'working document' which should be revised in the Stage 2 (if carried out), once more is known about the development scenarios and housing numbers to be taken forward for detailed assessment. More relevant site specific details can then be included to make it a document which can be used as part of the planning process for developers.

Key

- Water Cycle strategy Recommended Policy
- Environment Agency and Natural England policy and recommendations
- Local Policy
- National Policy or Legislation

	Flood Risk Assessment requirement checklist		Policy or Legislation
1	Is the Development within Flood Zones 2 or 3 as defined by the flood zone mapping in the relevant SFRA?	Y - go to 5 N - go to 2	PPS25
2	Development is within Flood Zone 1: • Site larger than 1 Ha? • Site smaller than 1 Ha?	 go to 5 go to 3	
3	Is the development residential with 10 or more dwellings or is the site between 0.5Ha and 1Ha?	Y - go to 6 N - go to 4	
4	Is the development non-residential where new floorspace is 1,000m^2 or the site is 1 Ha or more	Y - go to 6 N - go to 7	
5	The development constitutes major development and requires a Flood Risk Assessment (in accordance with PPS25 and the relevant SFRA) and the Environment Agency are required to be consulted.	Go to 8	
6	The development constitutes major development and is likely to require a Flood Risk Assessment (in accordance with PPS25 and the relevant SFRA) but the Environment Agency may not be required to be consulted.	Go to 8	
7	An FRA is unlikely to be required for this development, although a check should be made against the SFRA and the LPA to ensure that there is no requirement for a FRA on the grounds of critical drainage issues. Does the SFRA or does the LPA consider a Flood Risk Assessment (FRA) is required?	Y – go to 8 N – go to 9	

8	Has an FRA been produced in accordance with PPS25 and the relevant SFRA?	Y/N or N/A	
	Surface water runoff		
9	A) What was the previous use of the site? B) What was the extent of impermeable areas both before and after development?	 % before % after	Environment Agency Requirement for FRA.
10	If development is on a greenfield site, have you provided evidence that post development run-off will not be increased above the greenfield runoff rates and volumes using SuDS attenuation features where feasible (see also 18 onwards). If development is on a brownfield site, have you provided evidence that the post development run-off rate has not been increased, and as far as practical, will be decreased below existing site runoff rates using SuDS attenuation features where feasible (see also 17 onwards).	Y/N or N/A Y/N or N/A	PPS25
11	Is the discharged water only surface water (e.g. not foul or from highways)? If no, has a discharge consent been applied for?	Y/N Y/N	Water Resources Act 1991
12	A) Does your site increase run-off to other sites? B) Which method to calculate run-off have you used?	Y/N	PPS 25
12	Have you confirmed that any surface water storage measures are designed for varying rainfall events, up to and including, a 1 in 100 year + climate change event (see PPS25 Annex B, table B.2)?	Y/N	PPS25
13	For rainfall events greater than the 1 in 100 year + climate change, have you considered the layout of the development to ensure that there are suitable routes for conveyance of surface flows that exceed the drainage design?	Y/N	PPS25 Guidance Notes
14	Have you provided layout plans, cross section details and long section drawings of attenuation measures, where applicable?	Y/N	
15	If you are proposing to work within 8 m of a watercourse have you applied, and received Flood Defence Consent from the Environment Agency?	Y/N or N/A	Water Resources Act 1991 Land Drainage Act 1991
16	The number of outfalls from the site should be minimised. Any new or replacement outfall designs should adhere to standard guidance form SD13, available from the local area Environment Agency office. Has the guidance been followed?	Y/N	Guidance Driven by the Water Resources Act 1991
	Sustainable Drainage Systems (SuDS)		

17	A) Has the SuDS hierarchy been considered during the design of the attenuation and site drainage? Provide evidence for reasons why SuDS near the top of the hierarchy have been disregarded. B) Have you provided detail of any SuDS proposed with supporting information, for example, calculations for sizing of features, ground investigation results and soakage tests? See CIRIA guidance for more information. http://www.ciria.org.uk/suds/697.htm	Y/N	PPS25 Guidance
18	A) Are Infiltration SuDS to be promoted as part of the development? If Yes, the base of the system should be set at least 1m above the groundwater level and the depth of the unsaturated soil zones between the base of the SuDS and the groundwater should be maximised. B) If Yes – has Infiltration testing been undertaken to confirm the effective drainage rate of the SuDS?	Y/N Y/N	
19	A) Are there proposals to discharge clean roof water direct to ground (aquifer strata)? B) If Yes, have all water down-pipes been sealed against pollutants entering the system form surface runoff or other forms of discharge?	Y/N Y/N	
20	Is the development site above a Source Protection Zone (SPZ)?	If Y go to 22 If N go to 23	Groundwater Regulations 1998
21	A) Is the development site above an inner zone (SPZ1)? B) If yes, discharge of Infiltration of runoff from car parks, roads and public amenity areas is likely to be restricted – has there been discussion with the Environment Agency as to suitability of proposed infiltration SuDS?	Y/N Y/N	Groundwater Regulations 1998
22	A) For infill development, has the previous use of the land been considered? B) Is there the possibility of contamination? C) If yes, infiltration SuDS may not be appropriate and remediation may be required. A groundwater Risk Assessment is likely to be required (Under PPS23) Has this been undertaken before the drainage design is considered in detail?	Y/N Y/N Y/N	PPS23
23	Have oil separators been designed into the highway and car parking drainage? PPG23: http://publications.environment-agency.gov.uk/pdf/PMHO0406BIYL-e-e.pdf	Y/N	PPG23
	Water Consumption		
26	A) Have you provided the expected level of water consumption and hence the level to be attained in the Code for Sustainable Homes B) Have you considered whether the development can achieve a water consumption lower than 120 l/h/d (105 l/h/d for Levels 3 & 4 in the Code for Sustainable Homes, or the Environment Agency target of 95l/h/d as required for Levels 5 & 6)	Y/N	
28	Have you Provided details of water efficiency methods to be installed in houses?	Y/N	

	Pollution prevention		
33	Have you provided details of construction phase works method statement, outlining pollution control and waste management measures?	Y/N	PPG2, PPG5, PPG6, PPG21
	Water Supply and Wastewater Treatment		
35	Have you provided evidence to confirm that water supply capacity is available, and that demand can be met in accordance with the South Holland, South Kesteven and Rutland Stage 1 Water Cycle Strategy?	Y/N	
36	Have you provided evidence to confirm that sewerage and wastewater treatment capacity is available, and that demand can be met in accordance with the the South Holland, South Kesteven and Rutland Stage 1 Water Cycle Strategy?	Y/N	
	Conservation / Enhancement of Ecological Interest		
39	A) Have you shown the impacts your development may have on the water environment? B) Is there the potential for beneficial impacts?	Y/N Y/N	Town and Country Planning Regulations 1999.

Further information can be found in the Environment Agency's guide for developers
http://www.environment-agency.gov.uk/business/444304/502508/1506471

11 Recommendations for Detailed Study

This Outline Water Cycle Study has identified the key constraints to growth in the districts of South Holland, South Kesteven and Rutland for three different growth strategies.

The study has demonstrated that there are twelve WwTW where consented DWF is limited.

Furthermore, the study has shown that higher levels of growth may exceed the limit of growth catered for in STWL's and AWS's current water resource planning and that stringent targets for water use, and a push towards water neutrality, are likely to be required to deliver higher growth levels.

This Outline assessment has been undertaken at a strategic level based on best estimates of where growth is likely to occur on a town or village basis. At the time of undertaking the study, the preferred list of development sites was not available for the whole study area to allow more detailed site specific assessments. The following recommendations are therefore made for the Stage 2 Detailed WCS:

a) It is essential that, if available, preferred development sites are agreed for all authorities and provided to inform a more detailed assessment in Stage 2;

b) A preferred growth scenario should be selected to allow preferred solutions to be developed and tested via the sustainability assessment;

c) Options for increased wastewater treatment capacity at twelve WwTW will be required to allow growth to proceed;

d) Where discharge consent volumes will be increased, an assessment of impact on flood risk of receiving watercourses should be undertaken;

e) Wastewater network modelling at several locations is required to determine when and where new developer funded mains will be required;

f) A full assessment of the existing capacity of the sewage pumping stations and location and type of permitted sewage overflows to watercourses should be made included within the next phase of the WCS.

g) More detailed SuDS requirements, including options and techniques using the relevant CIRIA guidance[80], should be provided for preferred development sites when known, including deriving values for permitted runoff rates, options for linkage with green infrastructure;

h) Recommendations for the production of a Surface Water Management Plan for all major areas of allocated urban development; and

i) Infrastructure phasing timelines should be produced for each growth area to determine impact of infrastructure and mitigation provision on housing delivery.

[80] http://www.ciria.com/suds/

12 Appendices

12.1 Appendix A - Stakeholder Communications Strategy

Stakeholder Grouping and Definitions

Tier 1

Lead partner authority provided with fortnightly project updates by email or phone to the lead project manager; ongoing consultation on the findings of the study; and leaders of all steering group meetings and report direction.

Tier 2

Wider Steering Group (Environment Agency, Natural England, water companies) – attendance at proposed stakeholder workshops (see below), monthly steering group updates, attendance at 2 steering group meetings, invitation to comment on Scoping outputs; agreement on final WCS Outline report.

Tier 3

Wider stakeholders – Contact for additional useful information on local infrastructure, potential circulation of agreed Scoping Study outputs for information and comment to feed into Phase 2. This is likely to include British Waterways, IDBs and Highways Agency.

Tier 4

Provide findings of the joint Scoping and Outline Study – this tier is likely to include parish councils and neighbouring authorities.

Frequency and Level of Consultation

Tier 1

- Contacted for data;
- Fortnightly updates to SHDC specifically;
- Attendance at steering group meetings;
- Provision of comments on draft Outline and Detailed WCS essential; and
- Sign off to final reports essential.

Tier 2

- Contacted for data (EA, NE, AWS, STWL);
- Data specific meetings to discuss methods and data issues (EA, AWS);
- Provision of comments on draft Outline and Detailed WCS essential (EA, AWS, STWL, NE);
- Sign off to final reports essential (AWS, STWL, EA); and
- Sign off to final reports desirable but not essential (NE, IDBs, LCC).

Tier 3

- Requested for specific information/data required for specific elements of the study (not all stakeholders in this tier will need to be contacted; and
- Provision of Outline WCS report;

Tier 4

- Provision of outline WCS report.

12.2 Appendix B – Data Request

Data Type	Stakeholder	Priority	Notes
Final Water Resource Management Plan	AWS	Essential	Published February 2010
NGRs for WwTW locations and outfalls	AWS	Essential	Required to map WwTW and discharge points
Measured (or calculated where not available) dry weather flow for each WwTW affected by growth	AWS	Essential	Required to calculate consented volumetric headroom
Stage 3 (and Stage 4 where available) RoC reports for Rutland Water and The Wash	EA	Essential	Required for HRA of solutions
OS mapping for all Districts	All Councils	Essential	
Location of regional, county and local wildlife/ecology sites including RNR, LNR, SNCI	All Councils	Ideal	
Annual Monitoring Reports for 2009	All Councils	Ideal	
GIS river lines for main rivers in all districts	EA	Ideal	To provide accurate GIS mapping outputs
Consent details for each WwTW for both flow (DWF and FFT) and quality conditions for BOD, Amm-N and P	AWS	Required	Required to calculate consents and undertake RQP modelling for watercourse capacity.
PE figures for each WwTW, broken down into domestic, trade and holiday, with estimate of trade flow for each WwTW	AWS	Required	Required to calculate consented volumetric headroom - **Overall PE for WwTW would suffice**
Assumptions used on water consumption rates for current and future populations in each WRZ, broken down into metered, unmetered and average of the two	AWS	Required	Required to calculate consented volumetric headroom - **breakdown into metered and unmetered not essential**
Welland CAMS (2007)	EA	Required	To be taken from EA website
Nene CAMS (2005)	EA	Required	To be taken from EA website
IDB policies	IDBs	required	Taken from IDB website
Final Catchment Flood Management Plan for Nene	EA	Required	drafts downloaded from EA website, but final plan ideal (or indication of when final plan will be available).
Source Protection Zone Maps	EA	Required	To inform SuDS assessments for SFRA and WCS and management of groundwater resources for WCS
Groundwater vulnerability maps	EA	Required	For SuDS assessments
Confirmation of the housing numbers broken down into a) already built, b) granted permission but not built, and c) residual target to meet RSS requirements	All Councils	Required	RSS target figures already built affects baseline of assessment as this is already accounted for in measured flow and supply

Core Strategy documents	All Councils	Required	
IDB catchment boundaries	IDBs	Required	To identify the responsible authority.
Groundwater Monitoring Data	EA	Required	Dip data from the monitoring boreholes
River Flows (mean and 95%ile for period 2004-2009) fro receiving watercourse upstream of each WwTW	EA	Required	Required to Run RQP for water quality capacity of receiving watercourses - Gauged data preferred, followed by national SIMCAT data, or flow estimates
Water Quality monitoring data (2004-2009) upstream and downstream of each WwTW for BOD, Ammonia (as N), Phosphate (as orthophosphate), DO and Suspended Solids	EA	Required	Required to Run RQP for water quality capacity of receiving watercourses - Summary data would suffice
GIS river/drain lines for all non-EA managed rivers	IDBs	Required	To provide accurate GIS mapping outputs
Growth figures to use, broken down into proposed allocations	All Councils	Essential	Assessments cannot be made on future WwTW capacity as a result of growth if it is not known where growth is likely to be allocated
Confirmation on the RSS review target scenarios, including whether the growth is pro-rata'd in each allocation, or growth increased at different locations	All Councils	Essential	
Information of growth forecasts already catered for in AWS' planning	AWS	Ideal	What growth figures have been used by AWS for the water supply zone/WRZ - ideal to make a comparison with RSS target which is being assessed in the WCS as an evidence base, and to compare against RSS review levels
Emergency Planning Procedures	All Councils	Required	For emergency planning in the SFRA
Confirmation of employment types for each employment area envisaged	All Councils	Required	Important as it affects wastewater generation and water supply requirements (although not essential)
Confirmation of the housing numbers broken down into a) already built, b) granted permission but not built, and c) residual target to meet RSS requirements	All Councils	Required	RSS target figures already built affects baseline of assessment as this is already accounted for in measured flow and supply
Wastewater network layer, including pipe sizes, pumping station locations, and CSO outfall locations	AWS	Essential	Required to map wastewater catchments, and make assessment of potential capacity in absence of network model coverage
Confirmation of network model coverage	AWS	Essential	Network models not required, but information on coverage of modelling is required to determine where modelling assessments on capacity will not be possible
Boundaries for proposed allocation sites (where known) for both housing and employment	All Councils	Essential	For mapping and to allow accurate assessment of impact on wastewater drainage areas
Further information on wastewater capacity constraints, particularly pumping station constraints	AWS	Ideal	To further inform sewer network capacity assessments
BGS Bedrock and drift geology for study area	EA	Ideal	

Urban Capacity studies or SHLAA information	All Councils	Ideal	
Employment Land Reviews	All Councils	Ideal	If available
DG5 sewer flooding database	AWS	Required	To inform sewer network capacity assessment and infrastructure flood risk for SFRA as required under PPS25
Abstraction licence details, including limit on abstraction	AWS	Ideal	Required to calculate capacity in existing licences - a statement from AWS would suffice, stating available capacity or not with respect to Defra instruction on security
Information on current capacity in abstraction licences	AWS	Ideal	Required to calculate capacity in existing licences - a statement from AWS would suffice, stating available capacity or not with respect to Defra instruction on security