Gainsborough Outline Water Cycle Study

Prepared by: .....
Christian Lomax
Principal Consultant

Checked by: .....
Roy Lobley
Associate Director

Approved by: .....
Andy Yarde
Regional Director

Gainsborough

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5th Floor, 2 City Walk, Leeds, LS11 9AR
Telephone: 0113 391 6800 Website: http://www.aecom.com

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Table of Contents

Tables

Figures

Capabilities on project:
Water

1 Introduction

Background

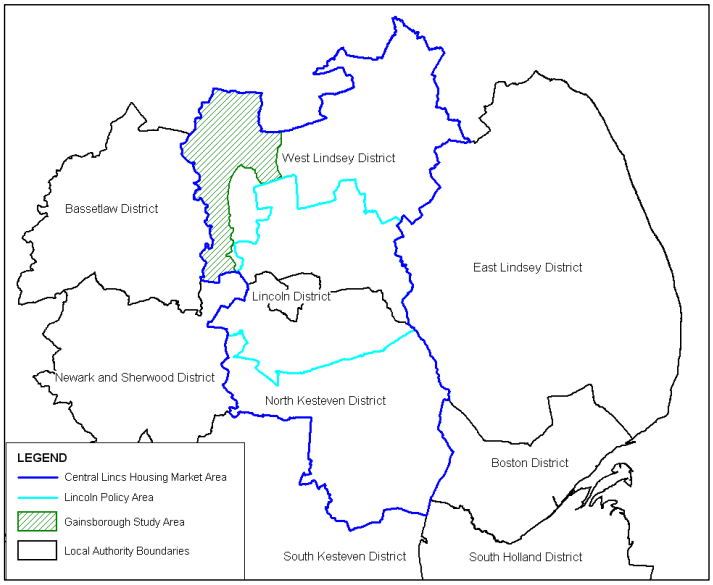
New Growth Point status for West Lindsey, outside the Lincoln Policy Area, was announced in July 2008 (subject to confirmation in the ongoing review of the East Midlands Regional Plan). Over the next 20 years and beyond, Gainsborough is intended to provide the main focus for urban expansion in West Lindsey, expanding its role as the principal town and regionally important regeneration area. The regeneration of Gainsborough will be achieved by delivering a fundamental change in the level of housing and employment opportunities, particularly through the development of a series of neighbourhood extensions to the south, east and north of Gainsborough.

The need for a Water Cycle Study (WCS) has come about through the potential for water infrastructure and the water environment to pose a significant constraint to the rate and nature of growth in the Gainsborough area. A review of the existing water infrastructure is therefore required along with an assessment of what is necessary to facilitate growth.

Links with Other Studies

The Lincoln WCS is due for completion in May 2010. The study commenced by addressing future growth planned for the Lincoln Policy Area, which covers all of the City of Lincoln and parts of neighbouring West Lindsey and North Kesteven (Figure 1.1). Following developments amongst the three planning authorities it was considered appropriate to expand the study so that it covered all of West Lindsey and North Kesteven. This area is referred to as the Central Lincolnshire Housing Market Area (Figure 1.1) in the East Midlands Regional Plan.

Figure 1.1: Study Boundary



Since Gainsborough falls within West Lindsey and the Central Lincolnshire Housing Market Area this WCS has been produced taking into account the Lincoln WCS so that the two documents are complementary.

Gainsborough Water Cycle Study Boundary

Figure 1.1 illustrates the boundary of the area under consideration for the Gainsborough WCS within the context of the Central Lincolnshire Housing Market Area.

Gainsborough has been separated out from the Lincoln WCS as a standalone WCS for two principle reasons;

Capabilities on project:
Water

1. The high levels of growth in Gainsborough and Lincoln could result in several unforeseen issues which could cause delays to the delivery of either study. Undertaking two separate studies means that delays in one study should not have a knock-on effect for the other. This is particularly relevant since delivery of the Gainsborough WCS is seen as being urgent.
2. Severn Trent Water and Anglian Water both have interests in the north west of the West Lindsey district, whereas in the rest of West Lindsey, the City of Lincoln and North Kesteven Anglian Water is the sole water company operating. WCS's involving cross border issues between water companies require greater consideration for stakeholders, due to the elements of commercial sensitivity and competition. This could potentially hamper progress towards developing a strategy for the Lincoln WCS.

Consequently a separate stand alone WCS has been established for Gainsborough, which is the focus of growth in West Lindsey. This Outline WCS for Gainsborough addresses the area of West Lindsey where both Anglian Water and Severn Treat Water have interests.

Partners & Stakeholders

Several organisations have an interest in the findings of the Gainsborough WCS. The key Partners who have been involved with establishing the WCS and driving it forward are;

- West Lindsey District Council (Client & Project Manager),
- Anglian Water,
- Severn Trent Water, and
- the Environment Agency.

In addition to the key Partners above the following stakeholders have expressed an interest in the findings of the study;

- City of Lincoln Council,
- North Kesteven District Council,
- Bassetlaw District Council,
- North Lincolnshire Council,
- Newark and Sherwood District Council,
- Lincolnshire County Council,
- Upper Witham Internal Drainage Board,
- Newark Area Internal Drainage Board,
- Gainsborough Internal Drainage Board,
- Natural England,
- Lincolnshire Wildlife Trust, and
- Significant landowners including Thonock Estates.

Outline WCS

This report constitutes the findings of the Outline WCS that has been undertaken for Gainsborough. The purpose of the Outline WCS is to assess the existing water infrastructure and water environment to determine if it can accommodate the proposed levels of growth or where further work may be required to facilitate the growth and ensure that it does not detrimentally impact upon the natural environment.

The report has the following structure:

- Chapter 2 presents an assessment of future housing growth
- Chapter 3 reviews Water Resources & Supply
- Chapter 4 reviews Sewerage & Sewage Treatment
- Chapter 5 reviews Flood Risk
- Chapter 6 reviews Other Environmental Constraints, and
- Chapter 7 presents the conclusions and recommendation of this Outline WCS for Gainsborough.

Capabilities on project:
Water

2 Future Growth

Introduction

West Lindsey DC, the City of Lincoln Council and North Kesteven DC have recently formed a Central Lincolnshire Joint Strategic Planning Committee with effect from 12th October 2009. This Committee will lead the production of the Local Development Framework for Central Lincolnshire including the production of a Core Strategy for the area. Therefore rather than each of the three local authorities producing a Core Strategy there will be one covering all three authority areas.

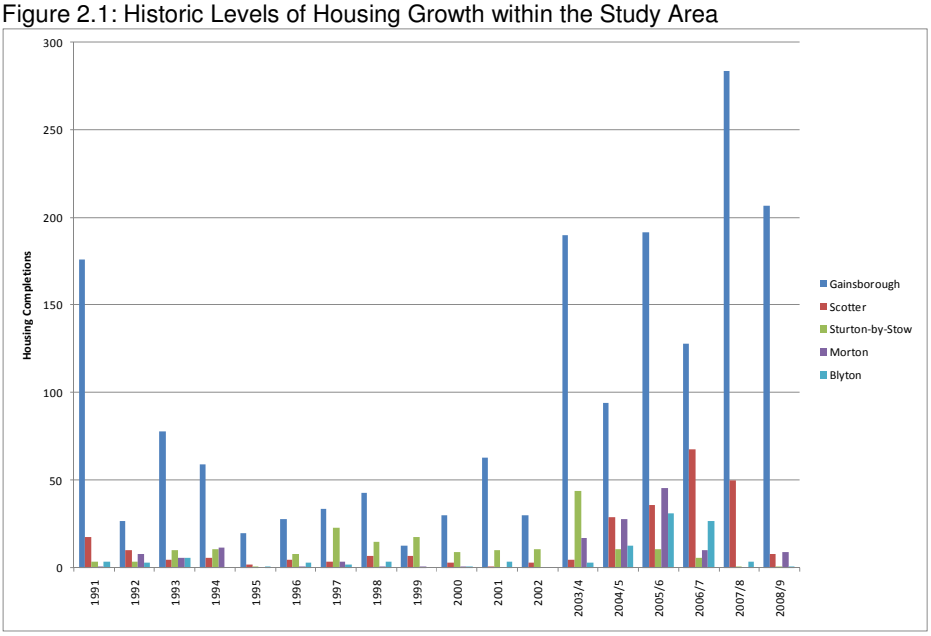
The first step in the process will be the approval of a Central Lincolnshire Local Development Scheme in January 2010 and a Joint Planning Unit is currently being formed to take forward the Local Development Framework work. In light of this work on the West Lindsey Core Strategy and Gainsborough Area Action Plan have been suspended pending decisions on the scope and timetable of the Local Development Scheme. These matters are expected to be concluded early in 2010.

Irrespective of these issues, Gainsborough has Growth Point status and details of future growth are required to inform the WCS. The West Lindsey Annual Housing Supply Assessment[1] represents the most up-to-date information available concerning house building within the district. The Growth Point Bid – Programme of Development[2] is considered to provide the most accurate information concerning future housing growth with the district. These two documents have therefore been used to inform the WCS.

Historic Housing Growth

Within the study area, 2,879 houses were built between 1991 and April 2009. 1,696 of these, or 59% occurred within Gainsborough at an average rate of 94 per year. The variation around the average is however considerable, hitting a low of 13 in 1999 and a high of 284 in 2007/08. Figure 2.1 illustrates the annual completions in Gainsborough where it can be seen that it dominates the housing market within the study area, and that the number of completions jumped in 2003/04 and remained at a much higher level than had been seen in the preceding years.

Figure 2.1: Historic Levels of Housing Growth within the Study Area



[1] West Lindsey DC (June 2009). Annual Housing Supply Assessment. For the period 1st April 2008 – 31st March 2009.
[2] West Lindsey DC (October 2008). Gainsborough (West Lindsey) Growth Point. Programme of Development 2008 – 2026.

In addition to the housing completions for Gainsborough, Figure 2.1 also shows the four villages which experienced the highest levels of growth after Gainsborough; more than 100 completions over the 18 year period. After Gainsborough the village experiencing the next largest increase in housing numbers over the same period is Scotter, where 267 houses were built. Other villages within the study area experiencing notable levels of growth include 198 completions in Sturton-by-Stow, 145 in Morton and 107 in Blyton.

Based on this it can be concluded that with the exception of Gainsborough, the study area is comprised of small rural villages that have experienced low levels of growth over the last two decades.

Future Housing Growth

The WCS is to consider future growth up until 2026, the same date as the Lincoln WCS.

Future levels of growth are expected to be similar to the historic trends only in that Gainsborough will continue to dominate and be the focus of house building. However, the levels of housing growth in Gainsborough are to be significantly different from those seen in recent years (Figure 2.1).

The future growth has been based upon the Growth Point Programme of Development[2] which has been considered to provide the most accurate information concerning future housing growth. This document only refers to Gainsborough and Market Rasen specifically (although the latter is outside the Gainsborough study area). The rest of the district has been grouped together and referred to as rural windfall and rural sustainable development.

In order to distribute the future growth expected in rural areas amongst the different villages, historic levels of completions were used to inform the process. The average number of completions over the last five years in each village across West Lindsey was taken as a percentage of the whole district and used to distribute the future rural development amongst the villages.

Appendix A presents the levels of forecast growth for villages across the study area. Many of these villages are expected to have very low levels of growth which have been excluded from further investigation. Thirteen villages are expected to have more than ten houses built up until 2026. These are listed in Table 2.1 and illustrated in Figure 2.2. Figure 2.2 includes the locations of the proposed Neighbourhood Extensions for the Gainsborough.

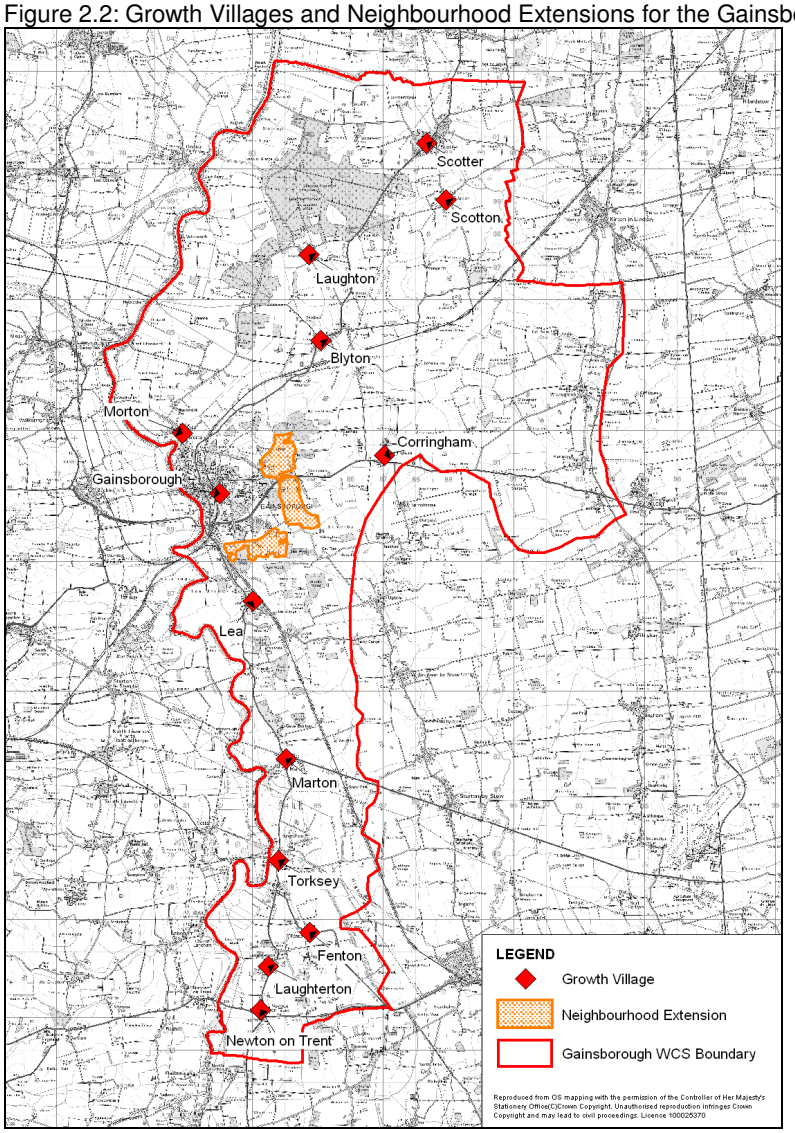
Table 2.1: Villages Experiencing Growth of more than Ten Properties

Settlement	AMP4	AMP5	AMP6	AMP7	TOTAL
	2006-2010	2010-2015	2015-2020	2020-2026	
Gainsborough	678	3,228	2,421	1,902	8,230
Blyton	36	31	27	23	117
Corringham	32	17	17	15	81
Fenton	8	12	10	8	37
Laughterton	6	9	9	8	31
Laughton	9	16	16	15	56
Lea	2	6	3	0	11
Marton	7	15	16	15	53
Morton	18	42	36	31	127
Newton-on-Trent	5	8	8	8	29
Scotter	134	91	80	69	374
Scotton	42	24	24	23	113
Torksey	5	11	9	8	33

Capabilities on project:
Water

These thirteen villages have been considered by this Outline WCS.

Figure 2.2: Growth Villages and Neighbourhood Extensions for the Gainsborough WCS



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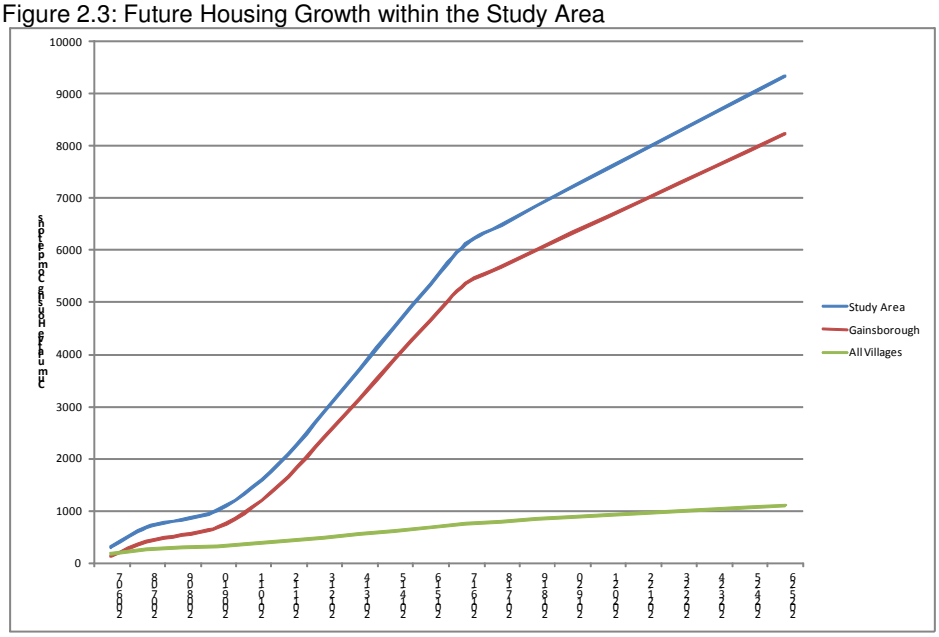
Water

Figure 2.3 illustrates housing growth in the study area between 2006 and 2026 where it is apparent Gainsborough will comprise the majority (88%) of house building. Over the period 2006 to 2026 there are to be an additional 9,333 houses built within the study area (this includes completions for the years 2006 – 09). Of the 9,333 houses, 8,230 of them are to be built in Gainsborough whereas all of the other villages will only increase in size by 1103 houses.

Figure 2.3: Future Housing Growth within the Study Area



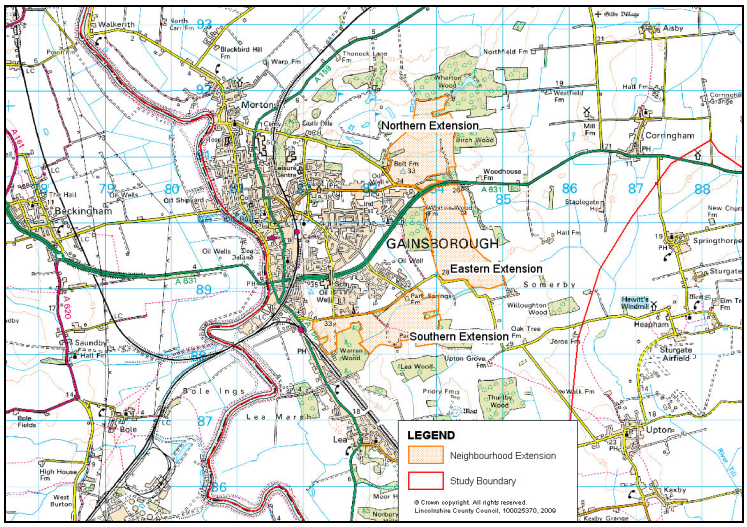
The housing numbers have been grouped so that they are comparable with the water companies planning cycle; Asset Management Periods (AMP) and are presented in Table 2.1 and Appendix A.

Gainsborough

The significant growth in Gainsborough is to be delivered primarily through the creation of three neighbourhood extensions to the north, east and south of the current settlement (Figure 2.5).

Figure 2.4: Gainsborough's Neighbourhood Extensions

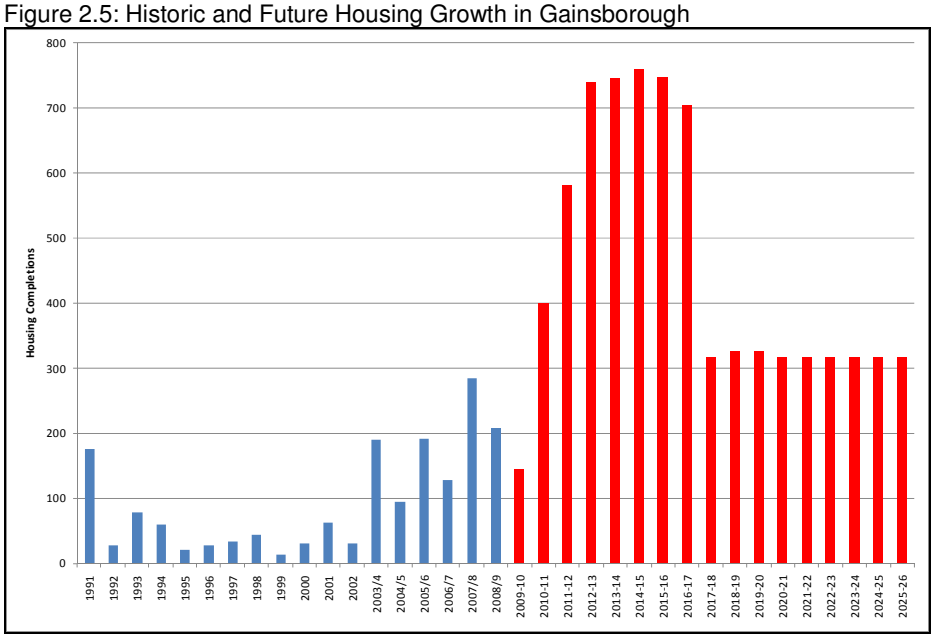
Capabilities on project:
Water



The aspirations of the developers are for the northern extension to comprise 2,427 houses, the eastern extension 2,138 and the southern 2,875. 5,740 could be expected to be built by 2026 out of a total of 7,440.

Figure 2.6 presents housing completions in Gainsborough between 1991 and 2008/09 and the projected housing completions up until 2025/26. It is clearly apparent from this figure that there is to be a significant increase in the number of housing completions to deliver Gainsborough's Growth Point.

Figure 2.5: Historic and Future Housing Growth in Gainsborough



Capabilities on project:
Water

3 Water Resources and Supply

Introduction

Future growth within the study area would be significantly constrained if there was insufficient water available to support the levels of growth and / or if the water could not be supplied to the areas accommodating the new development. The following section is concerned with the current status of water resources, and the ability to supply clean water.

Water Resources

Environment Agency

The Environment Agency manages water resources at a local level through Catchment Abstraction Management Strategies (CAMS). The majority of the study area falls within the Lower Trent and Erwash CAMS[3] area. Most of the study area falls within Water Resource Management Unit 5 (WRMU), which is downstream of the tidal limit of the Trent. No resource availability status has been assigned to WRMU5 because the CAMS process is not equipped to take tidal rivers into consideration and does not calculate the resource availability of level dependent areas (areas of pumped drainage rather than naturally flowing watercourses). However, new abstraction licences will still be considered, subject to conditions.

Whilst the River Trent flows along the western boundary of the study area, abstraction from the Trent does not represent the sole water resource available within the study area. Water is abstracted from the Trent for transfer into the River Witham, from which it is abstracted and transferred into the River Ancholme where it is taken northwards for subsequent abstraction by water users including Anglian Water.

The Witham CAMS[4] classifies the relevant stretches of watercourse as having “no water available” whilst the Grimsby, Ancholme and Louth CAMS[5] classifies the River Ancholme as having “water available”.

Water Companies

The study area falls entirely into the area of supply of Anglian Water who are responsible for the operation and maintenance of the potable water supply system throughout the study area.

Anglian Water has divided its region into Water Resource Zones (WRZ). The Lincoln WRZ covers the entire study area, which in turn is split into Planning Zones. The study area is covered by five of Anglian Water’s Planning Zones as outlined in Table 3.1 and shown in Figure 3.1.

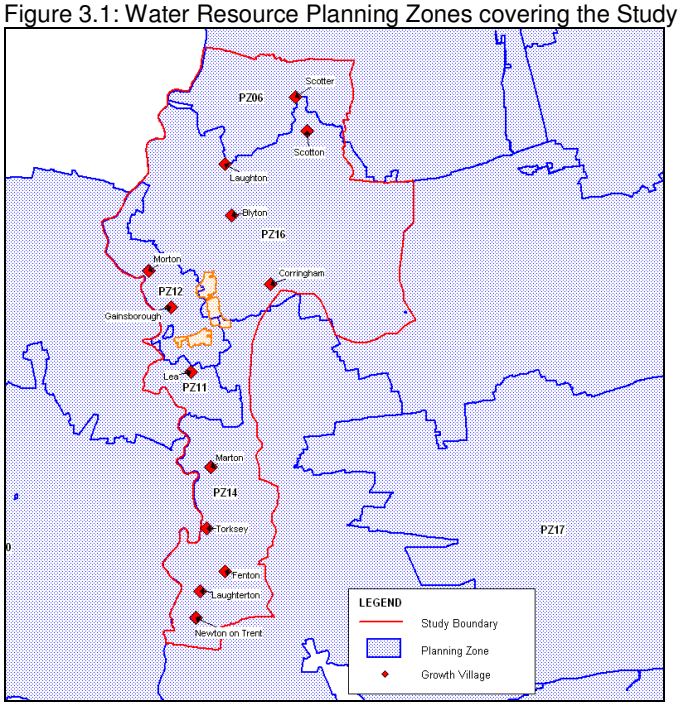
Table 3.1: Water Resource Planning Zones covering the Study Area

Planning Zone Reference	Planning Zone Name
06	Scunthorpe South
11	Everton
12	Gainsborough
14	Lincoln
16	Waddingham

[3] Environment Agency (March 2008). The Lower Trent and Erwash Catchment Abstraction Management Strategy.
[4] Environment Agency (March 2004). The Witham Catchment Abstraction Management Strategy.
[5] Environment Agency (April 2006). The Grimsby, Ancholme and Louth Catchment Abstraction Management Strategy.

Capabilities on project:
Water

Figure 3.1: Water Resource Planning Zones covering the Study Area



Anglian Water manages water resources across their region through a Water Resources Management Plan[6] (WRMP). This sets out how they intend to maintain their water resources over a 25 year planning horizon.

Of the five PZ's covering the study area, three; PZ06, PZ14 and PZ16 are forecast to have a deficit in water resources by 2035-36. To overcome the forecast deficits Anglian Water have proposed a number of solutions to ensure that water supplies to these PZ's do not fall short. The selected schemes for the three PZ's are summarised in Table 3.2 along with the Asset Management Period (AMP) in which they would be implemented.

Table 3.2: Selected Water Resources Schemes

PZ	Selected option	Period
06	Covenham-Irby to Elsham WTW transfer	AMP5
14	Pressure reduction to reduce leakage	AMP5
	New Lincoln WTW	AMP5
16	Pressure reduction to reduce leakage	AMP5
	Targeted cistern devices	AMP6
	Further targeted leakage control	AMP6
	New Lincoln WTW	AMP6

In the WRMP PZ's 11 and 12 are not forecast to experience a deficit in supplies. Gainsborough falls within PZ12 however the WRMP was drafted prior to the Growth Point designation. Anglian Water has advised that their WRMP assumed that Gainsborough would grow by 4,646 properties by 2036/37.

[6] Anglian Water (April 2008). Draft Water Resources Management Plan.

Although this is less than the 8,230 properties that have been proposed in the Programme of Development, Anglian Water has indicated that having accounted for 4,646 properties in Gainsborough there would still be spare capacity for between 3,745 and 4,600 additional properties.

This means that the current water resources would provide capacity for between 8,391 and 9,246 new properties in Gainsborough. Anglian Water stated that this suggests that water resources will be adequate in the short to medium term, but that additional supplies may be needed in the longer term as the number of additional houses started to approach the 8,000 level.

Conclusions

The information that has been received as part of the Outline WCS indicates that no further analysis is required concerning water resources.

Anglian Water are responsible for the water resources across the Gainsborough WCS area and their WRMP and additional comments indicate that there are sufficient water resources, or measures are in place to ensure that water resources can be maintained at appropriate levels to ensure there are no shortfalls. Based upon the information provided by Anglian Water each of the settlements within the study area have been classified as either, Red, Amber or Green (RAG) where;

- Red – there are insufficient water resources to accept the additional growth and increasing the resource is economically and/or environmentally unviable,
- Amber – there insufficient water resources to accept the additional growth however the WRMP has identified measures by which the shortfall in resources can be accommodated and managed,
- Green – there is current sufficient water resources to accommodate the proposed development.

The results of this assessment are summarised in Table 3.3.

Table 3.3: Water Resources RAG Status

Settlement	Housing Growth	Planning Zone	RAG Status
Gainsborough	8,230	12	Green
Blyton	117	16	Amber
Corringham	81	16	Amber
Fenton	37	14	Amber
Laughterton	31	14	Amber
Laughton	56	16	Amber
Lea	11	11	Green
Marton	53	14	Amber
Morton	127	12	Amber
Newton-on-Trent	29	14	Amber
Scotter	374	06	Amber
Scotton	113	16	Amber
Torksey	33	14	Amber

Water Supply

Anglian Water is solely responsible for ensuring that the water supply networks have sufficient capacity to deliver the additional water resources required to the additional housing planned for the study area. They have undertaken a review of their water supply network based on the housing numbers using a RAG assessment where;

- Red – there is insufficient spare capacity to accept the additional growth and an upgrade of the water supply network is economically and/or environmentally unviable,

- Amber – there is insufficient spare capacity to accept the additional growth and an upgrade of the water supply network is viable,
- Green – there is spare capacity in the supply network to serve the proposed development.

The results of this assessment are summarised in Table 3.4 and displayed in Figure 3.2.

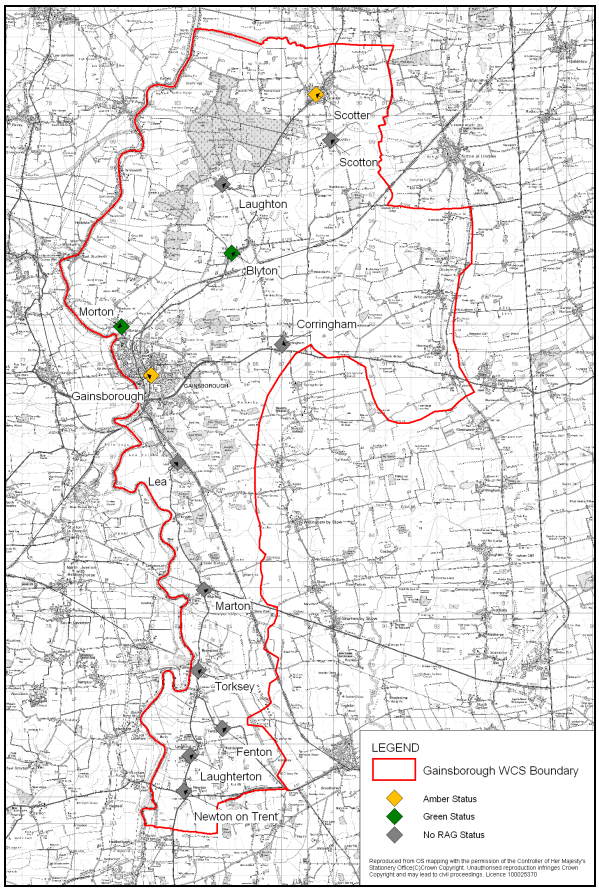
Table 3.4: Water Supply RAG Status

Settlement	Total Housing Growth (2006 – 2026)	RAG Status
Gainsborough	8,230	Amber
Blyton	117	Green
Corringham	81	Green
Fenton	37	Green
Laughterton	31	Green
Laughton	56	Green
Lea	11	Green
Marton	53	Green
Morton	127	Green
Newton-on-Trent	29	Green
Scotter	374	Amber
Scotton	113	Green
Torksey	33	Green

Anglian Water considers that growth of less than 100 properties will not have a significant impact on the water supply network.

Figure 3.2: Water Supply RAG Status

Capabilities on project:
Water



Conclusions

Table 3.4 indicates that the ability to supply clean water will not be a constraint to the potential growth forecast for the study area. Whilst there is insufficient capacity at present to serve the total growth proposed for Gainsbrough and Scotter, it is possible to upgrade the supply networks. It will be necessary for West Lindsey DC to work closely with Anglian Water in the future to monitor housing growth to ensure that Anglian Water are able to upgrade their supply networks in sufficient time to enable delivery of the growth.

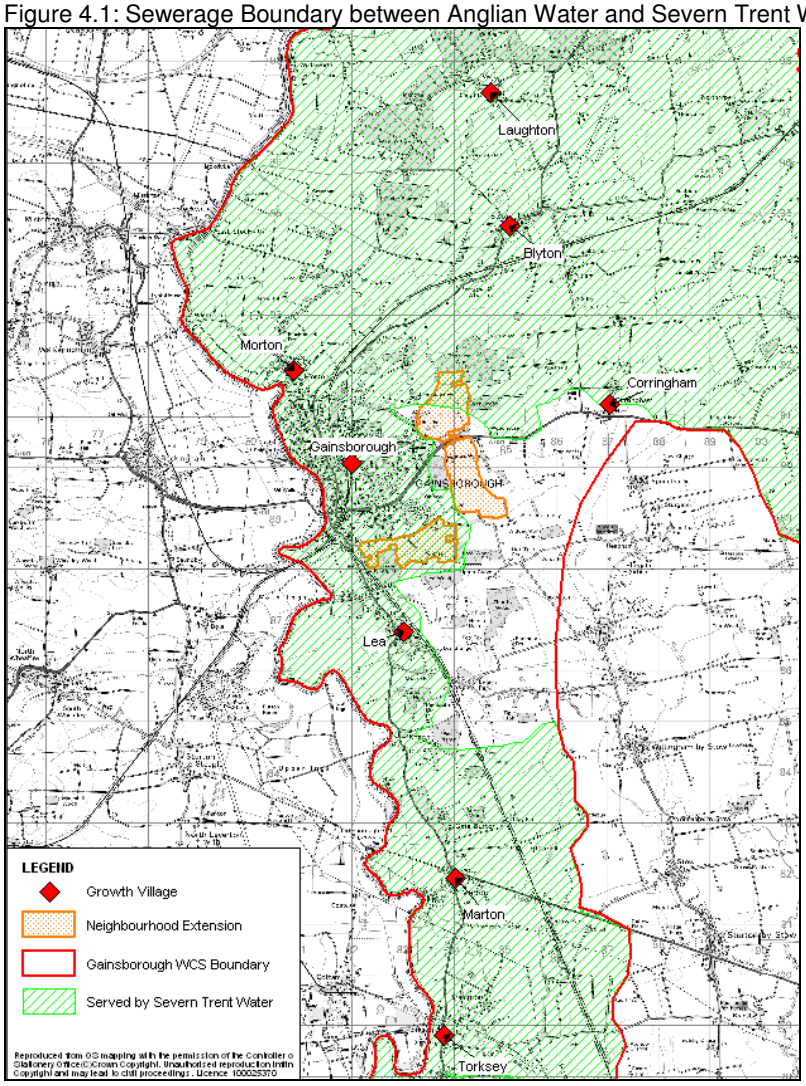
4 Sewerage and Sewage Treatment

Sewerage

Introduction

Once households and businesses have used water the foul water must be taken away. This happens via foul or combined sewers. The study area is served by both Anglian Water and Severn Trent Water in terms of foul sewerage. Figure 4.1 illustrates the coverage of each water company across the study area.

Figure 4.1: Sewerage Boundary between Anglian Water and Severn Trent Water



It is apparent that Severn Trent Water is responsible for the majority of foul sewerage across the study area, taking in all of the villages expecting significant growth. Notably the boundary between Severn Trent Water and Anglian Water runs through the middle of Corringham, and skirts around the eastern periphery of Gainsborough.

This has important implications as far as the three proposed Neighbourhood Extensions are concerned. The Southern Extensions falls entirely within the area served by Severn Trent Water, the Easter Extensions falls entirely within the area served by Anglian Water, whilst the Northern Extension falls either side of the boundary. This will have significant implications

concerning arrangements between the two water companies for how the three extensions are served for sewerage and treatment of that foul sewerage. This aspect will need to be considered as part of the Detailed WCS.

Sewerage Assessment

The two water companies have undertaken a review of their foul sewerage based on the housing numbers using a RAG assessment where;

- RED - Sewerage network requires upgrade and there are known planning issues (e.g. odour - 400m cordon sanitaire, pumping station 15m cordon sanitaire for noise), restricted space on site for storage capacity, or cost may not be proportional to benefits of upgrade.
- AMBER – Sewers / pumping stations require upgrading and there are no known cost benefits or planning constraints.
- GREEN - Sewerage system has capacity to cater for proposed growth.

The results of this assessment are summarised in Table 4.1.

Table 4.1: Foul Sewerage RAG Status

Settlement	Total Growth	RAG
Gainsborough	8,230	Amber
Blyton	117	Amber
Corringham	81	Amber / Green*
Fenton	37	Amber
Laughterton	31	Green
Laughton	56	Amber
Lea	11	Green
Marton	53	Amber
Morton	127	Amber
Newton-on-Trent	29	Amber
Scotter	374	Amber
Scotton	113	Amber
Torksey	33	Green

* Corringham is served by both Severn Trent Water and Anglian Water. Severn Trent Water has classified the sewerage as Amber whereas Anglian Water has classified it as Green.

Severn Trent has advised that the sewerage network through Gainsborough has been classified as Amber because the growth represents a significant increase in loading upon the system which will require considerable planning and investment to accommodate. It has been agreed that this will be considered as part of a Detailed WCS for Gainsborough.

In the case of Corringham, the assessment would indicate that it would be more sustainable to develop in the south of the village utilising the spare capacity present in the Anglian Water sewers rather than developing in the north which could trigger investment by Severn Trent Water to upgrade the sewerage system. However this assumption should be applied to significant development. If the 81 houses were distributed across the area it is possible that both Anglian Waters and Severn Trent Waters sewers would be able to accommodate the additional flows. The issue of ownership of the sewer network will need to be reviewed as part of the Detailed WCS, which will also ensure that utilising the spare capacity does not use up headroom that might provide a safety factor.

Sewage Treatment Works

Introduction

The foul water must be treated before it can be returned to the environment; this takes place at Sewage Treatment Works (STWs).

Anglian Water and Severn Trent Water have undertaken a review of their STWs based on the housing numbers using a RAG assessment where;

- RED – STW Requires upgrade and there are known planning issues (e.g. odour - 400m cordon sanitaire, flood plain), there is restricted space on site or the discharge consent limits cannot be achieved using conventional technology.
- AMBER – STW requires upgrade and there are no known cost benefits or planning constraints.
- GREEN – STW has capacity to cater for proposed growth.

The results of this assessment are summarised in Table 4.2.

Table 4.2: Sewage Treatment Works RAG Status

Settlement	Total Growth	Relevant STW	RAG
Gainsborough	8,230	Gainsborough	Amber
Blyton	117	Blyton	Amber
Corringham	81	Corringham	Amber
Fenton	37	Laughterton	Green
Laughterton	31	Laughterton	Green
Laughton	56	Blyton	Amber
Lea	11	Gainsborough	Amber
Marton	53	Marton	Amber
Morton	127	Gainsborough	Amber
Newton-on-Trent	29	Laughterton	Green
Scotter	374	Scotter	Amber
Scotton	113	Scotter	Green
Torksey	33	Torksey	Green

Corringham STW is owned and operated by Anglian Water but treats foul flows from. Anglian Water's sewers and Severn Trent's sewers.

Severn Trent Water has advised that the Gainsborough STW has been classified as Amber, however, if all of the proposed growth for Gainsborough were to be treated at the Gainsborough STW this would represent a significant increase to the current loading that the STW accommodates which would require considerable planning and analysis to establish the appropriate means by which the STW could serve the growth. It has been agreed that this will be considered as part of a Detailed WCS for Gainsborough.

Elsewhere, investment would be required at Blyton and Marton STW in order to be able to accommodate the future growth. In light of this it is recommended that West Lindsey DC liaise with Severn Trent Water concerning future growth in areas that would affect these two STWs to determine if growth should be constrained within the existing capacity or will of a sufficient magnitude to warrant an upgrade.

Capabilities on project:
Water

5 Flood Risk

Introduction

An important consideration of the WCS is the risk posed to people and property by all forms of flooding, and ensuring that flood risk has been suitably addressed within the study area to inform planning decisions and avoid future growth increasing the risk of flooding. This chapter presents a review of our current understanding of flood risk across the study area.

Flood Risk

Flood risk is addressed by a number of different bodies including West Lindsey DC, the Environment Agency, water companies and Internal Drainage Boards (IDBs); Gainsborough and Upper Witham.

At a strategic level flood risk has been considered by a number of assessments undertaken across the study area. The key documents being the Environment Agency's Catchment Flood Management Plans (CFMPs) for the River Trent, River Witham and River Ancholme and West Lindsey DC's Strategic Flood Risk Assessment (SFRA)[7]. These documents, particularly the SFRA should be given due consideration when considering planning applications.

Fluvial & Tidal Flooding

Villages within the study area are at risk of both fluvial and tidal flooding. The most obvious source of flooding affecting the study area is the River Trent which runs along the western edge of Gainsborough and forms the boundary between West Lindsey and Bassetlaw. This stretch of river is affected by the tidal cycle and the low lying character of Gainsborough would make the town particularly vulnerable to flooding when the spring tides coincide with high river levels if flood defences were not in place. The last major flood occurred in 1947 since when a number of flood alleviation schemes have been implemented to protect the town against flooding.

Through Gainsborough the defences have been designed for the 1 in 200 year level plus freeboard, based on predicted still water levels for the year 2045. The 1 in 200 year water level in 2000 was estimated as 6.05mAOD and in the year 2045 as 6.5mAOD. The new defence height is 6.8mAOD providing a freeboard of 300mm. These defences are critical to the protection of Gainsborough during flood events. If a defence were to fail, areas of Gainsborough in vicinity of the failure would be inundated with water. At present the Environment Agency are undertaking flood defence improvements to increase the level of flood protection offered to 2,600 properties in Gainsborough. The work stretches for 4km from Morton Corner in the north to the Trent railway bridge south of Gainsborough.

Earth embankments have been constructed along the entire length of the River Trent in rural West Lindsey. To the north of Gainsborough these defences have an average standard of protection of greater than a 200 year flood return period event. To the south of Gainsborough the standard of protection ranges from less than two years to greater than 200 years. The embankments and flood walls have been designed to give a higher standard of protection in the urban areas.

The maintenance of these embankments is crucial in order to protect the urban areas and to control flood risk elsewhere in West Lindsey. Breaching of these embankments does however pose a residual risk of flooding.

Some of these embankments have been designed with locally lower crest levels, for example at Lea Marshes, enabling flood water to inundate adjacent land, in extreme events and thus reduce the volume of water flowing downstream.

Beckingham Marshes on the left bank of the River Trent at Gainsborough are periodically used for flood storage in order to reduce flood risk and alleviate flooding in Gainsborough. The flood storage area covers approximately 488 hectares and was originally rich wet grassland but is now used for arable farming.

The River Trent CFMP covers parts of West Lindsey. Of particular interest is the flood risk management policy that it has assigned to the "Shelford to Gainsborough" policy unit, which extends from Morton in the north beyond Newton-on-Trent in the south. This area has been assigned the policy of *"Take further action to sustain the current level of flood risk into the future (responding to the potential increases in flood risk from urban development, land use change, and climate change."*

[7] AECOM (July 2009). West Lindsey Strategic Flood Risk Assessment. Final Report.

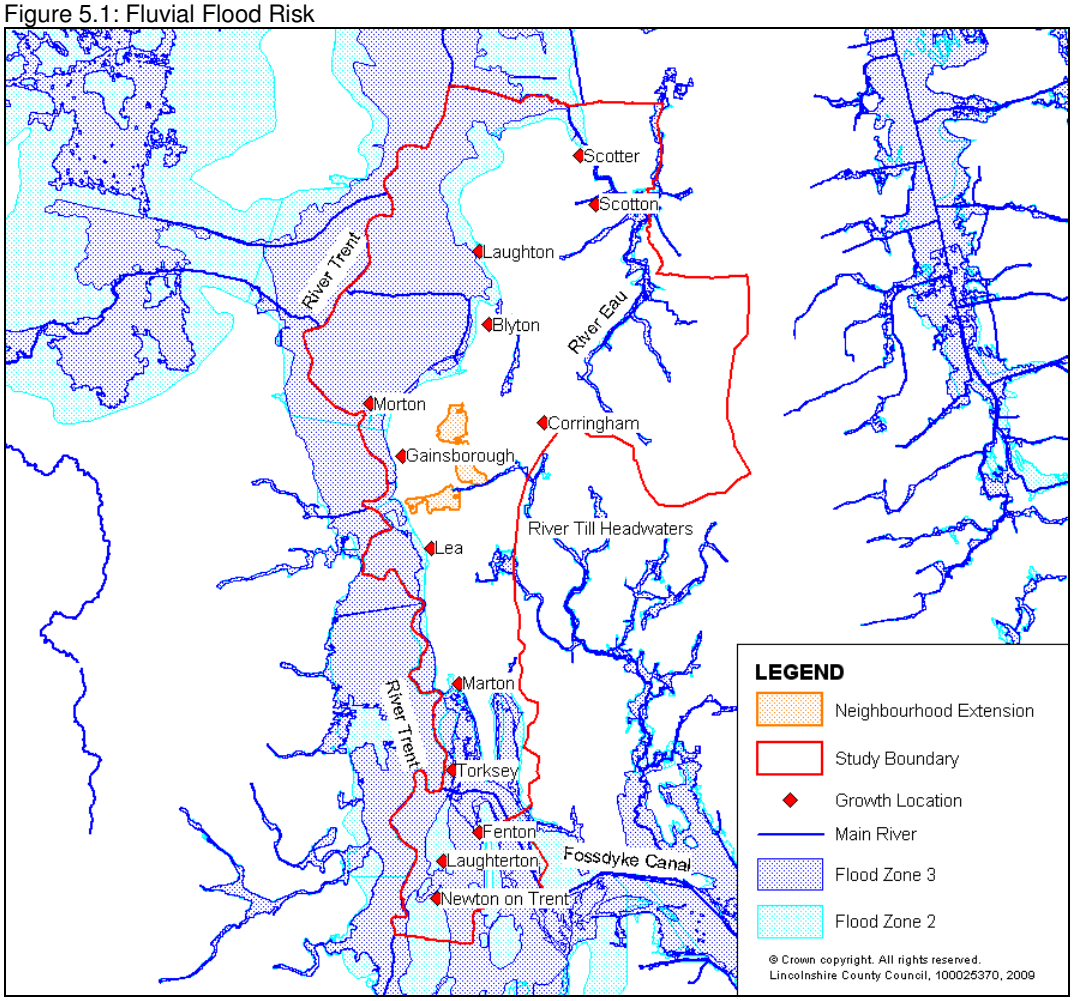
Capabilities on project:
Water

To the north of Morton, the Trent CFMP has assigned the policy of *"Reduce existing flood management actions (accepting that flood risk will increase over time)"*. This affects villages such as Blyton, Laughton, Scotter and Scotton. This same policy has also been applied by the River Witham CFMP to the south east of Gainsborough, affecting the headwater tributaries of the River Till.

The SFRA for West Lindsey presents a series of maps illustrating areas at risk of fluvial and tidal flooding across the district and should be referred to by the planning authority when considering planning applications.

Figure 5.1 shows the Environment Agency's Flood Zones across the study area.

Figure 5.1: Fluvial Flood Risk



Based on Figure 5.1 it is apparent that there is a high level of flood risk, particularly from the River Trent which has a wide floodplain, although not in the locality of Gainsborough.

The far south of the study area is within the floodplains of the River Trent and the Fossdyke Canal. This will affect the villages of Marton, Torksey, Fenton, Laughterton and Newton-on-Trent, which are all expected to see some growth in the future. Consequently any development in these locations will need to have due regard for this flood risk and will require Flood Risk Assessments in line with PPS25.

Capabilities on project:
Water

In addition, the villages of Scotter, Scotton, Laughton and Blyton all lie in close proximity a river and therefore are at risk of either fluvial or tidal flooding. However, there are large areas of land that are not at risk and therefore development should be targeted in these areas.

The three neighbourhood extensions to Gainsborough are largely unaffected by the Flood Zones. However the Eastern and Southern extensions are dissected by Flood Zones associated with tributary watercourses of the River Till (Figure 5.1) and will therefore need to have due regard for this risk when they are developed.

Surface Water

Surface water flooding from overloaded sewers has been identified as being a problem in Gainsborough. The SFRA makes reference to several parts of the town where sewers have been regularly overloaded by intense rainfall and surface water which has presented a flood risk such as in August 2004. According to the SFRA this is an existing problem, the root of which has not been adequately identified.

The SFRA recommends that before further development occurs in these parts of Gainsborough the surface water sewer system is analysed in detail to avoid further development exacerbating the existing problem. It may be appropriate for this to be addressed through a Surface Water Management Plan to enable further development to take place in Gainsborough without exacerbating the existing surface water problem. The Surface Water Management Plan ought to incorporate an assessment of the impact of the surface water and if it affects the relevant STW.

The three neighbourhood extensions are located outside of the town centre where the surface water flooding has previously been reported. Therefore whilst they are not located in the area of risk they could potentially exacerbate the existing problem. In order to avoid this it is recommended that no surface water flows from the three neighbourhood extensions are channelled through the existing pipe network in Gainsborough. It is understood that the developers are in talks with the Upper Witham IDB concerning balancing ponds and discharge to watercourses that comprise the headwaters of the River Till that flows away to the south east of Gainsborough.

An additional consideration is that the three neighbourhood extensions are located in a topographically low area. This basin could potentially be a location where surface water flooding could pond.

Groundwater Flooding

The SFRA concluded that the risk of groundwater flooding is not a significant risk across West Lindsey.

Climate Change

Climate change is bringing fresh challenges as patterns of rainfall are predicted to change, with more intense and frequent rainfall events. The impacts of climate change are likely to include increased flood risk from all sources.

The Trent CFMP indicates that the Environment Agency will be taking action to manage the effects of climate change on Gainsborough and the area to the south, to avoid the risk increasing beyond what it is at present. Elsewhere the existing flood risk is likely to increase.

Conclusions

Table 5.1 presents a RAG classification for each of the growth villages based upon the Environment Agency's Flood Zones and what information is known about the surface water flood risk in Gainsborough, where;

- Red – flooding presents a significant barrier to development.
- Amber – a significant proportion of the village area lies within the Environment Agency Flood Zones or has known surface water issues.

- Green – the village lies entirely outside the Environment Agency Flood Zones or only a small proportion falls within the Flood Zones.

Table 5.1: Flood Risk RAG Status

Settlement	Total Growth	RAG
Gainsborough	8,230	Amber
Blyton	117	Green
Corringham	81	Green
Fenton	37	Amber
Laughterton	31	Amber
Laughton	56	Amber
Lea	11	Green
Marton	53	Amber
Morton	127	Amber
Newton-on-Trent	29	Amber
Scotter	374	Green
Scotton	113	Green
Torksey	33	Amber

6 Environmental Constraints

Introduction

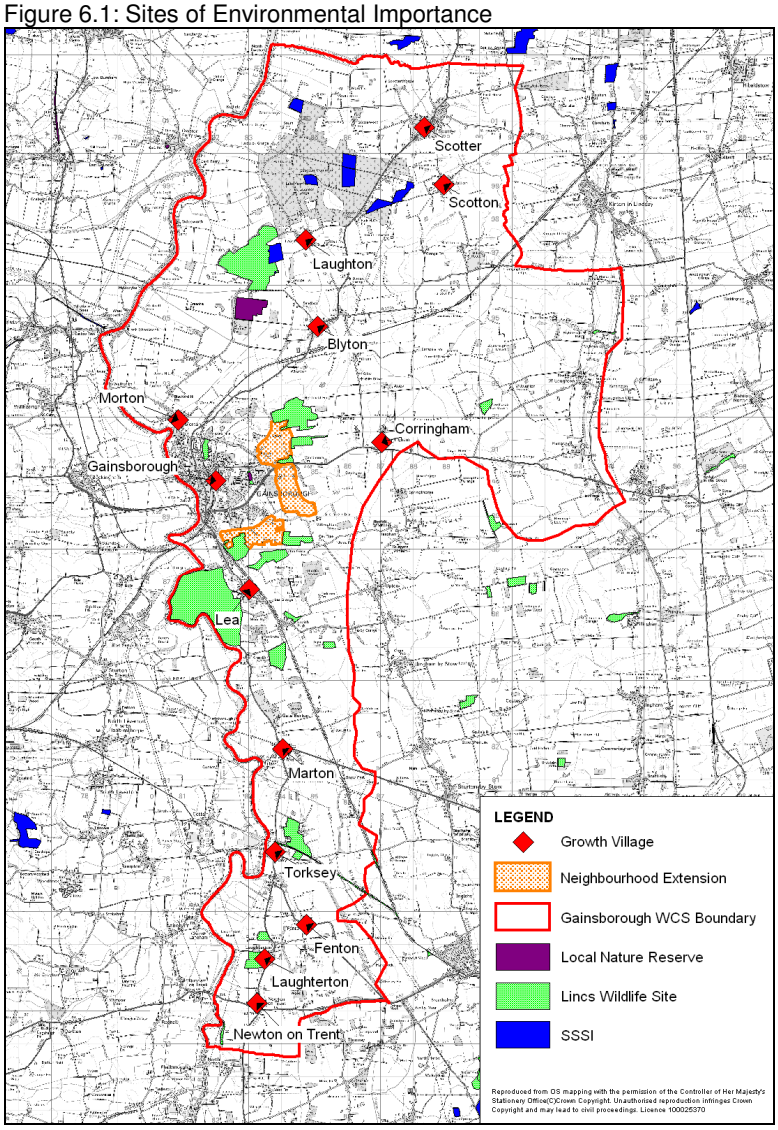
A key objective of a WCS is to ensure that the planning process gives due regard to the environmental capacity of the water environment. Key to this is the consideration of potential constraints and risks relating to ecology, nature conservation and biodiversity.

Environmentally Designated Sites

There are no internationally protected sites within the LPA, this covers Ramsar sites, Special Protection Areas (SPA) and Special Areas of Conservation (SAC).

Data has been obtained concerning Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Local Nature Reserves (LNR) and Lincolnshire Wildlife Trust Sites (LWTS) (Figure 6.1).

Figure 6.1: Sites of Environmental Importance



Capabilities on project:
Water

Based on the information collected there are six SSSIs, two LNRs and 19 Lincolnshire Wildlife Trust Sites (LWTS) located within the study boundary. These are listed in Table 6.1 below.

Table 6.1: Sites of Environmental Importance within the Study Area

Designation	Site
Site of Special Scientific Interest	Tuetoes Hills
	Scotton & Laughton Forest Ponds
	Scotton Common
	Scotton Beck Fields
	Laughton Common
	Lea Marsh
Local Nature Reserve	Owlet
	Theaker Avenue
Lincolnshire Wildlife Trust Site	Laughton Common
	Wharton Wood
	Yawthorne Fox Covert
	Birch Wood
	Pitt Hills Plantation
	Somerby Wood and Hornby Wood
	Theaker Avenue Urban Wildlife Area
	Bass Wood and Park Springs Wood
	Lea Wood
	Warren Wood
	Lea Marsh
	Stag Wood and Moor Plantation
	Park Plantation
	Tiger Holt
	Torksey Golf Course
	Torksey Marsh
	Broom Hills
	Naylors Hills
	Newton Cliff

Interactions of Growth & Environmentally Designated Sites

Reviewing the information presented in Figure 6.1 the majority of villages where growth is likely to occur do not lie in close proximity to any sites with special environmental designations. Therefore housing growth there is unlikely to have significant impact on any of these sites.

Areas where development needs to have due regard for environmental sites:

- The Naylors Hills LWTS covers a large part of Laughterton
- Lea Marsh SSSI and LWTS fringes the edges of Lea and therefore any development to the west of the existing settlement should bear this in mind
- Gainsborough is where the majority of development is going to take place. Any development within the existing urban area should take account of the locations of Theaker Avenue LNR which is also a LWTS, and Pitt Halls Plantation another LWTS. The proposed three neighbourhood extensions are all fringed by and border LWTS, six in all. The development of these neighbourhood extensions would need to ensure that the special features of these sites were duly account for and not detrimentally affected.

Environmental Enhancement

Where appropriate, it is often possible to seek opportunities for enhancement of the natural environment through development projects. This can be in the form of improving the existing environment or creating new habitats that can benefit the general public and wildlife.

Habitat enhancements could include new wildlife ponds and improved terrestrial habitat in the form of wild flower grasslands, scrub areas and hedgerow planting merged in with the overall development where possible. In highly urbanised areas, ponds and open spaces can act as vital wildlife corridors linking several small habitats together, providing a means for wildlife to travel between fragmented habitats. Ponds or swales can obviously provide additional benefits such as mitigating flood risk.

Conclusions

Table 6.2 presents a RAG classification for each of the growth villages based upon the proximity to a site of conservation value to one of the growth villages, where;

- Red – the development is within a site of international or national importance.
- Amber – a site of conservation value is within or borders the village.
- Green – the village is largely unaffected by any sites of conservation value.

Table 6.2: Environmental RAG Status

Settlement	Total Growth	RAG
Gainsborough	8,230	Amber
Blyton	117	Green
Corringham	81	Green
Fenton	37	Green
Laughterton	31	Amber
Laughton	56	Green
Lea	11	Green
Marton	53	Green
Morton	127	Green
Newton-on-Trent	29	Green
Scotter	374	Green
Scotton	113	Green
Torksey	33	Green

Capabilities on project:
Water

7 Conclusions

Summary

This Outline WCS for Gainsborough has assessed potential growth in Gainsborough and a wider study area along the western periphery of the West Lindsey DC administrative boundary. In line with the Programme of Development potential growth of 9,333 new properties could be expected between 2006 and 2026. 88% of this growth is to be in and around the town of Gainsborough which is a designated Growth Point. To ensure that this development is sustainable this Outline WCS was commissioned.

The Outline WCS has undertaken a high level review of the development against aspects of the water cycle, namely; water resources, water supply, foul sewerage, sewage treatment, flood risk and other environmental considerations. Table 7.1 presents a summary of the findings using RAG classifications, details of which can be found in the individual chapters.

Table 7.1: Water Cycle Constraints

Settlement	Water Resource	Water Supply	Foul Sewers	Sewage Treatment	Flood Risk	Environ-ment
Gainsborough	Green	Amber	Amber	Amber	Amber	Amber
Blyton	Amber	Green	Amber	Amber	Green	Green
Corringham	Amber	Green	Amber / Green*	Amber	Green	Green
Fenton	Amber	Green	Amber	Green	Amber	Green
Laughterton	Amber	Green	Green	Green	Amber	Amber
Laughton	Amber	Green	Amber	Amber	Amber	Green
Lea	Green	Green	Green	Amber	Green	Green
Marton	Amber	Green	Amber	Amber	Amber	Green
Morton	Amber	Green	Amber	Amber	Amber	Green
Newton-on-Trent	Amber	Green	Amber	Green	Amber	Green
Scotter	Amber	Amber	Amber	Amber	Green	Green
Scotton	Amber	Green	Amber	Green	Green	Green
Torksey	Amber	Green	Green	Green	Amber	Green

* Corringham is served by both Severn Trent Water and Anglian Water. Severn Trent's classification is first followed by Anglian Water's.

Anglian Water is responsible for the provision of water resources and the supply of clean water across the study area and has indicated that the levels of growth can be supported. Whilst there may not be existing capacity to support all of the forecast growth, their WRMP presents a number of options by which Anglian Water intend to manage both the demand for water across their supply area and increase the availability of the resource with planned improvement and investment where necessary.

Flood risk and the natural environment are not likely to present insurmountable barriers to development. The Environment Agency's Flood Zones are extensive in the south of the study area affecting several villages such as Torksey and Newton-on-Trent where significant development ought to be avoided. However the only location where significant development is expected is Gainsborough, where there is also a potential flood risk. It should be possible to manage the risk through appropriate mitigation measures. The danger of exacerbating the existing risk of surface water flooding is more of an issue for development in central Gainsborough rather than in the neighbourhood extensions.

Sewerage and sewage treatment have not been classified as Red however have the potential to impact upon future development. Gainsborough, Morton and Lea are all to be considered as part of a Detailed WCS for Gainsborough that will review the potential to deliver the three neighbourhood extensions to Gainsborough since the development proposed for Gainsborough has the potential to significantly impact upon the foul sewers and sewage treatment works.

Elsewhere in Blyton, Marton, Scotter, Fenton, Laughton, Newton-on-Trent, and Scotton it is possible to upgrade the sewers and sewage treatment to accommodate the potential growth. It is recommended that West Lindsey work with Severn Trent Water

concerning development in these areas to ensure that the infrastructure is in place when the developments come forward and that the is sufficient development to warrant upgrading the systems.

It should be noted that if the current planning situation changes and significant development were to come forward in any of the villages outside of Gainsborough, beyond that which has been considered by this Outline WCS further work would be required to evaluate its impact upon the water cycle.

Detailed Strategy

West Lindsey DC requested that a Detailed WCS be undertaken for Gainsborough and the neighbourhood extensions. In light of the assessment it will be necessary for the Detailed WCS to review sewerage and sewage treatment to ensure that it is possible to sustainably deliver the proposed growth. In addition to the impact of growth on the sewers and sewage treatment there is the issue of the neighbourhood extensions lying across the boundary between the two water companies which creates issues as to how the water companies will organise themselves to serve the neighbourhoods.

A number of potential solutions are presented below that could address the issue of sewers and sewage treatment in Gainsborough. The Detailed WCS will need to explore these in greater detail.

- All three neighbourhood extensions could be taken to and treated at Gainsborough STW. This would require new trunk sewers for each of the neighbourhood extensions with a direct connection to the Gainsborough STW, unless it is practical to use the existing network through Gainsborough. This option would require a significant upgrade to the existing Gainsborough STW.
- Alternatively the neighbourhood extensions could be taken to Corringham STW, albeit some distance away and requiring significant investment at Corringham STW.
- The neighbourhood extensions could be split as per which side of the water company boundary they fall. Anglian Water could use Corringham STW to treat foul flows and Severn Trent Water use Gainsborough STW to treat foul flows.
- A brand new STW could be built and located in either water company area to be operated that water company or a third party.
- The boundary between the water companies could be revised so that all of the neighbourhood extensions fall under one water company rather than split between the two.

Timescales

The programme initially devised for the Gainsborough WCS is presented in Figure 7.1. This indicates that the draft report for the Detailed WCS would be submitted by the end of February 2010.

Capabilities on project:
Water

Project:	Gainsborough Water Cycle Study
Job No:	60095992
Date:	Sep-09

Programme

	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10
Project Management												
Inception Meeting												
Inception Report												
Progress Meetings												
Stage 1: Outline Study												
Data Collection & Review												
Reporting												
Stage 2: Detailed Strategy												
Technical Meetings												
Review Water Infrastructure												
Optioneering & Costings												
Sustainability of Development												
Reporting												
Sign Off												
West Lindsey Timescales												
Decision re Joint Planning Unit												
Joint Core Strategy												
Planning Applications												
Area Action Plan for Gainsboro'												

cont. to May 2011

Tasks planned
Tasks completed
Milestone
West Lindsey Planning Timescales

Capabilities on project:
Water

As part of the analysis for the Detailed WCS it will be necessary to breakdown the proposed development in Gainsborough, accounting for that in the neighbourhood extensions and that in the town centre. It is therefore recommended that West Lindsey DC collate and provide available information from the developers and their planning team concerning the neighbourhood extensions and town centre. It is noted that the Gainsborough Area Action Plan has been suspended pending decisions on the scope and timetabling of a Central Lincolnshire Local Development Framework and the related role of the Joint Planning Unit that has been formed covering the City of Lincoln Council, Lincolnshire County Council, North Kesteven DC and West Lindsey DC. These matters are expected to be concluded early in 2010.

The timescales for the WCS will need to be reviewed as part of the Detailed Study.

Appendices

Capabilities on project:
Water

Appendix A: Housing Growth

	AMP4	AMP5	AMP6	AMP7	
Settlement	**2006-2010**	**2010-2015**	**2015-2020**	**2020-2026**	**TOTAL**
Gainsborough	678	3,228	2,421	1,902	8,230
Aisby	2	0	0	0	3
Blyborough	0	1	1	0	3
Blyton	36	31	27	23	117
Brampton	0	0	0	0	1
Corringham	32	17	17	15	81
East Ferry	0	0	0	0	0
East Stockwith	2	1	0	0	4
Fenton	8	12	10	8	37
Gate Burton	0	0	0	0	0
Grayingham	3	0	0	0	3
Harpswell	0	1	1	0	3
Hemswell	1	1	0	0	3
Kettlethorpe	0	0	0	0	1
Knaith	4	0	0	0	5
Knaith Park	4	0	0	0	4
Laughterton	6	9	9	8	31
Laughton	9	16	16	15	56
Lea	2	6	3	0	11
Marton	7	15	16	15	53
Morton	18	42	36	31	127
Newton-on-Trent	5	8	8	8	29
Northorpe	0	0	0	0	0
Pilham	0	1	1	0	3
Scotter	134	91	80	69	374
Scotterthorpe	2	0	0	0	2
Scotton	42	24	24	23	113
Stow Park	0	0	0	0	0
Susworth	1	0	0	0	1
Torksey	5	11	9	8	33
Walkerith	1	2	1	0	3
Wilsworth	3	1	0	0	5
Yawthorpe	0	0	0	0	0
TOTAL	**1,007**	**3,523**	**2,679**	**2,124**	**9,333**