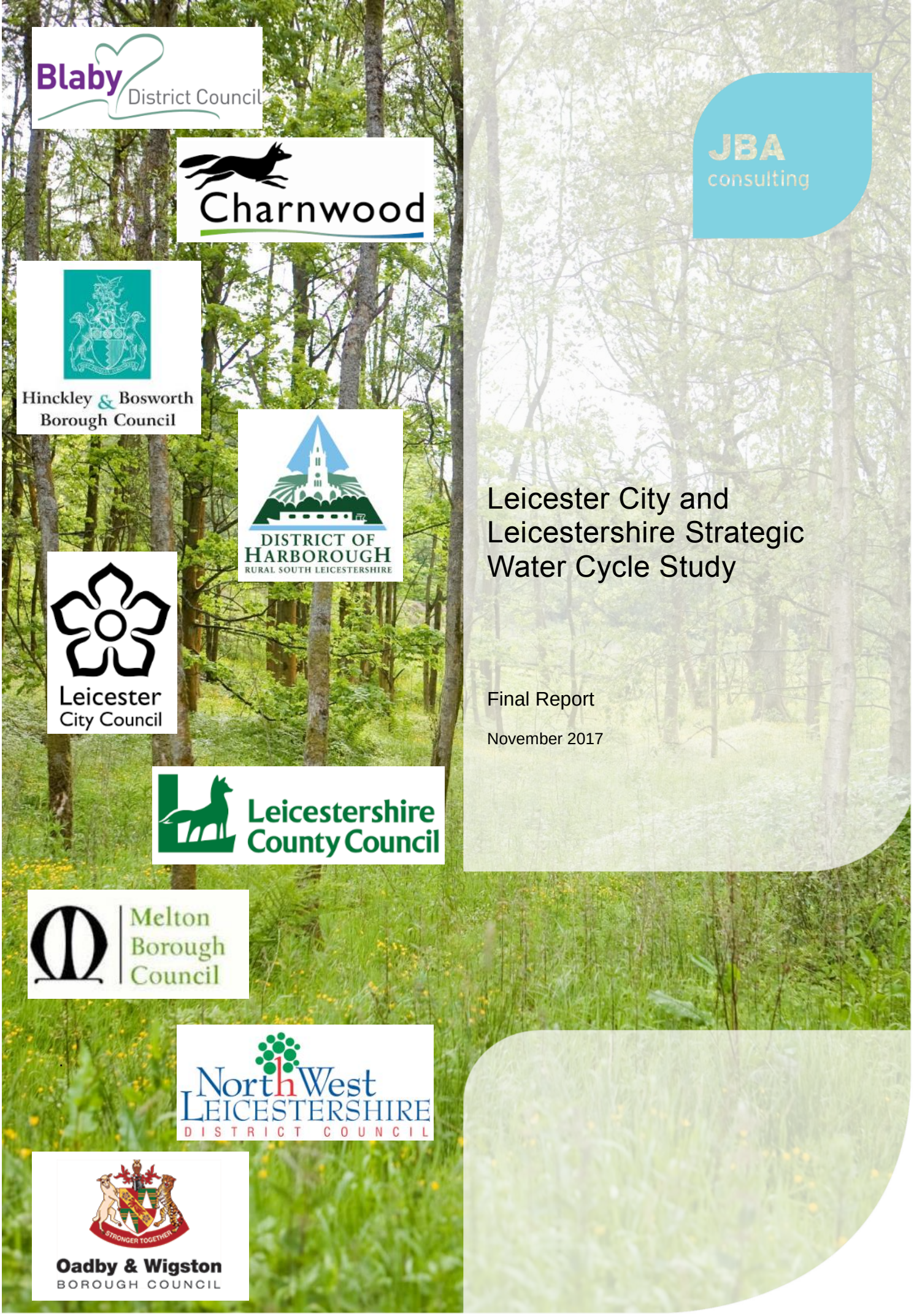

Leicester City and Leicestershire Strategic Water Cycle Study

Final Report

November 2017

JBA Project Manager

Claire Gardner
The Library
St Philips Courtyard
Church Hill
COLESHILL
Warwickshire
B46 3AD

Revision History

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Final Draft v2.0	Amended based on comments stakeholders	Dave Nash (North West Leicestershire District Council)
Final Draft v3.0	Amended to include additional Non-strategic site information	Dave Nash (North West Leicestershire District Council)
Final v4.0		Dave Nash (North West Leicestershire District Council)
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Contract

This report describes work commissioned by the non-unitary authorities of Leicestershire, Leicester City Council and Leicestershire County Council. The Councils' joint representative for the contract was David Nash, Strategic Planning Consultant supporting the Joint Strategic Planning Manager for the County and Districts of Leicestershire, Leicester City and the LLEP.

Prepared by ..... Holly Hart BSc
Assistant Analyst

Alistair Clark BSc MSc
Senior Analyst

Reviewed by ..... Paul Eccleston BA CertWEM CEnv MCIWEM C.WEM
Technical Director

Purpose

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Acknowledgements

JBA Consulting would like to thank Leicestershire County Council, North West Leicestershire District Council, Charnwood Borough Council, Melton Borough Council, Harborough District Council, Oadby and Wigston Borough Council, Blaby District Council, Hinckley and Bosworth Borough Council, the Environment Agency, Thames Water and Anglian Water for their assistance in preparing this report.

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Executive Summary

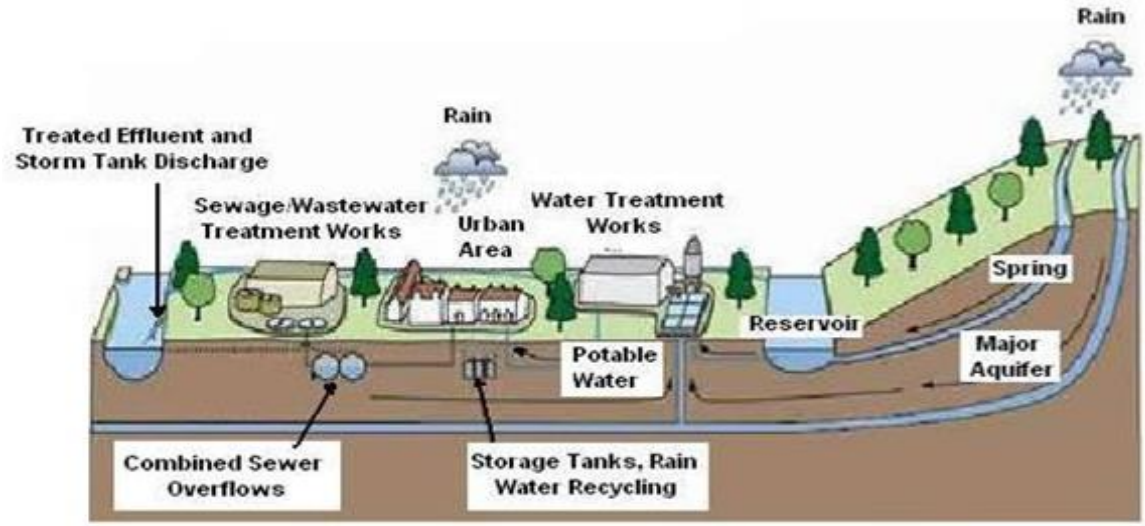
Introduction

In April 2017, JBA Consulting was commissioned by the non-unitary authorities of Leicestershire, Leicester City Council and Leicestershire County Council to complete a Water Cycle Study (WCS) for the County of Leicestershire and the City of Leicester to support the production of the Strategic Growth Plan (SGP). The SGP aims to set out the partners' aspirations for growth, development and environmental matters over the long term. It will identify the broad locations that are most likely to be developed in the longer term to accommodate the projected growth through to 2050.

New strategic and non-strategic growth and development within Leicester City and Leicestershire will require the provision of clean water, safe disposal of wastewater and protection from flooding. It is possible that allocating large numbers of residential dwellings and economic developments within the area could result in the local infrastructure being put under excessive pressure, reducing the capacity of the system and affecting its ability to maintain delivery in accordance with environmental standards. These situations could potentially lead to service failures for water and wastewater customers across Leicester and Leicestershire. Any adverse impacts on the environment and high cost upgrades of existing and new water and wastewater assets could also be passed on to bill payers within the County and/or the City. It is therefore crucial to assess the impacts of growth on water and wastewater infrastructure to inform sustainable development within the study area.

In addition to the increased housing demand; climate change presents future challenges such as increased intensive rainfall and a higher frequency of drought events that will put further pressure on the existing water and wastewater infrastructure. Sustainable planning for water must therefore take the impacts of climate change into account across the water cycle (Figure 1-1).

Figure 1-1: The Water Cycle



This study will assist the local authorities within the study area to identify the most suitable sustainable development allocations which minimise impacts on the environment, water quality, water resources and water infrastructure. This study focusses on the potential growth areas identified by the emerging Leicester and Leicestershire Strategic Growth Plan to assess if large-scale development within these areas would be viable and sustainable in terms of their impacts on the water cycle. This has been achieved by identifying areas where there may be conflicts between any proposed developments, the requirements of the environment and by recommending potential solutions to these conflicts.

In addition to the commissioning authorities this Water Cycle Study has been carried out in co-operation with the Environment Agency, Severn Trent Water and Anglian Water.

Due to the strategic nature of this Water Cycle Study and the lack of information on the precise locations of future development, further detailed assessments of future allocations within the potential Strategic Growth Plan Growth Areas will be required to fully assess the impacts of individual developments on the water cycle.

This WCS has also identified whether infrastructure upgrades are expected to be required to accommodate growth. Timely planning and provision of upgrades will be undertaken through cooperation between Leicestershire County Council, Leicester City Council, the District and Borough Councils, Developers, Severn Trent Water and Anglian Water. Early developer engagement will be essential to ensure that sufficient time is available to build water and wastewater capacity upgrades prior to the development connecting to any of the existing infrastructure.

Future Growth in Leicester and Leicestershire

The Leicester and Leicestershire HEDNA was produced in 2017, providing an assessment of the future housing and economic growth needs across the study area. This Water Cycle Study focusses on three main areas of growth across Leicestershire.

2011 - 2031 Growth

The local authorities have provided data on the proposed growth from 2011 to 31 for assessment. These sites have been assessed to give a detailed understanding of the baseline growth to provide a full analysis of the impacts of growth across Leicester and Leicestershire to 2050.

2031 - 2050 Strategic Growth

The nine organisations within the study area, including the Leicestershire County Council, Leicester City Council and the non-unitary Borough and District Councils have formed a partnership to prepare a non-statutory Strategic Growth Plan (SGP) for the County. This aims to set out a strategic framework for delivering residential, economic and infrastructural growth to 2050.

The SGP has identified several Growth Areas that may accommodate the projected growth from 2031 to 2050. This WCS provides a high-level assessment of the impacts of strategic growth at the identified Primary Growth Centre, Secondary Growth Centres and Key Growth Centres.

2031 - 2050 Non-Strategic Growth

In addition to the strategic scale growth from 2031 to 50, around 34,000 dwellings will be delivered on non-strategic sites that will be distributed across Leicester and Leicestershire but haven't yet been located.

Water Resources

Water Resource Assessment - Availability of Water Resources

Catchment Abstraction Management Strategies (CAMS) are used to manage water resources at a strategic level. A permitting system is used to manage water resources across the UK. CAMS and licensing strategies are used to do this for each individual management area. Water available for consumption may by limited during low flows, this usually takes the form of a "Hands Off Flow" (HOF) conditions. The study area is covered by six CAMS:

- **Lower Trent and Erewash CAMS:** Water is available for licensing during the high flows and restricted flow available during low flows. HOF conditions apply to this area, these come into force when flows at the River Trent at North Muskham falls below a defined flow level.
- **Soar CAMS:** Water is available for licensing during the high flows and restricted flow is available during low flows. To protect the flows entering the downstream River Trent, a HOF condition applies when the River Trent at North Muskham falls below a defined flow level.
- **Tame, Anker and Mease CAMS:** Water is available for licensing during the high flows and restricted flow is available during low flows. There are two groundwater management units (GWMU) within this CAMS, the Coleorton GWMU and the Measham GWMU.
- **Warwickshire Avon CAMS:** The River Swift has water available for licensing in the high flows but no water is available for licensing in the low flow scenarios. The Upper River Avon has no water available for licensing in any flow scenario.
- **Welland CAMS:** In the Welland catchment, upstream of Tinwell, there is no water available for abstraction except in extremely high flows. Water resource availability in the Eye Brook is driven by the operation of the Eyebrook Reservoir.
- **Witham, Steeping Great Eau and Long Eau CAMS:** A minimal area of Leicestershire is covered by this CAMS, it has therefore not been assessed in this Water Cycle Study.

Water Resource Assessment: Water Resources Management Plans

When new development within a local authority is planned, it is important to ensure that there are adequate water resource provisions in the area to supply the increases in demand without risking shortages in the future or during periods of high-water demand. The aim of this assessment was to determine whether the levels of growth proposed within the study area exceeds the scale that's been considered by Severn Trent Water (STWL) whilst planning for future water demand. Severn Trent Water's Water Resources Management Plan 2014 (WRMP) was reviewed to assess each local authority and the levels of growth proposed in terms of water resource planning.

Leicestershire is located almost entirely within the STWL Strategic Grid Water Resource Zone (WRZ) and would therefore be managed in the same way over the next 33 years. The Strategic Grid is likely to require significant investment to cope with rapid growth, reduce unsustainable abstractions and to manage the long-term impacts of climate change. This is detailed in the WRMP.

Water Resource Assessment: Water Supply Infrastructure Assessment

A quantitative assessment of water supply infrastructure was not completed as part this WCS due to the uncertainty around the location of specific growth, however the response from the water company indicates that water supply is not expected to be a constraint to future development. There would still be a requirement for STWL to ensure that water could be supplied to each development adequately so, as development is allocated throughout the area, detailed modelling of water supply infrastructure will allow any infrastructural upgrades required to be identified and completed without restricting the timing, location or scale of the planned development.

Wastewater Collection and Sewerage System Capacity

Wastewater Assessment - Wastewater Treatment Assessment: 2011-31 Growth

Based on the locations of the committed development sites, each has been allocated to a Sewage Treatment Works (STW) to better understand how the proposed growth may affect the STWs in the future. This assessment has identified 45 STWs that could receive additional wastewater from the development of residential and employment sites. Many treatment works in the area could receive significant increases in wastewater flows in the future due to the quantity and scale of some proposed development sites. It is recommended that as development progresses, allocations are assessed in detail in relation to each STW so that upgrades or new infrastructure can be planned.

Wastewater Assessment - Wastewater Treatment Assessment: 2031-2050 Strategic Growth

The high-level assessment completed demonstrates the significant impact that strategic development in the study area could have on the existing wastewater infrastructure. This study has identified existing STWs that could be affected due to their proximity to the SGP Growth Areas, how the committed sites could further increase the pressure on infrastructure and identified high level constraints to growth in terms of wastewater management and upgrades that may be required.

Wastewater Assessment - Wastewater Treatment Assessment: 2031-50 Non-Strategic Growth

Due to the uncertainty surrounding the future geographical locations of the non-strategic sites, the notional dwellings have been proportioned and assigned to the STWs that are most likely to be affected by development based on the growth between 2011 and 2031. 41 STWs have been identified as potentially receiving additional wastewater flows in the future. It is recommended that this assessment should be updated when sites and notional capacities are identified across Leicestershire.

Wastewater Assessment - Cumulative Wastewater Treatment Assessment: 2011 - 2050

This assessment has identified the STWs most likely to be significantly impacted by cumulative growth across Leicestershire, including Strategic and Non-Strategic growth from 2011 to 2050. There are still some uncertainties present within this assessment due to the lack of information on the precise locations of growth between 2031 and 2050. It is recommended that once detailed information on growth is known, a detailed cumulative assessment is completed to fully understand how each STW across Leicestershire could be affected to 2050.

Wastewater Assessment - Wastewater Network Capacity Assessment

Developers have a legal right to connect to public sewers for newly developed sites as set out in the Water Industry Act 1991. Sewerage undertakers are also obliged to provide sewage treatment for sites which benefit from planning permission and are responsible for any required investment through their business planning process. However, sewerage undertakers are able to seek contributions for the improvement of wastewater networks relating to new development in accordance with the provisions of the Water Industry Act 1991. Therefore, wastewater network capacity should not be a constraint to future development but any identified capacity issues could have an impact on the timescale of development delivery in the future.

Wastewater Treatment Flow and Water Quality

Wastewater Treatment Flow Permit Assessment

The increases in Dry Weather Flow (DWF) at each STW can be compared to the permitted maximum DWF at each STW, identifying if there is capacity available at the STW to manage the additional wastewater flows from the potential growth.

This assessment identifies that the majority of STWs within Leicester and Leicestershire are already working close to, or over, their permitted maximum Dry Weather Flow rates with the current levels of development. Additional DWF rates, calculated from the committed housing and economic development sites across Leicester and Leicestershire, could therefore put significant additional demand on these STWs.

It is likely that, due to the significant levels of growth proposed throughout the area to 2031 and the additional levels of strategic development that are proposed in the Strategic Growth Plan for the period 2031 - 2050, significant wastewater infrastructural upgrades and investment will be required to manage the levels of development proposed in Leicestershire.

In areas where significant increases in DWF are predicted and it has been identified that the existing Sewage Treatment Works are likely to exceed their Maximum DWF Permits, it may be necessary to design and construct new wastewater treatment infrastructure to manage future demand. This is more likely to be the case for the identified STWs affected by the high levels of committed growth and those located in one of the longer-term Strategic Growth Plan Growth Areas.

Scoping Water Quality Assessment

This scoping Water Quality Assessment (WQA) provides an overview of the STWs located within the Strategic Growth Plan Growth Areas and the Water Framework Directive Overall Waterbody Classifications for watercourses also located within these areas. This shows the current water quality situation within the Growth Areas and how future development could impact these watercourses in terms of meeting their future water quality objectives. Due to the lack of information currently available on the specific locations of growth, this assessment provides a background understanding of the current water quality situation in the Growth Areas.

It is recommended that, when more information is available about the specific locations of development and the scale of growth, that a more in depth quantitative assessment of the impacts of growth on water quality is completed. This should take into account phased committed and Strategic Growth and, where appropriate existing water quality models exist, should be undertaken on a catchment scale in line with Environment Agency guidance.

Sewage Treatment Works Odour Assessments

STWs have been identified within the Growth Areas and the land within an 800m radius of the STWs identified as potentially at risk from odour originating from the associated STWs. This assessment aims to make future developers within the SGP Growth Areas aware of the potential risks associated with developing the land near STWs in terms of odour. This should encourage development to be allocated in the most suitable locations within the Growth Areas.

The scale of future development proposed in each Growth Area could be significant, as a result, new STWs and associated wastewater infrastructure are likely to be required in many locations across Leicestershire. Consideration should be given to the relative positions of new STWs and development, such that the risk of causing odour nuisance to new residential and employment development is minimised.

Environmental Constraints and Opportunities

Development within Leicester and Leicestershire has the potential to cause a range of adverse impacts on the water environment, biodiversity features, historical features and agricultural uses. Environmental designations of all types are well distributed across all the local authorities making up Leicester and Leicestershire. An assessment of the SGP Growth Areas has been completed to identify key environmental features that may affect development in specific locations of the Growth Area. Due to the scale of these areas, most contain a range of environmental designations that should be considered in detail during the site allocation and planning process.

This assessment has provided a high-level appraisal of the potential environmental risks and opportunities associated with the Leicester and Leicestershire Strategic Growth Plan Growth Areas. This assessment should be used in conjunction with Sustainability Appraisals (SAs) and/or Strategic Environmental Assessments (SEAs) where available. More detailed assessments of the environmental issues associated with the development of each strategic growth area should be undertaken prior to development sites being identified. This should include a thorough desk study and site surveys as required to fully identify sensitive environmental features present in each location.

Climate Change Assessment

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

The capacity of the sewerage system and the water quality of receiving water bodies stand out as two elements of the assessment where the consequences of climate change are expected to be high but no account has been made of climate impacts in the assessment. Where feasible, these should be taken into account in the additional assessment included within any future assessment of the water cycle when more detailed information on site allocations in available.

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Abbreviations

AW…….. Anglian Water
ALS ..... Abstraction Licensing Strategy
AMP ..... Asset Management Plan
AMR ..... Automatic Meter Reading
AONB..... Area of Outstanding Natural Beauty
AP ..... Assessment Point
ASNW ..... Ancient Semi-Natural Woodland
BERR ..... Department for Business Enterprise and Regulatory Reform
BIDS..... Business, Industrial, Distribution and Storage
BOD ..... Biochemical Oxygen Demand
CAMS..... Catchment Abstraction Management Strategies
CAPEX..... Capital Expenditure
CE ..... Cambridge Econometrics
CED ..... Common End Date
CFMP..... Catchment Flood Management Plan
CfSH ..... Code for Sustainable Homes
CLP ..... Comprehensive Local Plan
CSO ..... Combined Sewer Overflow
DCLG ..... Department of Communities and Local Government
DWF..... Dry Weather Flow
DWI ..... Drinking Water Inspectorate
DYAA ..... Dry Year Annual Average
DYCP ..... Dry Year Critical Period
EA ..... Environment Agency
EC ..... European Community
ECA..... European Communities Act
EDNA ..... Economic Development Needs Assessment
EFI ..... Ecological Flow Indicator
EP ..... Environmental Permit
EU ..... European Union
FEH..... Flood Estimation Handbook
FFT ..... Flow to Full Treatment
FWMA..... Flood and Water Management Act
FZ..... Flood Zone
GES ..... Good Ecological Status
GIS..... Geographic Information Systems
HOF ..... Hands-Off Flow
HOL..... Hands-Off Level
IDB ..... Internal Drainage Board

IDP ..... Infrastructure Delivery Plan
JBA ..... Jeremy Benn Associates
LLFA ..... Lead Local Flood Authority
LCC ..... Leicester City Council
LLEP ..... Leicester and Leicestershire Enterprise Partnership
LCoC ..... Leicestershire County Council
LPA ..... Local Planning Authority
l/p/d ..... Litres per person per day
Ml/d ..... Mega (Million) litres per day
NPPF ..... National Planning Policy Framework
NYAA ..... Normal Year Average Annual
OAN ..... Objectively Assessed Need
OfWAT ..... Water Service Regulation Authority
ONS ..... Office of National Statistics
OPEX ..... Operational Expenditure
OS ..... Ordnance Survey
PDL ..... Previously Developed Land
PE ..... Population Equivalent
p/h ..... Person per house
PPS ..... Planning Policy Statement
RAG ..... Red / Amber / Green assessment
RBD ..... River Basin District
RBMP ..... River Basin Management Plan
ReFH ..... Revitalised Flood Hydrograph
RNAG ..... Reason for Not Achieving Good (Status)
RQP ..... River Quality Planning tool
RZ ..... Resource Zone
SA ..... Sustainability Appraisals
SAC ..... Special Area of Conservation
SANGS ..... Suitable Accessible Natural Green Space
SBP ..... Strategic Business Plan
SEA ..... Strategic Environmental Assessment
SEPA ..... Scottish Environmental Protection Agency
SEW ..... South East Water
SFRA ..... Strategic Flood Risk Assessment
SGP ..... Strategic Growth Plan
SHELAA ..... Strategic Housing and Economic Land Availability Assessment
SHMA ..... Strategic Housing Market Assessment
SPA ..... Special Protection Area
SPZ ..... Source Protection Zone

SS ..... Suspended Solids
SSSI ..... Site of Special Scientific Interest
STWL ..... Severn Trent Water Limited
SU ..... Sewerage Undertaker
SuDS ..... Sustainable Drainage Systems
SWMP ..... Surface Water Management Plan
TCAMS ..... Thames Catchment Abstraction Management Strategy
TW ..... Thames Water
uFMfSW ..... Updated Flood Map for Surface Water
UWWTD ..... Urban Waste Water Treatment Directive
WaSC ..... Water and Sewerage Company
WCS ..... Water Cycle Study
WFD ..... Water Framework Directive
WRC ..... Water Recycling Centre
WRMP ..... Water Resource Management Plan
WRZ ..... Water Resource Zone
WQA ..... Water Quality Assessment
WTW ..... Water Treatment Works

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1 Introduction

1.1 Terms of Reference

In April 2017, JBA Consulting was commissioned by the non-unitary authorities of Leicestershire, Leicester City Council and Leicestershire County Council to complete a Water Cycle Study (WCS) for the County of Leicestershire and the City of Leicester to support the development of a non-statutory Strategic Growth Plan (SPG), designed to set out aspirations for growth, development and environmental management to 2050.

New growth and development within Leicester and Leicestershire will require the provision of clean water, safe disposal of wastewater and protection from flooding. It is possible that allocating large numbers of residential dwellings and economic development sites within the study area could result in the capacity of the available infrastructure being exceeded. This situation could potentially lead to service failures for water and wastewater customers across the study area. Adverse impacts on the environment and high cost upgrades of water and wastewater infrastructure could also be passed on to bill payers. It is therefore crucial to assess the impacts of proposed growth on water and wastewater infrastructure to inform sustainable development within the city and county.

Climate change also presents future challenges, such as increased intensive rainfall and a higher frequency of drought events that will put an increased pressure on the existing water and wastewater infrastructure. Sustainable planning for water must therefore take the impacts of climate change into account across the water cycle.

Figure 1-1: The Water Cycle

This study will assist all members of the commissioning group within Leicester and Leicestershire in the preparation of the Strategic Growth Plan (SGP) to identify sustainable development allocations whilst minimising impacts on the environment, water quality, water resources, water/wastewater infrastructure and flood risk. This has been achieved by identifying areas where there may be conflicts between any proposed developments and the requirements of the environment and by recommending potential solutions to these conflicts.

The Water Cycle Study (WCS) and associated Strategic Flood Risk Assessment (SFRA) will be used as evidence within the Strategic Growth Plan and can also be utilised by the local authorities within Leicestershire to inform the development of Local Plans.

1.2 Objectives of the Water Cycle Study

The study area comprises of the County of Leicestershire, administered by the County Council and seven non-unitary boroughs and districts, plus the City of Leicester unitary authority. These nine organisations have formed a partnership, the Leicester and Leicestershire Enterprise Partnership (LLEP), to prepare a non-statutory Strategic Growth Plan (SGP) covering the City and County. The SGP aims to set out aspirations for long term residential growth, economic development, infrastructure development and environmental management. The SGP identifies broad locations for development to accommodate the long term proposed growth through to 2050. It is essential that the potential impacts of large scale growth on the water cycle are understood at an early stage, to mitigate the impacts of development on areas with limited environmental capacity.

This Water Cycle Study (WCS) has been commissioned, alongside a Strategic Flood Risk Assessment (SFRA), to assess the potential impacts of the proposed growth upon water resources, wastewater services and the environment. The overall objective of this WCS is to understand the environmental and physical demands of the development and identify opportunities/requirements for more sustainable planning and improvements that may be required so that proposals do not exceed the water cycle capacity. This is assessed by considering the following areas:

- Water Resources and Water Supply
- Wastewater Collection and Treatment
- Water Quality
- The Environment
- Climate Change

Due to the scale of this assessment, future strategic developments within the study area have the potential to significantly impact water supply and demand, existing wastewater infrastructure and the water environment as a whole. It is important that the potentially negative impacts of proposed growth on the water cycle are identified at an early stage and that all stakeholders are aware of these impacts so that development can be managed in way that minimises the effects. This WCS aims to identify areas within the SGP Growth Areas, where development may have an impact on the water cycle, this information can then be used to allocate sites in the most appropriate locations within the Growth Areas.

1.3 Water Cycle Study Scope

The following topics and assessments have been covered as part of this Water Cycle Study:

Water Resources and Water Supply

- A review of Catchment Abstraction Management Strategies (CAMS) across Leicestershire;
- A review of the Severn Trent Water Limited (STWL) 2014 Water Resource Management Plan (WRMP) and its 2015 annual review;
- An assessment of water resources and water supply infrastructure by STWL.

Wastewater Collection and Treatment

- The identification of Sewage Treatment Works that could be affected by non-strategic local authority allocations and Strategic Growth Plan scale growth;
- An assessment of wastewater infrastructure and Sewage Treatment Work capacity by Severn Trent Water and Anglian Water.

Water Quality Assessment

- The identification of the current water quality levels in the study area and a high-level assessment of the impacts of growth on the water quality in the receiving watercourses.

Environmental Constrains and Opportunities

- An identification of fluvial and environmental designations within the Strategic Growth Plan Growth Areas and committed development sites, identifying the risks and opportunities associated with each environmental designation.

Climate Change

- The potential impacts of climate change on the assessments made in this WCS.

1.4 Structure of this Water Cycle Study

Table 1-1: Report Structure and Topics

Chapter	Description
1. Introduction	This chapter provides the background, the objective and the scope of the Water Cycle Study
2. Future Growth in Leicestershire	This chapter illustrates the scale and locations of the planned developments that were assessed in this study.
3. Legislation and Policy Framework	This chapter introduces the policy and legislative framework which drives the management of development and the water environment in England at local, national and European level.
4. Water Resources and Water Supply	This chapter looks at the availability of water resources to cover the future demand. It also covers the impact of the planned development on the existing capacity of the water supply infrastructure and highlights where upgrades or new infrastructure might be needed.
5. Wastewater Collection and Treatment	This chapter covers the impact of the planned development on the existing capacity of the sewerage system infrastructure and sewage treatment works and highlights where upgrades or new infrastructure might be needed. It also looks at the potential impact of odour from sewage treatment works on new developments.
6. Wastewater Treatment Flow and Water Quality	The chapter considers the impact of the increased discharge of effluent due to an increase in the population served by a STW may impact on the quality of the receiving water.
7. Environmental Constraints and Opportunities	This chapter looks at the environmental risks and opportunities associated with the allocation sites.
8. Climate Change Impact Assessment	This chapter illustrates the qualitative assessment undertaken to assess the potential impacts of Climate Change on the assessments made in this water cycle study.
9. Summary and Recommendations	This chapter summarises the findings of the Water Cycle Study and summarises all the recommendations provided in each chapter.

1.5 Study Area

The County of Leicestershire located is in the Midlands and covers an area of just over 2,000km^2. The study area is surrounded by Derbyshire, Nottinghamshire, Lincolnshire, Rutland, Northamptonshire, Warwickshire and Staffordshire. Leicestershire is divided into seven Local Planning Authorities (LPA):

- North West Leicestershire District
- Charnwood Borough
- Melton Borough
- Harborough District
- Oadby and Wigston Borough,
- Blaby District
- Hinckley and Bosworth Borough

The non-unitary boroughs and districts surround the City of Leicester, which is located at the centre of the County. Leicester City Council is a unitary authority and is administered separately from the rest of Leicestershire. For the purpose of this report the study area, as shown in Figure 1-2 refers to both the city and county.

Leicester and Leicestershire have a combined population of around 1,017,936 (ONS 2015 Mid-Year Population Estimates)[1], this has been broken down to district/borough/unitary authority scale in Table 1-2. The main population centres in the study area include Leicester, Loughborough, Ashby-de-la-Zouch, Coalville, Hinckley, Market Harborough, Melton Mowbray, Oadby and Wigston among others.

Table 1-2: Population of Leicestershire (ONS 2015 Mid-Year)

Local Planning Authority	ONS 2015 Mid-Year Population Estimates
North West Leicestershire	97,247
Charnwood	176,720
Melton	50,912
Harborough	89,284
Oadby and Wigston	55,833
Blaby	96,544
Hinckley and Bosworth	108,769
City of Leicester	342,627

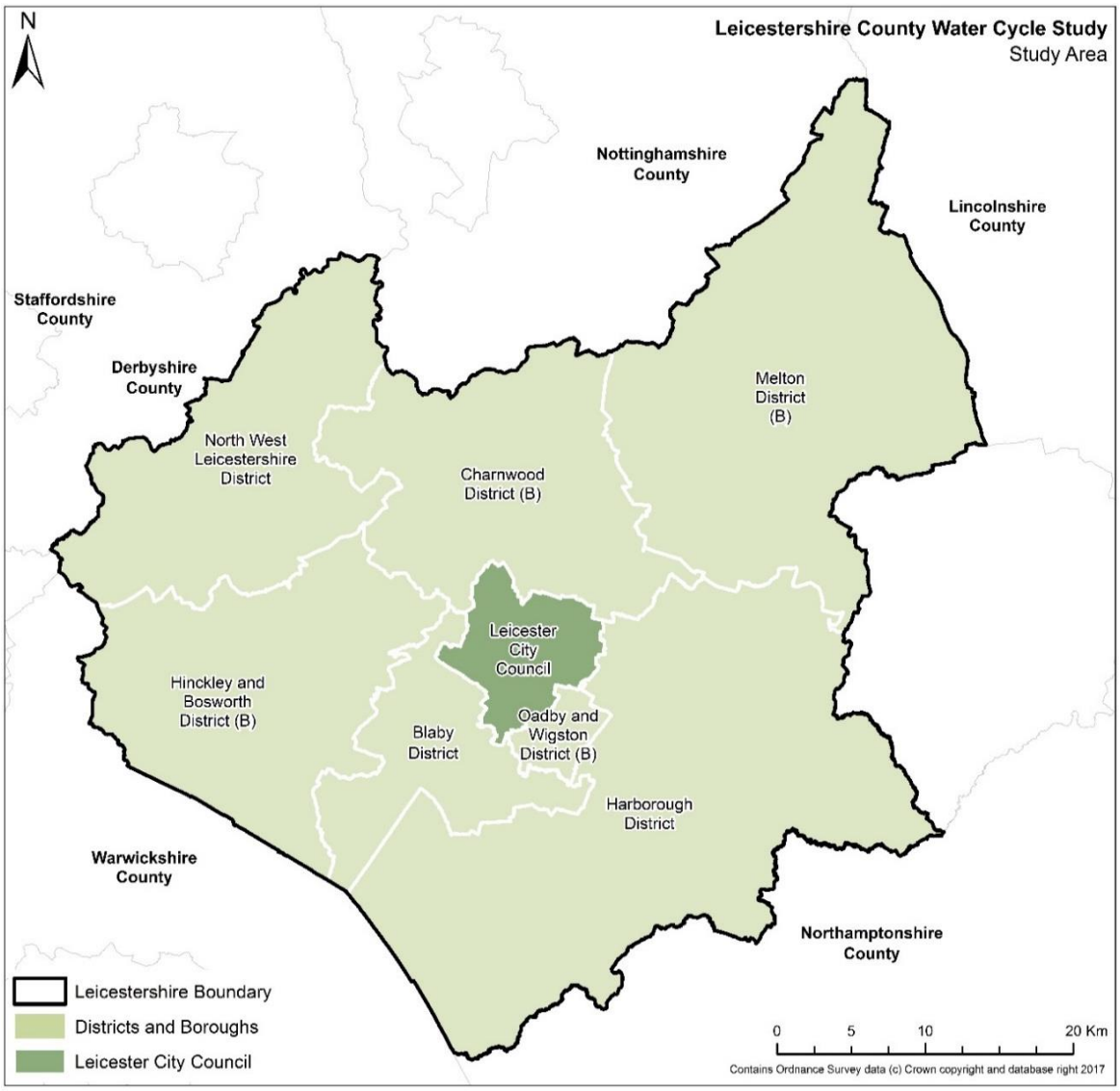
The study area is bisected vertically by the River Soar which flows northwards from Hinckley, though Leicester, joining the River Trent at its confluence on the northern border of the area with Nottinghamshire. Other rivers in the area include the River Mease, River Sence, Tweed River, River Swift and River Welland. As well as rivers, the Leicester Line of the Grand Union Canal, Charnwood Forest Canal and Ashby Canal are also located within Leicestershire.

Leicestershire has a moderate elevation of between around 60 and 180m above sea level, with Leicester and Loughborough located at the main topographic lows and high points in North West Leicestershire and Harborough. Much of Leicestershire is rural in character and agriculture is the main land use. The National Forest and Charnwood Forest also characterise the areas to the north-east of Leicester[2].

1 Office for National Statistics (2015) Populations Estimates Analysis Tool - Mid 2015 Dataset. Accessed online at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesanalysistool at 23/05/2017

2 Strategic Growth Plan Leicester & Leicestershire (Aug 2016) Strategic Growth Statement. Accessed online at http://www.llstrategicgrowthplan.org.uk/wp-content/documents/pdf_document/Strategic-Growth-Plan-12a.pdf on 23/05/2017

Figure 1-2: The County of Leicestershire and City of Leicester Study Area



1.6 Stakeholders and Consultation

The formation of the Leicester and Leicestershire Enterprise Partnership (LLEP) provides a platform for sharing information between the partners and will contribute to demonstrating the fulfilment of the 'Duty to Co-operate' required of local authorities. However it is also important that a Water Cycle Study (WCS) brings together knowledge, understanding, skills and resources from external partners and stakeholders to fully understand the environmental and physical constraints to development within Leicestershire.

Along with the members of the LLEP the following key stakeholders were consulted during the production of the Water Cycle Study:

- Environment Agency (EA)
- Severn Trent Water Limited (STWL)
- Anglian Water (AW)

2 Future Growth in Leicester and Leicestershire

2.1 2011 to 2031 Growth

The Leicester and Leicestershire Housing and Economic Development Needs Assessment (HEDNA)[3] produced in 2017, provides an integrated assessment of the future housing needs and the scale of future economic growth across the study area. The HEDNA provides an analysis of housing and economic development needs over two timeframes – 2011-31 and 2011-36 – to reflect plan periods used in the different local authorities. The Local Planning Authorities (LPAs) within Leicestershire are already planning to meet this medium-term growth within their Local Plans which are all at various stages of completion. Table 2-1 identifies what stage of Local Plan development each local authority has reached including the development of evidence bases relevant to this study.

Table 2-1: Summary of Local Plan Positions and Relevant Evidence Base Stages

Local Authority	Local Plan Stage	Existing WCS	Strategic Flood Risk Assessment
Blaby District Council	Core Strategy to 2029 adopted in 2013. Delivery DPD at preferred options stage.	No	October 2014 (joint with HBBC and O&WBC)
Charnwood District Council	Charnwood Local Plan Core Strategy timescale 2011 – 2028.	No	June 2014
Harborough District Council	Core Strategy to 2028 adopted in 2011. Well advanced new LP to 2031.	Yes – 2015	2009
Hinckley and Bosworth Borough Council	The LP 2006 – 2026, including the Core Strategy (2009). Working on a new LP for the period to 2036.	No	October 2014 (joint with BDC and O&WBC)
Leicester City	Core Strategy to 2026 adopted in 2014. Working on new LP to 2031.	No	February 2012
Melton Borough Council	LP to 2036 submitted for examination in September 2017.	No	2015 with 2016 addendum
North West Leicestershire District Council	LP to 2031 under examination.	Yes - 2012	2015 refresh and 2016 climate change update
Oadby and Wigston Borough Council	OWBC is now preparing a New Local Plan up to 2031 (not 2036).	No	October 2014 (joint with BDC and HBBC)

The local authorities within Leicester and Leicestershire have produced lists of known medium/large scale development sites for assessment within this Water Cycle Study. These sites, geographically located in Figure 2-1 and summarised in Table 2-2, are already in the development pipeline and make up a significant proportion of the development requirements for the period 2011 - 2031. They have been assessed alongside the potential developments in strategic growth areas to give a full picture of the impacts of large scale growth across Leicestershire.

Table 2-2: Development Sites Summarised by Local Authority

Local Authority	Identified Sites
Leicester City	82
North West Leicestershire District	59
Charnwood Borough	81
Melton Borough	80
Harborough District	34
Oadby and Wigston Borough	5
Blaby District	53
Hinckley and Bosworth District	52

3 GL Hearn (Jan 2017) Housing and Economic Development Needs Assessment: Leicester and Leicestershire Authorities and the Leicester and Leicestershire Enterprise Partnership. Accessed online at: https://www.llep.org.uk/wp-content/uploads/2017/01/HEDNA-Main-Report-Jan-2017.pdf on 15.07.2017

Figure 2-1: Locations of Local Authority Development Sites Across Leicestershire

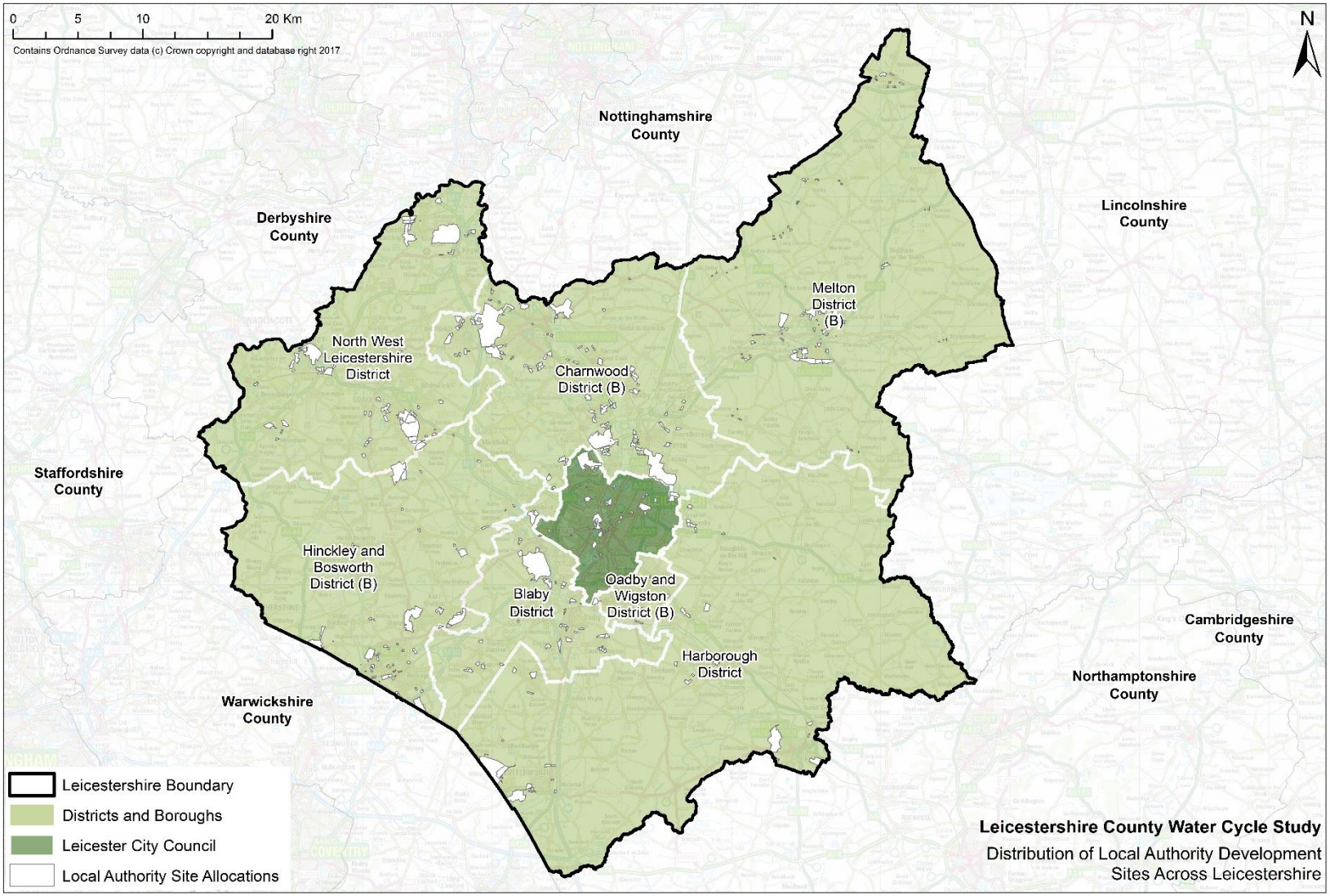


Table 2-3 sets out the anticipated Objectively Assessed Need (OAN) and notional supply in Leicestershire for the period 2011 - 2031.

Table 2-3: Leicestershire Housing Numbers: OAN and Housing Numbers: 2011-2031

Local Authority	OAN (2031)	Built and Committed	Emerging Allocations in Advanced Local Plans	'Likely' Additional Supply	Total Supply
Leicester City Council	33,840	19,212	0	5,150	24,362
North West Leicestershire District Council	9,620	12,015	1,540	2,500	16,055
Charnwood Borough Council	20,620	17,146	0	3,474	20,620
Melton Borough Council	3,720	1,518	3,662	100	5,280
Harborough District Council	10,640	6,815	4,020	1,834	12,669
Oadby and Wigston Borough Council	2,960	1,355	1,374	70	2,799
Blaby District Council	7,400	8,064	750	300	9,114
Hinckley and Bosworth Borough Council	9,420	9,466	0	1,100	10,566
Total (Leicester and Leicestershire)	**96,580**	**75,591**	**11,346**	**14,528**	**101,465**

2.2 Summary of Housing Need and Supply in Leicester and Leicestershire - 2031 to 2050

The Strategic Growth Plan covers the period to 2050. Over the period 2031 to 2050 it is estimated that around 60% of the growth will be located within the growth areas identifed in the SGP and discussed in Section 2.3. As discussed in Section 2.4, the remaining 40% will be provided by as yet unidentified non-strategic sites distributed across the local authorities.

Table 2-4 summarises the potential housing need and supply across Leicester and Leicestershire between 2031 and 2050.

Table 2-4: Notional Housing Need and Supply 2031 - 2050 (From the emerging Draft Strategic Growth Plan)

Local Authority	Housing Need 2031 - 2050		Delivery on Non-Strategic Sites		Delivery on Strategic Sites	Total Delivery	
	dpa	Total	dpa	Total		Av dpa	Total
Leicester City	1,668	31,692	550	10,450	0	550	10,450
North West Leicestershire	448	8,512	238	4,522	4,000	448	8,522
Charnwood Borough	994	18,886	468	8,892	10,000	994	18,892
Melton Borough	170	3,230	68	1,605	2,000	190	3,605
Harborough District	514	9,766	154	2,926	17,500	1075	20,426
Oadby and Wigston	155	2,945	60	1,140	1,500	139	2,640
Blaby District	361	6,859	108	2,052	16,500	976	18,552
Hinckley and Bosworth	454	8,626	136	2584	9,000	610	11,584
Total	**4,764**	**90,516**	**1,782**	**34,171**	**60,500**	**4982**	**94,671**

The overall assumption for the Housing Market Area (HMA) is 187,096 homes in the period 2011-2050. This Water Cycle Study (WCS) will assess proposed growth based on three main categories:

1. Local Authority Site Allocations - 2011 to 2031
2. Strategic Growth Plan (SGP) Growth Areas - 2031 to 2050
3. Non-Strategic Local Authority Site Allocations - 2031 to 2050

2.3 2031 - 2050 Strategic Growth: The Strategic Growth Plan

2.3.1 Introduction

The emerging SGP is considering several strategic locations to potentially accommodate the projected growth from 2031 to 2050. It is essential that the potential impacts of pursuing growth in any of the strategic locations on the water cycle is understood at an early stage. Figure 2-2 identifies Primary Growth Areas, Secondary Growth Areas and Key Growth Centres in the study area to be assessed.

2.3.2 Primary Growth: Leicester and the A46 Growth Corridor

The A46 is a key piece of infrastructure and will form a key part of the SGP. The Midlands Connect Strategy (MCS, 2017[4]), proposes improving the existing road and rail networks and the construction of a A46 Expressway to the south and east of the Leicester. This development encircling Leicester and improvements to connectivity provides an opportunity for strategic development.

The MCS proposes that improvements will be completed by the early 2030s. There is potential to accommodate around 30,000 new homes and significant levels of economic growth by 2050. As planning progresses, focus will shift from small individual sites, towards strategic developments. Within Leicester, regeneration is also proposed to extend the economic opportunities available. The A46 growth corridor will allow the City to grow with the development of high quality infrastructure.

2.3.3 Secondary Growth: The Northern Gateway

The Northern Gateway area is located to the north-west of Loughborough, around the A42 and M1. This is an area already containing major employment centres and having the potential to provide

4 Midlands Connect (March 2017) Midland Connect Strategy: Powering the Midlands Engine. Accessed online at: https://www.midlandsconnect.uk/media/1100/midlands-connect-strategy-march-2017.pdf on24/07/2017

new residential developments to accommodate around 10,000 homes. This growth area will be supported by improvements to the A42, M1, railway networks and services as identified in the MCS.

2.3.4 Secondary Growth: The Southern Gateway

The market town of Hinckley is the focal point of the Southern Gateway, located close to the intersection of the M69/A46 and A5. This area is already a hub of employment where future strategic growth could occur either to the east or the west of the town, possibly associated with the implementation of the A46 and A5 Expressway. There is potential for around 17,000 new homes.

2.3.5 Key Centres: Melton Mowbray

Strategic growth is proposed in Melton Mowbray to support growth and regeneration in the town centre. This town is located around 20km to the north-east of Leicester and despite this location, it should benefit from the infrastructural improvements associated with the A46 Expressway.

2.3.6 Key Centres: Lutterworth

The market town of Lutterworth lies close to Magna Park, a location that has become a focus of the logistics and distribution development. The growth proposed in this area would allow the town to reach the threshold where better services can be provided and should also reduce out-commuting.

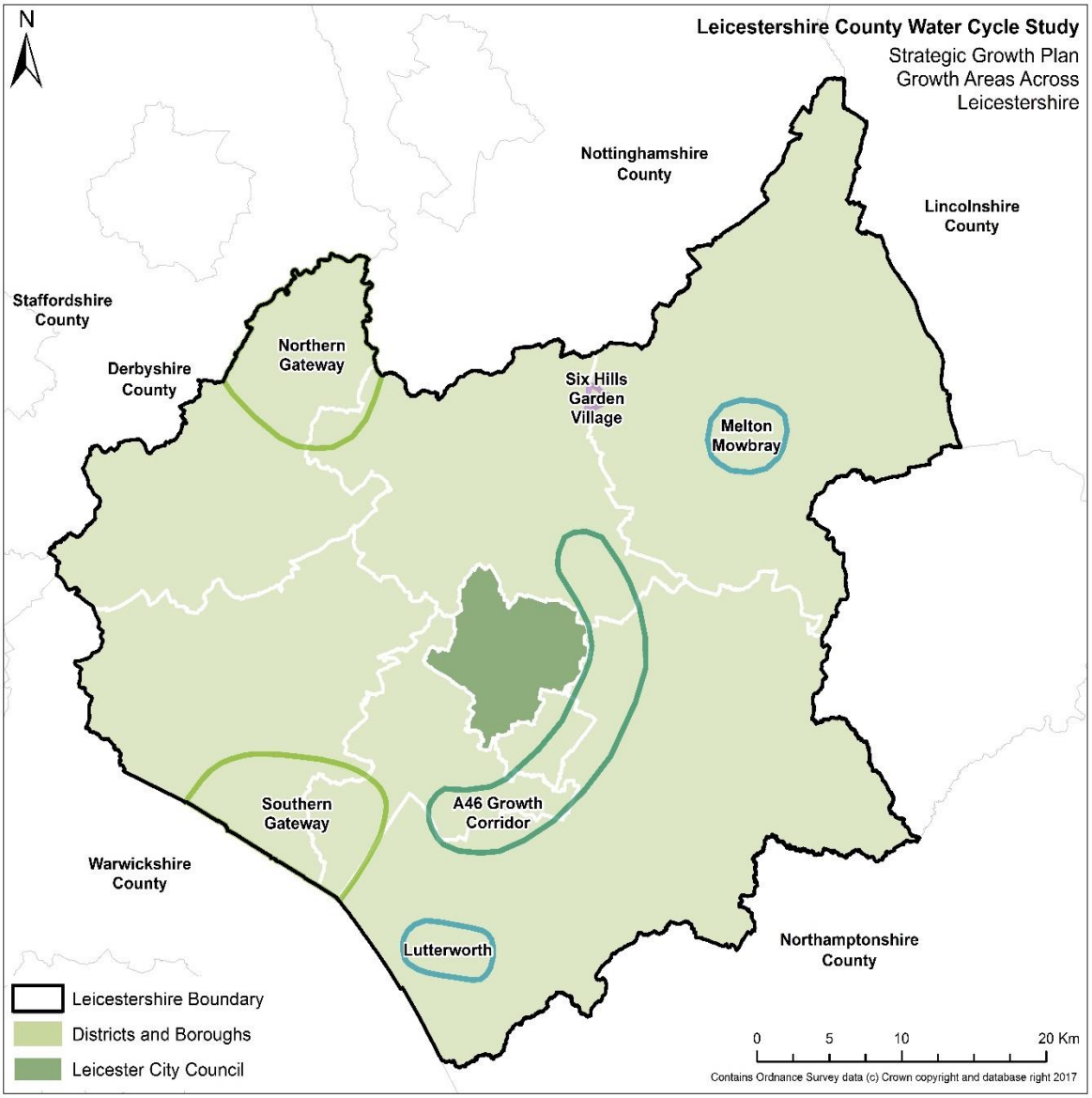
2.3.7 Six Hills Garden Village

There are known proposals for a new settlement to the west of Melton Mowbray. It is proposed to develop a 'Garden Village' on the triangular package of land to the east of the A46 and north of Six Hills Lane, on land containing the Six Hills Golf Course. The proposed site would include around 3,000 residential dwellings, associated business developments and local facilities. This site is not specifically mentioned within the Strategic Growth Plan and does not fall within any of Growth Areas, but the site is included on the basis that it could be considered as a future option for development.

Table 2-5: Notional Residential Capacities of the Strategic Growth Plan

Strategic Growth Areas	Notional Capacities (Dwellings)	Total
A46 Growth Corridor	30,000	
Southern Gateway	17,000	
Northern Gateway	10,000	***62,000***
Melton Mowbray	2,000	
Lutterworth	3,000	
Six Hills Garden Village	3,000	***3,000***

Figure 2-2: Locations of Strategic Growth Plan Growth Areas Across Leicestershire



2.4 2031 - 2050 Non-Strategic Growth

Beyond 2031, the identified strategic locations are expected to deliver around 60% of the overall housing need in Leicester and Leicestershire. This would therefore provide around 3,000 to 3,200 dwellings per annum (dpa) within the strategic growth areas. In order to meet the notional growth targets for the study area it is proposed that a further 34,000 dwellings are provided across Leicester and Leicestershire between 2031 and 2050 on smaller sites distributed across the LPAs. This will provide approximately 1,700 to 1,800 dpa on smaller sites distributed across the whole of Leicester and Leicestershire.

The precise location of this growth within each local authority area has not been identified at this stage, therefore for the purpose of the assessment it has been assumed that the growth will be distributed in similar areas to those accommodating the growth for the period 2011 - 2031.

Table 2-6: Assumed Distribution of Non-Strategic Local Authority Growth 2031 - 2050

Local Authority	Delivery on Non-Local Authority Sites	
	dpa	Total
Leicester City Council	550	10,450
North West Leicestershire District Council	238	4,522
Charnwood Borough Council	468	8,892
Melton Borough Council	68	1,605
Harborough District Council	154	2,926
Oadby and Wigston Borough Council	60	1,140
Blaby District Council	108	2,052
Hinckley and Bosworth Borough Council	136	2,584
Total (Leicester and Leicestershire)	**1,782**	**34,171**

3 Legislative and Policy Framework

The following sections introduce several national, regional and local policies that should be considered by the Local Planning Authorities (LPAs), Water Companies and developers in Leicestershire during the planning stages. Key extracts from these polices relating to water consumption targets and mitigating the impacts on the water environment from the proposed developments have been summarised below.

3.1 National policy

3.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[5] was published on 27th March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans.

Paragraph 94:

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

Paragraph 99:

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

Paragraph 100:

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

Paragraph 156:

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

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

- Flood Risk and Coastal Change[6]
- Water Supply, Wastewater and Water Quality[7].
- Housing - Optional Technical Standards[8].

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

6 Department for Communities and Local Government (2014) Planning Practice Guidance: Flood Risk and Coastal Change (2014). Accessed online at http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/ on 05/05/2016.

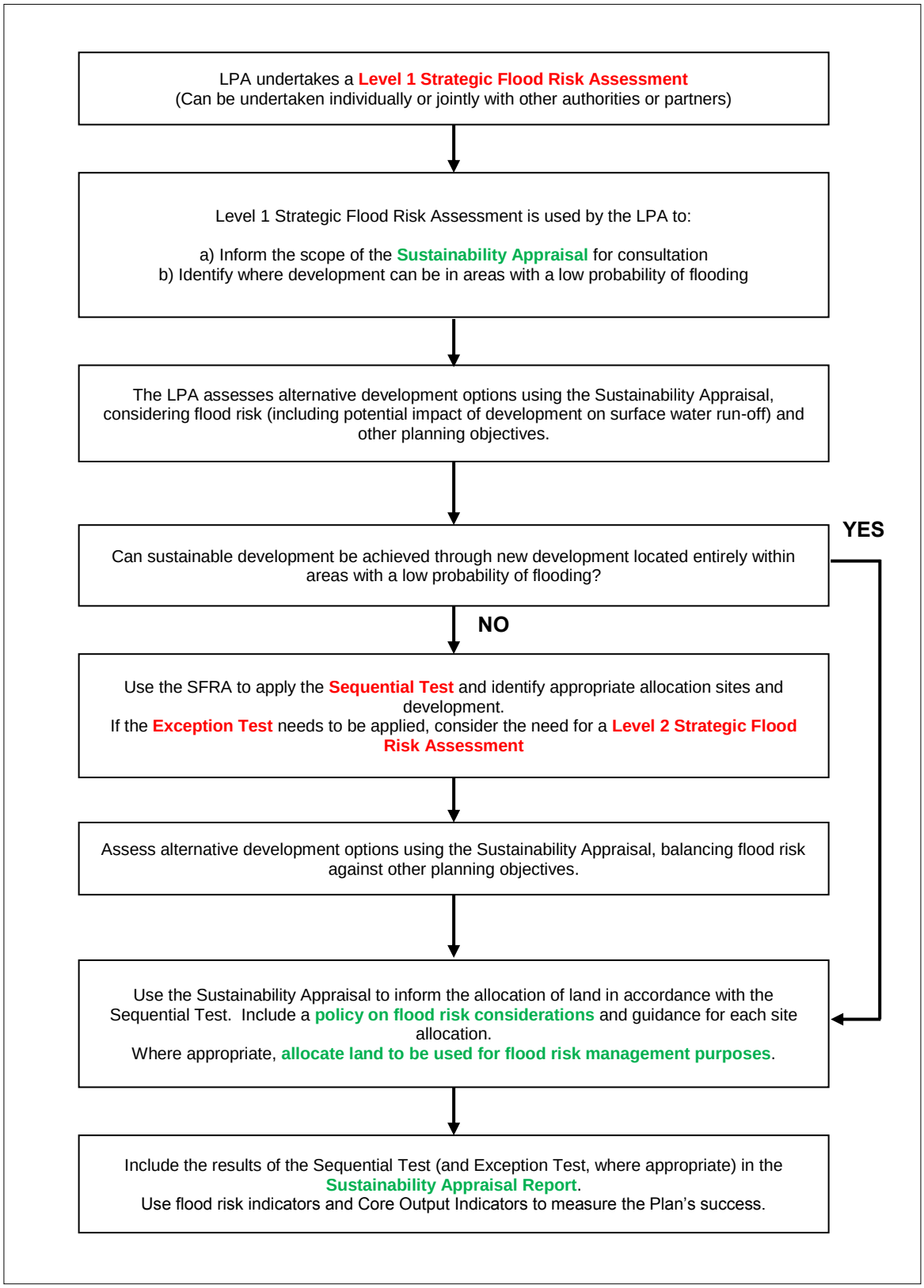
7 Department for Communities and Local Government (2014) Planning Practice Guidance: Water supply, wastewater and water quality. Accessed online at http://planningguidance.planningportal.gov.uk/blog/guidance/ on 24/05/2017

8 Department for Communities and Local Government (2014) Planning Practice Guidance: Housing - Optional Technical Standards Accessed online at http://planningguidance.planningportal.gov.uk/blog/guidance/ on 24/05/2017

3.1.2 Planning Practice Guidance: Flood Risk and Coastal Change

The diagram shown in Figure 3-1 is found in the Planning Practice Guidance (PPG) and sets out how flood risk should be considered in the preparation of Local Plans.

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



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

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

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

	Plan-making	Planning applications
Infrastructure	Identification of suitable sites for new or enhanced infrastructure. Consider whether new development is appropriate near to water and wastewater infrastructure. Phasing new development so that water and wastewater infrastructure will be in place when needed.	Wastewater considerations include: first presumption is to provide a system of foul drainage discharging into a public sewer. Phasing of development and infrastructure. Circumstances where package sewage treatment plants or septic tanks are applicable.
Water Supply	Water efficiency guidance is set out in Planning Practice Guidance: Housing - Optional Technical Standards - see section 2	Planning for the necessary water supply would normally be addressed through the Local Plan ... exceptions might include: large developments not identified in Local Plans; where a Local Plan requires enhanced water efficiency in new developments.
Water quality	How to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage. The type or location of new development where an assessment of the potential impacts on water bodies may be required. Expectations relating to sustainable drainage systems.	Water quality is only likely to be a significant planning concern when a proposal would: involve physical modifications to a water body; or indirectly affect water bodies, for example because of the redevelopment of land that may be affected by contamination etc. or through a lack of adequate infrastructure to deal with wastewater.
Wastewater	The sufficiency and capacity of wastewater infrastructure. The circumstances where wastewater from new development would not be expected to drain to a public sewer.	If there are concerns arising from a planning application about the capacity of wastewater infrastructure, applicants will be asked to provide information about how the proposed development will be drained and wastewater dealt with.
Cross-Boundary Concerns	Water supply and water quality concerns often cross local authority boundaries and can be best considered on a catchment basis. Recommends liaison from the outset.	No specific guidance (relevant to some developments).
SEA and Sustainability Appraisal	Water supply and quality are considerations in Sustainability Appraisals and Strategic Environmental Assessment. Appraisal objectives could include preventing deterioration of water quality, taking climate change into account and seeking opportunities to improve water bodies.	No specific guidance (should be considered in applications).

3.1.4 Planning Practice Guidance: Housing - Optional Technical Standards

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

3.1.5 Building Regulations and Code for Sustainable Homes

The Building Regulations (2010) Part G[10] was amended in 2015, requiring that all new dwellings must ensure that the potential water consumption does not exceed 125l/p/d, or 110 l/p/d where required under planning conditions. The regulations include advice on how to calculate this. The Code for Sustainable Homes (CfSH) was, from 2007 to March 2015, the Government's optional national standard for new housing. It became effective in England in April 2007 and a Code rating for new homes became mandatory in May 2008. The Code included six levels of water efficiency for new homes seeking to simplify the various building codes that house builders have to adhere to, the Government withdrew CfSH in March 2015, with the exception of legacy cases: *"where residential developments are legally contracted to apply a code policy (e.g. affordable housing funded through the national Affordable Housing Programme 2015 to 2018, or earlier programme), or where planning permission has been granted subject to a condition stipulating discharge of a code level, and developers are not appealing the condition or seeking to have it removed or varied".*

3.1.6 Sustainable Drainage Systems (SuDS)

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

- The National Planning Policy Framework (NPPF) which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.
- The House of Commons written statement[11] sets out government intentions that LPAs should "ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate" and "clear arrangements in place for ongoing maintenance over the lifetime of the development." This has been done by making Lead Local Flood Authorities (LLFAs) statutory consultees on drainage for developments.
- The Defra Non-statutory technical standards for sustainable drainage systems[12] set out the government's high-level requirements for managing peak flows and runoff volumes, flood risk from drainage systems and the construction of SuDS. This very short document is not a design manual and makes no reference to the other benefits of SuDS, for example water quality, habitat and amenity. Neither does it address adoption and maintenance.

As the LLFAs, Leicestershire County Council and Leicester City Council[13] are responsible for the management of flood risk and surface water drainage across Leicestershire. Leicestershire County Council plays a lead role in ensuring that the proposed drainage schemes for all new developments comply with technical standards and policies in relation to SuDS. Leicestershire County Council currently does not have a published SuDS Design Guide however, as statutory consultee to the planning application process, they do provide pre-application advise to developers.

9 Defra (2014) Housing Standards Review: Cost Impacts. Accessed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on 24/05/2017.

10 HM Government (2015) The Building Regulations (2010) Part G - Sanitation, hot water safety and water efficiency. 2015 edition. Accessed online at http://www.planningportal.gov.uk/uploads/br/BR_PDF_AD_G_2015.pdf on 24/05/2017.

11 Sustainable drainage systems: Written statement - HCWS161. Accessed online at http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/ on 24/05/2017.

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

13 Leicester City Council (March 2015) Leicester Local Flood Risk Management Strategy. Accessed online at: https://www.leicester.gov.uk/media/178225/master-lfrms-web-lo-res-mar-2015.pdf

AW have also produced a Sustainable Drainage Systems (SuDS) Adoption Manual[14] to guide the design, construction and maintenance of SuDS in the Anglian Water Region. The manual aims to outline the SuDS Principles and the adoption process for developments within the AW region.

An updated version of the CIRIA SuDS Manual[15] was published in 2015. Guidance covers the planning, design, construction and maintenance of SuDS for new and existing developments. The level of technical detail increases throughout the manual. The guidance does not include detailed information on planning requirements, SuDS approval/adoption processes and standards, as these vary by region and should be checked. SuDS features not adopted by Leicestershire County Council, STWL or AW must be maintained by property owners in the case of SuDS on private land and by management companies for SuDS in public open spaces or on highways.

3.2 Regional policy

3.2.1 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMPs) are high levels policy documents covering river basin catchments. CFMPs consider all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not coastal flooding, which is covered in 'shoreline management plans'. They also consider the likely impacts of climate change, the effects of how we use and manage the land, and how areas could be developed to meet our present day needs without compromising the ability of future generations to meet their own needs. They aim to set policies for sustainable flood risk management at whole catchment scale covering the next 50 to 100 years.

Much of Leicestershire is covered by the River Trent CFMP[16], this defines a range of policy options that are most suitable for different sub areas of the catchment. The Rural Leicestershire sub area is identified as an area of low to moderate flood risk where actions will be taken to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits. A small portion of the south-eastern area of Leicestershire around Market Harborough is covered by the River Welland CFMP[17]. This is also an area of low to moderate flood risk.

3.2.2 Surface Water Management Plans

A Surface Water Management Plan (SWMP) is a framework used to help understand the causes of surface water flooding and define a preferred strategy for the management of surface water flood risk. There are SWMPs available for the City of Leicester and Loughborough but there are no SWMPs covering the rest of the LPAs.

3.2.3 Water Resource Management Plans

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

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

Where necessary, WRMPs also set out requirements for developing additional water resources to meet demand. Leicestershire's water supply is solely provided at Seven Trent Water (STWL), their WRMP describes how the water company will manage the balance between water supply and demand between 2015 - 2040.

14 Anglian Water, Sustainable Drainage Systems (SuDS) Adoption Manual. Accessed online at: http://www.anglianwater.co.uk/_assets/media/AW_SUDS_manual_AW_FP_WEB.pdf on 25/09/2017

15 CIRIA (2015) The SuDS Manual (C753) Accessed online at

http://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

16 Environment Agency (Dec 2010) River Trent Catchment Flood management plan. Accessed online at

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289105/River_Trent_Catchment_Management_Plan.pdf on 24/05/2017

17 Environment Agency (Dec 2009) River Welland Catchment Flood Management Plan. Accessed online at

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/288870/River_Welland_Catchment_Flood_Management_Plan.pdf on 24/05/2017.

3.3 Local Policy

3.3.1 Localism Act

The Localism Act outlined plans to shift and re-distribute the balance of decision making from central government back to councils, communities and individuals. The Localism Act was given Royal Assent on 15th November 2011. In relation to the planning of sustainable development, provision 110 of the Act places a duty to cooperate on local authorities. This duty requires local authorities to *"engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter"*[18].

The Localism Act also provides new rights to allow local communities to come together and shape new developments by preparing Neighbourhood Plans. This means that local people can decide not only where new homes and businesses should go and but also what they should look like. As neighbourhoods draw up their proposals, LPAs will be required to provide technical advice/support.

3.3.2 Local Plans

Local Plans (LPs) set out the strategic priorities for development within a study area, they cover housing, commercial/economic development, transport infrastructure and environmental management. The Districts, Borough and Unitary Authorities within Leicestershire are at different stages of their local plan development, Table 3-2 summarises the Local Plan progress in each LPA.

Table 3-2: Summary of Local Plans Across Leicestershire

Local Planning Authority	Stage of Local Plan Development
Leicester City Council	The current adopted development plan is the 2014 Core Strategy to 2026[19]. LCC is working on a new Local Plan to 2036, due 2018.
North West Leicestershire District Council	Currently preparing a new local plan to 2031, this document is currently under examination[20].
Charnwood Borough Council	The Local Plan 2011 - 2028 Core Strategy was adopted in 2015[21].
Melton Borough Council	A new Melton Local Plan to 2036 was submitted for examination in September 2017[22].
Harborough District Council	Harborough has an Adopted Core Strategy to 2028 which was adopted in 2011[23]. The District is currently updating its Local Plan to 2036[24].
Oadby and Wigston Borough Council	Current Core Strategy to 2026 was adopted in 2010[25]. Now preparing a New Local Plan up to 2031 (not 2036).
Blaby District Council	Current Core Strategy to 2029 adopted in 2013[26]. Following the adoption of this strategy, the District is currently working on the Local Plan Delivery Development Plan Document (DPD) including site allocations, designations and development management policies.
Hinckley and Bosworth Borough Council	The Local Plan 2006 – 2026[27] is made up of a number of documents including the Core Strategy (2009) and Site Allocations and Development Management Policies Document (2016[28]). Working on a new Local Plan to 2036.

18 Localism Act 2011: Section 110. Accessed online at: http://www.legislation.gov.uk/ukpga/2011/20/section/110

19 Leicester City Council (July 2014) Leicester City Local Development Framework - Core Strategy. Accessed online at https://www.leicester.gov.uk/media/182519/local-development-framwork-core-strategy-adopted-2014.pdf on 24/05/2017

20 North West Leicestershire District Council (Sept 2015) North West Leicestershire Local Plan - Draft for Consultation. Accessed online at http://www.nwleics.gov.uk/pages/local_plan_have_your_say on 24/05/2017

21 Charnwood Borough Council (Nov 2015) Charnwood Local Plan 2011 to 2028 - Core Strategy. Accessed online at http://www.charnwood.gov.uk/pages/corestrategydpd on 24/05/2017

22 Melton Borough Council (2016) Draft Melton Borough Local Plan. Accessed online at https://www.meltonplan.co.uk/ on 24/05/2017

23 Harborough District Council (Nov 2011) Harborough District Local Development Framework - Core Strategy 2006 - 2028. Accessed online at http://www.harborough.gov.uk/directory_record/460/core_strategy

24 Harborough District Council. New Harborough Local Plan. Accessed online at http://www.harborough.gov.uk/local-plan

25 Oadby and Wigston Borough Council (Sept 2010) Oadby and Wigston Core Strategy - Development Plan Document. Accessed online at http://www.oadby-wigston.gov.uk/pages/core_strategy on 24/05/2017

26 Blaby District Council (Feb 2013) Blaby District Local Plan - Core Strategy Development Plan Document. Accessed online at http://www.blaby.gov.uk/about-the-council/strategies-plans-policies/environment-and-planning/local-plan/local-plan-core-strategy/

27 Hinckley and Bosworth Borough Council (Dec 2009) Local Development Framework - Core Strategy. Accessed online at http://www.hinckley-bosworth.gov.uk/downloads/file/487/core_strategy_adopted_document on 24/05/2017

28 Hinckley and Bosworth Borough Council (July 2016) Accessed online at http://www.hinckley-bosworth.gov.uk/downloads/download/1218/site_allocations_and_development_management_policies_dpd_-_adoption_july_2016 on 24/05/2017.

3.3.3 Infrastructure Delivery Plan

The purpose of an Infrastructure Delivery Plan (IDP) is to evaluate various services to determine if there is sufficient infrastructure to support the future levels of housing and employment in the area.

Table 3-3: Summary of Infrastructure Delivery Plans in Leicestershire

Local Planning Authority	Stage of Local Plan Development
Leicester and Leicestershire	Leicester & Leicestershire HMA Authorities - Growth Infrastructure Assessment[29]
Leicester City Council	There is an Infrastructure Schedule within the 2014 Core Strategy
North West Leicestershire District Council	North West Leicestershire District Council Infrastructure Delivery Plan 2016[30]
Charnwood Borough Council	Charnwood Infrastructure Delivery Plan 2013[31]
Melton Borough Council	Melton Borough Council Infrastructure Delivery Plan[32] - Stage 2 Final. March 2017
Harborough District Council	The new Local Plan to 2036 will contain an Infrastructure Delivery Plan
Oadby and Wigston Borough Council	Oadby and Wigston Borough Council Local Infrastructure Plan 2009 - 2010[33]
Blaby District Council	Infrastructure Plan contained within the Adopted Core Strategy to 2029, this will be updated an included within the Delivery DPD Document
Hinckley and Bosworth Borough Council	An Infrastructure Plan can be found in the 2006 to 2026 Adopted Local Plan

3.4 Environmental Policy

3.4.1 Urban Wastewater Treatment Directive (UWWTD)

The UWWTD is an EU Directive that concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of waste water from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of the above-mentioned wastewater discharges. More specifically Annex II A(a) sets out the requirements for discharges from urban wastewater treatment plants to sensitive areas which are subject to eutrophication. One or both parameters may be applied depending on the local situation. The values for concentration or for the percentage reduction shall apply. For specific information regarding concentration limits please refer to the UWWTD[34]. The Directive has been transposed into UK legislation through enactment of the Urban Waste Water Treatment (England and Wales) Regulations 1994 and 'The Urban Waste Water Treatment (England and Wales) (Amendments) Regulations 2003'.

29 Roger Tym & Partners and URS (April 2009) Leicester & Leicestershire HMA Authorities - Growth Infrastructure Assessment. Accessed online at file:///C:/Users/hollyhart/Desktop/leicester-and-leicestershire-growth-infrastructure-assessment.pdf on 24/05/2017

30 AECOM (June 2016) North West Leicestershire District Council Infrastructure Delivery Plan 2016. Accessed online at http://www.nwleics.gov.uk/files/documents/nwl_infrastructure_delivery_plan_2016/NWLDC%20IDP%20Final%20Version.pdf on 24/05/2017

31 Charnwood Borough Council (Oct 2013) Charnwood Infrastructure Delivery Plan. Accessed online at: https://www.charnwood.gov.uk/files/papers/cnl_28_oct_2013_item_31_core_strategy_submission_appendix_r_infrastructure_delivery_plan/Cnl%2028%20Oct%202013%20Item%203.1%20Core%20Strategy%20Submission%20-%20Appendix%20R%20-%20Infrastructure%20Delivery%20Plan.pdf on 24/05/2017

32 ARUP (Oct 2016) Melton Borough Council Infrastructure Delivery Plan. Accessed online at http://www.melton.gov.uk/downloads/file/3301/revised_issue_mbc_idp_201016pdf on 24/05/2017

33 Oadby and Wigston Borough Council (Oct 2009) Local Infrastructure Plan 2009 - 2010. Accessed online at http://www.oadby-wigston.gov.uk/files/documents/cd8_04_local_infrastructure_plan/CD8-04%20Local%20Infrastructure%20Plan.pdf on 24/05/2017

34 UWWTD. Accessed online at http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31991L0271 on 24/05/2017

3.4.2 Habitats Directive

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

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

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

3.4.3 The Water Framework Directive

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

River Basin Management Plans (RBMP) are required under the WFD and are strategies. Leicestershire is mostly located in the Humber RBMP with small areas in the Severn and Anglian RBMPs. Under the WFD the RBMPs, which were originally published in December 2009 were reviewed and updated in December 2015. A primary WFD objective is to ensure 'no deterioration' in environmental status, therefore all water bodies must meet the class limits for their status class as declared in the Final Thames River Basin Management Plan. Another equally important objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment and compromise WFD objectives. The WFD objectives as outlined in the updated RBMPs are summarised below:

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

LPAs must have regard for Water Framework Directive as implemented in the Environment Agency’s River Basin Management Plans (RBMPs).

3.4.4 Protected Area Objectives

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

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

The types of protected areas are:

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- Areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish);
- Bodies of water designated as recreational waters, including Bathing Waters;

- Nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive (UWWTD); and
- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites.

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

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

Drinking Water Protected Areas

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

Economically Significant Species (Freshwater Fish Waters)

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

Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

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

Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

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

Natura 2000 Protected Areas (water dependent SACs and SPAs)

- The objective for Natura 2000 Protected Areas identified in relation to relevant areas designated under the Habitats Directive or Birds Directive is to protect and, where necessary, improve the status of the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site's natural habitat types and species of importance.

3.4.5 Groundwater Source Protection Zones

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

Zone 1 (Inner protection zone) - This zone is designed to protect against the transmission of toxic chemicals and water-borne disease. It indicates the area where pollution can travel to the borehole within 50 days from any point in the zone and applies at and below the water table. There is also a min 50m protection radius around the borehole.

Zone 2 (Outer protection zone) - This zone indicates the area in which pollution takes up to 400 days to travel to the borehole, or 25% of the total catchment area, whichever area is the biggest. This is the minimum length of time the Environment Agency think pollutants need to become diluted or reduce in strength by the time they reach the borehole.

Zone 3 (Total catchment) - This is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

Zone of special interest - This is defined occasionally where conditions mean that industrial sites and other polluters could affect the groundwater source even when they are outside the catchment.

The Environment Agency's Approach to Groundwater Protection[35] sets out a series of position statements that detail how the EA delivers government policy on groundwater and protects it from contamination. The position statements that are relevant to this study regarding discharges to groundwaters, including surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g. lorry parks) and from treated sewage effluent.

3.4.6 River Basin Management Plans

River Basin Management Plans are required under the WFD and should influence development plans. Much of Leicestershire is located in the 2015 Humber RBMP with small areas located within the 2015 Severn RBMP and 2015 Anglian RBMP. River Basin Management Plans (RBMPs) are further discussed in Section 4.2.5.

3.4.7 European derived legislation and Brexit

Much of the legislation behind the regulation of the water environment derives from the UK enactment of European Union (EU) directives. Following the referendum decision of June 2016 that the United Kingdom would leave the EU, the UK Government has published the European Union (Withdrawal) Bill[36] on 13 July 2017. This bill will repeal the European Communities Act 1972, transpose European Union law into domestic law, and will give ministers powers to make secondary legislation to address technical problems arising from the enactment of EU law into UK statute.

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

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

3.5 Water Industry Policy

3.5.1 The Water Industry in England

Water and sewerage services in England and Wales are provided by 10 Water and Sewerage Companies (WaSCs) and 12 'water-only' companies. The central legislation relating to the industry is the Water Industry Act 1991. The companies essentially operate as regulated monopolies within their supply regions, although very large water users and developments can obtain water and/or wastewater services from alternative suppliers - these are known as inset agreements.

The Water Act 2014 aims to reform the water industry to make it more innovative and to increase resilience to droughts and floods. Key measures influencing the future provision of water and wastewater services include:

- Non-domestic customers will be able to switch their water supplier and/or sewerage undertaker (from April 2017).
- New businesses will be able to enter the market to supply these services.
- Measures to promote a national water supply network.
- Enabling developers to make connections to water and sewerage systems.

3.5.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies:

- The Water Services Regulation Authority (OfWAT) – Economic/ customer service regulation
- Environment Agency - Environmental regulation
- Drinking Water Inspectorate (DWI) - Drinking water quality

35 Environment Agency (2017) The Environment Agency's approach to groundwater protection. Accessed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598778/LIT_7660.pdf on 25/5/2017

36 HM Government (2017) European Union (Withdrawal) Bill. Accessed online at https://publications.parliament.uk/pa/bills/cbill/2017-2019/0005/18005.pdf on 14/08/2017.

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

When considering investment requirements to accommodate growing demand, water companies are required to ensure a high degree of certainty that additional assets will be required before funding them. Longer term growth is, however, considered by the companies in their internal asset planning processes and reports on their 25-year Strategic Direction Statements and WRMPs.

3.5.3 Developer Contributions

Developments with planning permission have a right to connect to the public water and sewerage systems, although this doesn't preclude the requirement to ensure capacity exists to serve a development.

Developers may either requisition a water supply connection or sewerage system, or self-build the assets and offer these for adoption by the water company or sewerage undertaker. Self-build and adoption are usually practiced for assets within the site boundary, whereas requisitions are normally used where an extension of upgrading the infrastructure requires construction on third party land. The cost of requisitions is shared between the water company and developer as defined in the Water Industry Act 1991.

Where a water company is concerned that a new development may impact upon their service to customers or the environment (for example by causing foul sewer flooding or pollution) they may request the LPA to impose a Grampian condition, whereby the planning permission cannot be implemented until a third-party action.

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

4 Water Resources and Water Supply

4.1 Introduction

4.1.1 Surface Waters

Figure 4-1 shows the locations of the key watercourses across Leicestershire and Table 4-1 provides details of these watercourses, grouped by Catchment Abstraction Management Strategy (CAMS) area, further discussed in Section 4.2. The River Soar is the main watercourse and catchment characterising Leicestershire, bisecting Study area as it flows northwards towards its confluence with the River Trent on the border with the Study area of Nottinghamshire.

Figure 4-1: Surface Waters Across Leicestershire

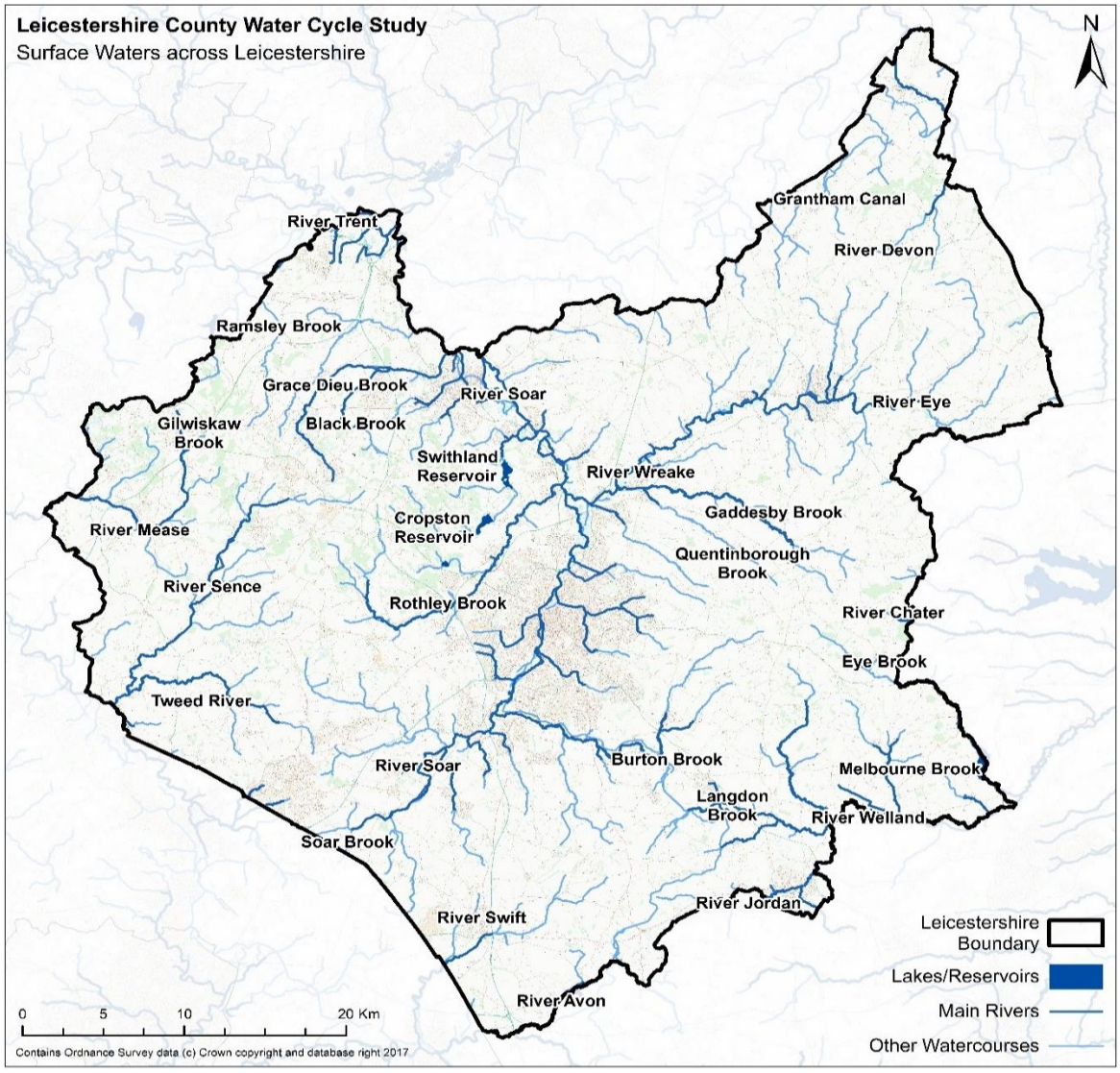


Table 4-1: Key Watercourses in Leicestershire Grouped by CAMS

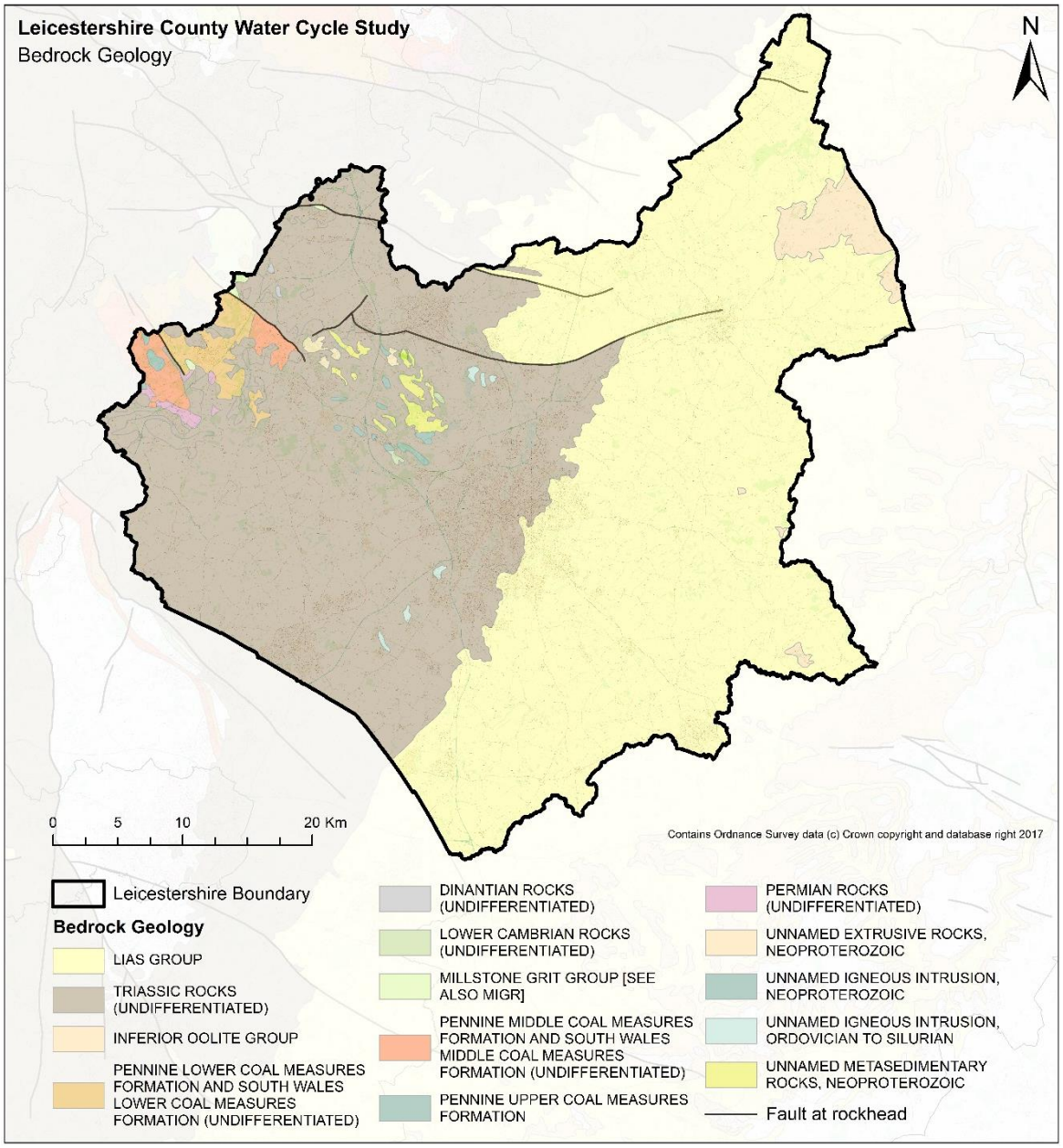
CAMS	Key Watercourses
Lower Trent and Erewash	River Devon, River Trent, Ramsley Brook, Grantham Canal
Soar	River Soar, Rothley Brook, River Wreake, Gaddesby Brook, River Eye,
Tame, Anker and Measure	River Mease, Hooborough Brook, River Sence, Tweed River,
Warwickshire Avon	River Avon, River Swift
Welland	River Jordan, Langton Brook, River Welland, Eye Brook, River Chater

4.1.2 Geology and Groundwater

Due to the geographical scale of Leicestershire, the study area has a highly-varied geology. The bedrock geology of the east of the study area is predominantly made up of the Lias Group, consisting of clays, mudstones and limestones. Waltham on the Wolds in the north-east of the area is underlain by the Inferior Oolitic Group, consisting of limestones. The Oolitic limestones are well-cemented and have a low intergranular permeability and primary aquifer storage is limited.

The west of the study area has a more varied geology compared to the east. Most of this area is underlain by undifferentiated Triassic Rocks. There are metasedimentary deposits and igneous intrusions to the north west of the Leicester. On the western border of the study area around Ashby-De-La-Zouch and Swadlingcote, Pennine Lower and Middle Coal Measures are found. Some faulting can be seen in the north of the study area. Figure 4-2 shows the bedrock geology of Leicestershire, faults can also be identified in the north and north-western areas of the study area.

Figure 4-2: The Bedrock Geology of Leicestershire



Due to the scale of the County, Leicestershire has complex superficial and bedrock geologies and therefore complex groundwater designations. The environmental constraints associated with development on important geology and groundwater designations is further discussed in Section 8.3.

4.2 Water Resource Assessment: Availability of Water Resources

4.2.1 Overview of Water Resource Management

Catchment Abstraction Management Strategies (CAMS) are prepared by the Environment Agency to manage water resources at a strategic scale. A permitting system is used to control and manage water resources in the UK. CAMS and Licensing Strategies are used to do this for each area. The Licensing Strategy sets out how water resources are managed within different areas of England and Wales and contribute to implementing the Water Framework Directive (WFD). CAMS provide information on available water resources and the conditions to apply to new licenses. The licences require abstractions to stop or reduce when a flow or level falls below a threshold as a restriction to protect the environment and manage the balance between supply and demand for all water users.

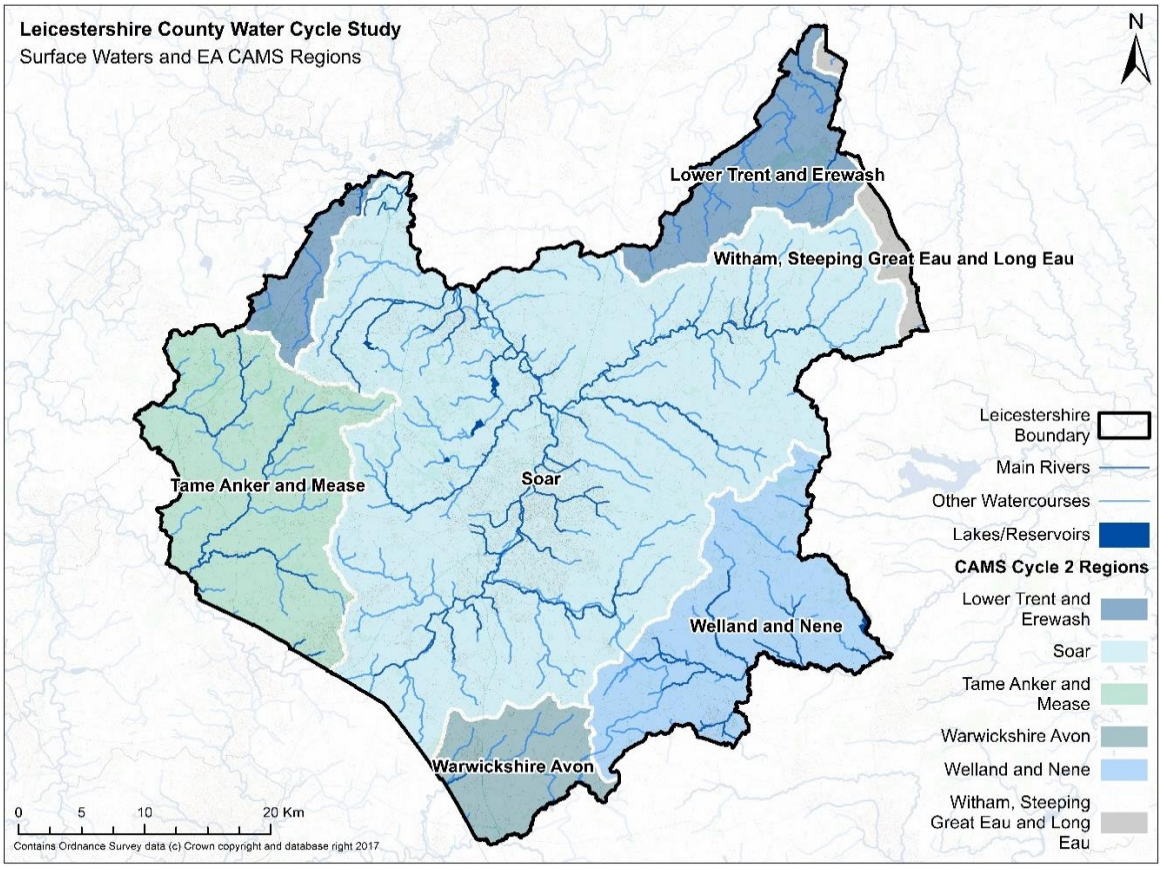
Licences are often time limited, this allows for a periodic review of the specific area as circumstances may have changed since the licences were initially granted. These are generally given for a twelve-year duration, but shorter and longer duration licences can also be accepted. This is usually dependant on local factors such as the lifetime of the infrastructure and the availability of resources and plans in the area. The licences are then replaced/renewed near to the expiry date.

CAMS are important in terms of the Water Resource Management Plans (WRMP) as this helps to determine current and future pressures on water resources and how supply and demand will be managed[37]. Leicestershire is covered by six CAMS regions, located in Figure 4-3:

- Lower Trent and Erewash CAMS
- Soar CAMS
- Tame, Anker and Mease CAMS
- Warwickshire Avon CAMS
- Welland CAMS
- Witham, Steeping Great Eau and Long Eau CAMS

As the Witham, Steeping Great Eau and Long Eau CAMS covers less than 2% of the area of Leicestershire and contains no major settlements, it will not be assessed any further in this WCS.

Figure 4-3: Surface Waterbodies and CAMS Regions Across Leicestershire



37 Environment Agency (Oct 2016) Managing Water Abstraction. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/562749/LIT_4892.pdf on 18/05/2017

4.2.2 Resource Availability Assessment

To abstract surface water sustainably, it is important to understand what water resources are available within a catchment and where abstraction for consumptive purposes is allowed. The Environment Agency (EA) has developed a classification systems which aims to show:

- The relative balance between the environmental requirements for water and how much has been licensed for abstraction;
- Whether there is more water available for abstraction in the area;
- Areas where abstraction may need to be reduced.

The availability of water for abstraction is determined by the relationship between the fully licensed (all abstraction licenses being used to full capacity) and the recent actual flows (amount of water abstracted in the last 6 years) in relation to the Environmental Flow Indicator (EFI). Water resource availability is split into six categories which are further explained in Table 4-2. Resource availability is calculated at four different flows, Q95 (lowest), Q70, Q50, and Q30 (highest) In some cases, water available of consumption may by limited during low flows, this usually takes the form of a "Hands Off Flow" (HOF) condition on a licence. Similarly, where abstraction is from an aquifer, a "Hands Off Level" (HOL) may be applied.

Table 4-2: Water Resource Availability Categories

Resource Availability	Implications for Licensing
High hydrological regime	There is more water than required to meet the needs of the environment. Due to the need to maintain the near pristine nature of the water body, further abstraction is severely restricted.
Water available for licensing	There is more water than required to meet the needs of the environment. Licences can be considered depending on local/downstream impacts.
Restricted water available for licensing	Fully Licensed flows fall below the Environmental Flow Indicator (EFI). If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted. It may also be appropriate to investigate the possibilities for reducing fully licensed risks. Water may be available via licence trading.
Water not available for licensing	Recent Actual flows are below the Environmental Flow Indicator (EFI). This scenario highlights water bodies where flows are below the indicative flow requirement to help support Good Ecological Status. No further licences will be granted. Water may be available via licence trading.
HMWBs (and /or discharge rich water bodies)	These Highly Modified Water Bodies have a modified flow that is influenced by reservoir compensation releases or they have flows that are augmented. There may be water available for abstraction in discharge rich catchments.

4.2.2.1 Lower Trent and Erewash CAMS

Two separate areas of northern Leicestershire are covered by the Lower Trent and Erewash CAMS[38]. This catchment is elongated, encompassing the route of the River Trent northwards, through Nottinghamshire towards it's confluence with the Humber. Agriculture is the dominant land use throughout the catchment, relying heavily on local surface water and groundwater abstractions principally for irrigation. Public water supply abstractions from both groundwater and surface waters (principally the River Trent) are also important. The catchment also receives imported water from Derbyshire and exports water to Lincolnshire depending on supply and demand.

Industry, agriculture and water for public water supply are the biggest pressures on groundwater, however the power generation sector exerts the biggest pressure on surface waters. 28.4% of the licences in the Lower Trent and Erewash are time limited, the next common end date for the CAMS is 31st March 2027.

One Assessment Point (AP) for the Lower Trent and Erewash CAMS is located in Leicestershire. Currently water is available for licensing during high flows and there is restricted flow available for licensing during low flows (Table 4-3). HOF conditions apply to this area of the catchment, these come into force when flows at the River Trent at North Muskham (AP9) fall below 2,650 Ml/d.

38 Environment Agency (Feb 2013) Lower Trent and Erewash Abstraction Licensing Strategy. Accessed online at: https://www.gov.uk/government/publications/cams-lower-trent-and-erewash-abstraction-licensing-strategy on 19/05/2017

Table 4-3: Lower Trent and Erewash CAMS Resource Availability within Leicestershire

AP	Name	CAMS	Resource Availability	HOF (1)	Days (2)	Approx Vol (Ml/d) (3)	Additional Restrictions
1	Trent to Shardlow	Lower Trent & Erewash	Q30	2,650 Ml/d	329	130	N/A
			Q50				
			Q70				
			Q95				

(1) Hands Off Flow Restriction
(2) Number of days' abstraction may be available
(3) Approximate volume per day available

Groundwater availability is guided by the surface water resource availability unless there is better information on the principle aquifers or local issues in the Lower Trent and Erewash CAMS. Groundwater has been assessed using groundwater management units (GWMU) to assess water resources in principle aquifers. The Diseworth GWMU is located on the north-west border of Leicestershire, this resource is assessed as having water available for licensing.

4.2.2.2 Soar CAMS

The Soar CAMS encompasses the catchment of the River Soar, a major tributary of the River Trent[39]. Most of the catchment is located within the County of Leicestershire, with areas of south Nottinghamshire and north-east Warwickshire also included. There are few water resource pressures within the catchment, as a large proportion of the water resources for public water supply are imported from neighbouring catchments. However, there are several public water supply reservoirs in the west of the catchment, many of which are designated as SSSIs. There are also very few strategically important groundwater licences in the Soar CAMS. 21% of the licenses in the Soar CAMS are time limited, the next common end date is 31st March 2025.

All eight Assessment Points (APs) in the Soar CAMS are in Leicestershire. All APs have water available for licensing in the high flows and restricted water available for licensing in the low flows. HOF conditions also apply to all APs. The need to protect the flows entering the downstream River Trent mean that a HOF of 2,650 Ml/d at North Muskham is also appropriate for this catchment. For the Soar, the need to protect flows entering the River Trent has meant that an equivalent HOF of 340Ml/d as measured at AP8 (Kegworth gauging station) has been used to ensure adequate protection of the HOF at North Muskham. Details of the Soar CAMS are found in Table 4-4.

In terms of groundwater, there are no GWMUs in the Soar catchment as there are no principle aquifers. Most of bedrock outcrops in the catchment relate to the Mercia Mudstone Group and superficial deposits which provide localised and inconsistent resources. Both the Mercia Mudstone and superficial deposits have water available for licensing.

Table 4-4: Soar CAMS Resource Availability within Leicestershire

AP	Name	CAMS	Resource Availability	HOF (1)	Days (2)	Approx Vol (Ml/d) (3)	Additional Restrictions (4)
1	Upper River Soar: Littlethorpe	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				
2	River Sence	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				
3	River Eye	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				

39 Environment Agency (Feb 2013) Soar Abstraction Licensing Strategy. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291399/LIT_2646_3c9ca3.pdf on 19/05/2017

AP	Name	CAMS	Resource Availability	HOF (1)	Days (2)	Approx Vol (Ml/d) (3)	Additional Restrictions (4)
4	River Wreake	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				
5	Rothley Brook	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				
6	Middle River Soar: Pillings Lock (Barrow on Soar)	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				
7	Kingston Brook	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				
8	Lower River Soar: Kegworth	Soar	Q30	340 Ml/d	329 (av)	17	N/A
			Q50				
			Q70				
			Q95				

(1) Hands Off Flow Restriction
(2) Number of days' abstraction may be available
(3) Approximate volume per day available
(4) This quantity is available throughout the whole catchment, but not necessarily all at any individual assessment point.

4.2.2.3 Tame, Anker and Mease CAMS

Significant areas of Birmingham, Staffordshire, Warwickshire and the eastern portion of Leicestershire are covered by the Tame Anker and Mease CAMS[40]. The catchment is highly variable, heavily modified by urbanisation and contains over 100 miles of canals. The River Mease and River Sence are the main rivers found in the Leicestershire portion of the CAMS, this area is characterised mainly by agricultural usage. Abstractions from the catchment are used for public water supply, energy production and industry. This area also has a range of water-dependant environments with significant ecological value.

None of the assigned Assessment Points within the Tame, Anker and Mease catchment are located within Leicestershire. The area of the catchment falling within Leicestershire has water available for licensing in the high flow scenarios (Q30 and Q50), there is restricted water available for licensing during the low flows scenarios (Q70 and Q95).

In terms of groundwater, availability is guided by the surface water resource availability colours unless there is better information on principal aquifers or there is awareness of local issues that need to be protected. The catchment contains one principle aquifer of strategic importance, the Sherwood Sandstone. This has been split into nine groundwater management units (GWMU), two of which are partially within Leicestershire:

- The Coleorton GWMU has water available for licensing if applicants can confirm that there is no impact on other abstractors, the aquatic environment and river flows. A HOF may be applicable. Parts of the aquifer are fragmented so the potential for development is low.
- The Measham GWMU does not have any water available for licensing. The resource is closed due to over abstraction.

40 Environment Agency (Feb 2013) Tame, Anker and Mease Abstraction Licensing Strategy. Accessed online at: https://www.gov.uk/government/publications/cams-tame-anker-and-mease-abstraction-licensing-strategy on 19/05/2017

4.2.2.4 Warwickshire Avon CAMS

A small portion of southern Leicestershire is found in the Warwickshire Avon CAMS[41]. The rest of the Warwickshire Avon catchment covers most of Warwickshire, significant areas of Worcestershire, Gloucestershire and small areas of Oxfordshire and Northamptonshire. The headwaters of the River Avon are found in the study area and the watercourse flows southwards through the rest of the catchment. 10.5% of licenses in the Warwickshire Avon CAMS are time limited, the next common end date is 31st March 2025.

No Assessment Points (APs) are found within Leicestershire but AP 1 at Rugby (Upper River Avon and River Swift), has been used to assess water resource availability in the Warwickshire Avon area of Leicestershire, including the River Swift and River Avon (Table 4-5). The River Swift has water available for licensing in the high flow scenarios (Q30 and Q50) but no water available for licensing in the low flow scenarios (Q70 and Q95). The Upper River Avon has no water available for licensing in any flow scenario. A HOF has been assigned to AP1, these have been set throughout the catchment to protect flows at Deerhurst to protect the Severn Estuary.

Table 4-5: Warwickshire Avon CAMS Resource Availability within Leicestershire

AP	Name	CAMS	Local Resource Availability		HOF (1)	Days (2)	HOF (Ml/d) (3)	Add Restrictions (4)
			Swift	Avon				
1	Rugby (Upper River Avon and River Swift	Warwickshire Avon	Q30	Q30	87.3 Ml/d at Stareton Gauging Station	230	2.68	N/A
			Q50	Q50				
			Q70	Q70				
			Q95	Q95				

(1) Hands Off Flow Restriction
(2) Number of days' abstraction may be available
(3) Approximate volume per day available
(4) Less will be available further upstream and from tributaries due to reduced flows

There are no principle aquifers within the Warwickshire Avon CAMS that are located within the County of Leicestershire.

4.2.3 Welland CAMS

The Welland CAMS covers 1,656km^2 in total, including the eastern portion of Leicestershire[42]. The River Welland is the primary watercourse in the catchment, rising near Market Harborough in Leicestershire and flowing eastwards towards The Wash in the north-western corner of East Anglia. This watercourse is a key resource for the public water supply to Rutland Water and industrial supply at the Eyebrook Reservoir. It is also important for navigation and recreational uses. The only major aquifer in the catchment is the Lincolnshire Limestone, this is an important water resource for the public water supply.

Within the portion of the Welland CAMS that is located within Leicestershire, there are four Assessment Points (APs) located within Area A: Welland to Tinwell. In the Welland catchment, upstream of Tinwell (AP 8), there is no water available for abstraction except at extremely high flows. Table 4-6 summarises water resource availability in Leicestershire within the Welland CAMS. Water resource availability in the Eye Brook (AP 5) is driven by the operation of the Eyebrook Reservoir, there is no water available for abstraction at any flow.

41 Environment Agency (Feb 2013). Warwickshire Avon Abstraction Licensing Strategies. Accessed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291400/LIT_2604_7a244e.pdf on 19/05/2017

42 Environment Agency (Feb 2013) Welland Catchment Abstraction Management Strategy. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/356134/LIT_7778_660701.pdf on 19/05/2017

Table 4-6: Welland CAMS Resource Availability within Leicestershire

AP	Name	CAMS	Local Resource Availability	HOF (1)	Days (2)	Vol (Ml/d) (3)	Additional Restrictions
1	Market Harborough	Welland	Water not available for licensing	189.2	21	83.6	N/A
2	Melbourne Beck	Welland	Water not available for licensing	57.5	21	20.5	N/A
3	Ashley	Welland	Water not available for licensing	774.6	21	361.4	N/A
5	Eye Brook (downstream)	Welland	Water not available for licensing	179.9	N/A	N/A	N/A

(1) Hands Off Flow restriction
(2) Days per year when abstraction may be available
(3) Approximate volume available at restriction

In terms of groundwater, the resources in the Lincolnshire Limestone are fully committed to existing license holders and the environment. Consequently, no new consumptive licences will be considered. New non-consumptive licences will be considered on a case by case basis.

4.2.4 Recommendations for Better Management Practises

Due to high levels of abstraction within the five CAMS covering Leicestershire, many water resources have been identified as having restricted or no water available for licencing. This underlines the requirement to reduce abstractions by using more efficient management practises. This would improve the sustainability of abstractions and reduce the negative impacts on the local environment.

The main options for this identified in the CAMS are to adopt water efficiency and demand management techniques. Methods of improved water resource management include:

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

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

4.2.5 Water Stress

Water stress is a measure of the level of demand for water (from domestic, business and agricultural users) compared to the available freshwater resources, whether these are surface water or groundwater sources. Water stress can lead to a deterioration of the water environment in terms of quality and quantity of water. This could consequently restrict the ability of a waterbody from achieving "Good Status" under the Water Framework Directive (WFD).

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

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

In the Environment Agency and Natural Resources Wales Assessment[43], the STWL supply region is classed as an area of "moderate" water stress in all scenarios assessed. The AW supply region, which includes small parts of Harborough and Melton, is identified as an area of serious water stress.

43 Environment Agency and Natural Resources Wales (2013) Water Stressed Areas - Final Classification. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf on 22/05/2017

4.2.6 River Basin Management Plans

River Basin Management Plans (RBMPs) set out how organisations, stakeholders and communities will work together to improve the water environment within several large-scale catchments covering the UK and parts of Wales. Each River Basin District (RBD) covers the entire system, including river, lake, groundwater, estuarine and coastal water bodies. There are 11 river basin districts in England and Wales. The Environment Agency manage the 7 RBDs in England.

The RBD RBMPs are designed to protect and improve the quality of our water environment. Good quality water is essential for wildlife, agriculture and business to thrive. And is one of the means for boosting regeneration (both structural and economic), recreation and tourism. The RBMPs support the government's framework for the 25-year environment plan. And will allow local communities to find more cost-effective ways to act to further improve our water environment.

Much of the study area is covered by the 2015 Humber River Basin Management Plan (RBMP)[44]. This document provides a framework for protecting and enhancing the benefits provided by the water environment, it also informs decisions on land-use planning within the river basin.

Significant water management issues in the basin include:

- **Physical modifications**: This affects 42% of water bodies in the River Severn Basin.
- **Pollution from waste water**: Affecting 38% of water bodies in the basin.
- **Pollution from towns, cities and transport**: Affecting 16% of water bodies in the basin.
- **Changes to the natural flow and level of water**: Affecting 6% of water bodies in the basin.
- **Negative effects of invasive non-native species**: Affecting <1% of water bodies in the basin.
- **Pollution from rural areas**: Affecting 32% of water bodies in the basin.
- **Pollution from abandoned mines**: Affecting 4% of water bodies in the basin.

The Humber Basin is split into 15 management catchments. Leicestershire is located within the Soar management catchment. The Soar catchment partnership contains a range of organisations, priority issues to be tackled in this catchment include diffuse pollution from urban and rural area, modified river and wetland habitats and addressing the limited understanding of the multiple benefits of water environments and sustainable drainage systems (SuDS).

Small areas of Leicestershire are also covered by the 2015 Severn River Basin Management Plan (RBMP)[45] and Anglian River Basin Management Plan[46].

The Environment Agency also encourage LPAs to adopt tighter (optional) water efficiency standards. Where there is a clear local and environmental need, the LPA can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day.

44 Department of Environment, Food & Rural Affairs, Environment Agency (Dec 2015) Part 1: Humber River Basin District - River Basin Management Plan. Accessed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500465/Humber_RBD_Part_1_river_basin_management_plan.pdf on 22/05/2017

45 Department of Environment, Food & Rural Affairs, Environment Agency, Natural Resources Wales (Dec 2015) Part 1: Severn River Basin District - River Basin Management Plan. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/501290/Severn_RBD_Part_1_river_basin_management_plan.pdf on 22/05/2017

46 Department of Environment, Food & Rural Affairs, Environment Agency (Dec 2015) Part 1: Anglian River Basin District - River Basin Management Plan. Accessed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500463/Anglian_RBD_Part_1_river_basin_management_plan.pdf on 22/05/2017

4.3 Water Resource Assessment: Water Resources Management Plans

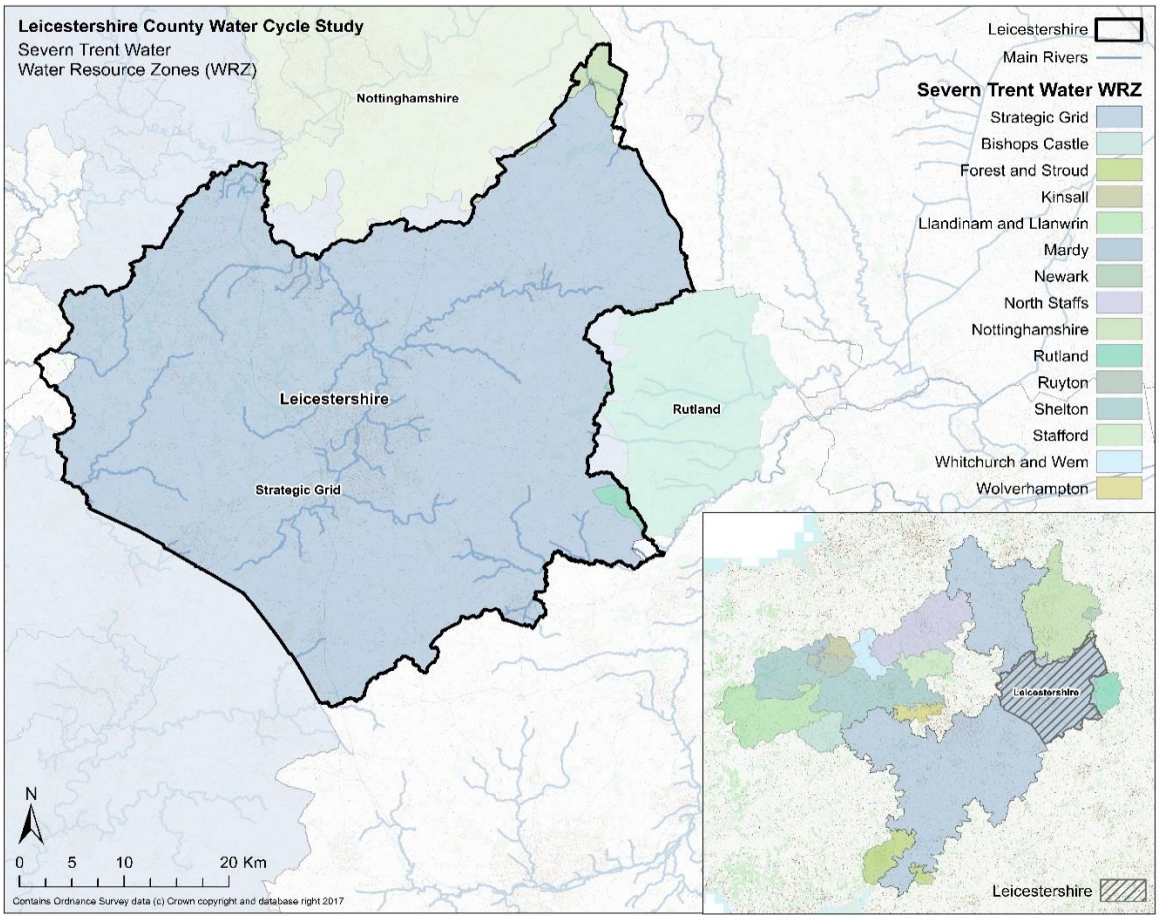
4.3.1 Introduction

When new development within a local authority area is planned, it is important to ensure that there are adequate water resource provisions in the area to supply the increases in demand without risking shortages in the future or during periods of high water demand.

The aim of this assessment is to determine whether the levels of growth proposed within Leicester and Leicestershire exceed the number that have been considered by Severn Trent Water (STWL) whilst planning for future water demand. It is important that this is assessed so that actions can be implemented and water resources managed to overcome possible future water shortages.

Water resources for the majority of the study area are managed by STWL; however, AW also supplies some areas of the east of the county including parts of Harborough and Melton. As the growth areas are all located within the area served by STWL an assessment of water resources and the impacts of growth have been carried out by reviewing STWL Water Resources Management Plan (WRMP). Additional comments have been sought from STWL and AW as part of the consultation phase of the study.

Figure 4-4: Water Supply Company Boundaries in Relation to Leicestershire



4.3.2 Methodology

Severn Trent Water's Water Resource Management Plan (WRMP)[47] was reviewed and attention was mainly focussed upon:

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

47 Severn Trent Water Limited (2014) Final Water Resources Management Plan 2014. Accessed online at https://www.severntrent.com/future/future-plans-and-strategy/water-resources-management-plan on 22/05/2017

4.3.3 Data Collection

The datasets used to assess the water resource capacity were:

- Site locations in GIS format (provided by local authorities)
- Site details including location, proposed use and housing yields (provided by local authorities)
- Water company and water resource zone boundaries (provided by STWL)
- Water Resource Management Plans

4.3.4 Results

Severn Trent Water (STWL) is responsible for supplying the majority of Leicestershire with water. For the purposes of water resource planning, the extensive STWL supply area is divided into 15 Water Resource Zones (WRZ) which vary greatly in scale and have unique water resource concerns. Leicester and Leicestershire are entirely contained within the Strategic Grid WRZ, the largest of the resource zones which supplies a large proportion of STWL customers as shown in Figure 4-4.

STWL's Final Water Resources Management Plan 2014[48] was reviewed to assess each LPA and the levels of growth proposed in terms of water resource supply planning. The WRMP strategy aims to reduce the overall demand for water across all water resource zones whilst making best use of existing water resources through a more flexible and sustainable supply system. To do this, STWL aim to:

- Reduce waste by driving down leakage in the network, reducing leakage by 18% by 2040 compared to 2010 levels;
- Reduce the demand for water by working in partnership with our customers to help them become more water efficient, with expected savings of around 40Ml/d by 2040;
- Improve the ability to deploy existing water resources flexibly and efficiency;
- Use water trading to make more efficient use of resources and improve resilience;
- Develop new water resources when required, with the focus on expanding existing resources first;
- Using proactive catchment management measures to protect sustainable sources of drinking water from pollution risks.

In the short term, the strategy is driven by the need to address environmentally unsustainable levels of abstraction. In the longer term, the strategy aims to deal with significant uncertainties around the impacts of climate change and increasing the flexibility and capacity of the Strategic Grid. Note that WRMPs plan to a 25-year time horizon, and therefore the current WRMP plans to 2040, and therefore does not cover the final 10 years of planning period covered by this WCS.

Severn Trent Water's Key Points for the Strategic Grid WRZ

The Strategic Grid WRZ is likely to require significant investment to reduce environmentally unsustainable abstractions and to meet the longer-term challenge of the impacts of climate change.

The largest challenge faced by the Strategic Grid is the impact of Natural Resources Wales' Review of Consents on the River Wye required by the Habitats Directive. This would result in a loss of deployable output of up to 75 Ml/d. Further abstraction licence reductions will lead to a further 5 Ml/d loss of deployable output. However, it is expected that this loss of deployable output can be accommodated before 2020. A summary of the Strategic Grid strategy can be seen in Table 4-7.

48 Severn Trent Water (2014) Final Water Resources Management Plan 2014. Accessed online at: https://www.severntrent.com/future/plans-and-strategy/water-resources-management-plan on 06/07/2017

Table 4-7: Summary of Strategic Grid Water Management Strategy 2015 - 2040

Delivery Period	Scheme Description	Assumed Benefit
AMP6 2015-2020	Reduce leakage by 19Ml/d. Reduce demand by 5Ml/d through additional water efficiency activity. Increase Uckington output in the Shelton zone to facilitate Upper Worfe flow augmentation which will be re-abstracted into the Strategic Grid zone from the River Severn.	19Ml/d 5Ml/d Maintain service levels
AMP7 2020-2025	Reduce leakage by 3Ml/d. Trimpley-Worcestershire groundwater conjunctive use. Whitacre aquifer storage and recovery, Phase 2. Draycote reservoir 6% expansion. Bromsgrove groundwater licence transfer. Upper and Lower Worfe flow augmentation	3Ml/d 15Ml/d 10Ml/d 7.5Ml/d 17Ml/d 30Ml/d
AMP8 2025-2030	Reduce leakage by 1.9Ml/d.	1.9Ml/d
AMP9 2030-2035	Reduce leakage by 3.7Ml/d.	3.7Ml/d
AMP10 2035-2040	Reduce leakage by 0.3Ml/d.	0.3Ml/d

Population and Household Growth:

For the base year 2012/13, the number of properties within the supply area were based on STWLs billing system TARGET. Property records were then linked to WRZs using their postcodes. These figures were used to forecast property numbers for each year to 2040. Forecasts for population growth and therefore housing yields are based on the 2011 population projections from the Office for National Statistics (ONS). The household growth estimates used in the 2014 WRMP[49] for the strategic grid area shown in Table 4-8.

Table 4-8: STWL WRMP Household Growth Estimates for the Strategic Grid WRZ

Component	2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
Strategic Grid Growth	67,850	63,380	74,370	76,250	77,600	**359,450**

The Strategic Grid WRZ is comprised of 26 full local authorities and 13 local authorities that are located on the periphery of the WRZ and are therefore partially covered. To provide a comparison using the latest household projections for each relevant local authority, the Department for Communities and Local Government's (DCLG's) February 2015 estimates for household growth were collated for the Strategic Grid supply area. For those districts partially covered, the percentage of the current population of each local authority within the WRZ was applied.

49 Severn Trent Water Limited (2013) Strategic Grid fWRMP Data Tables. Accessed via https://www.severntrent.com/content/ConMediaFile/1718 on 22/05/2017.

Figure 4-5 identfies the local authorities completely contained within the Strategic Grid and those partially contained due to their locations of the periphery.

Figure 4-5: Local authorities supplied from the STWL Strategic Grid WRZ

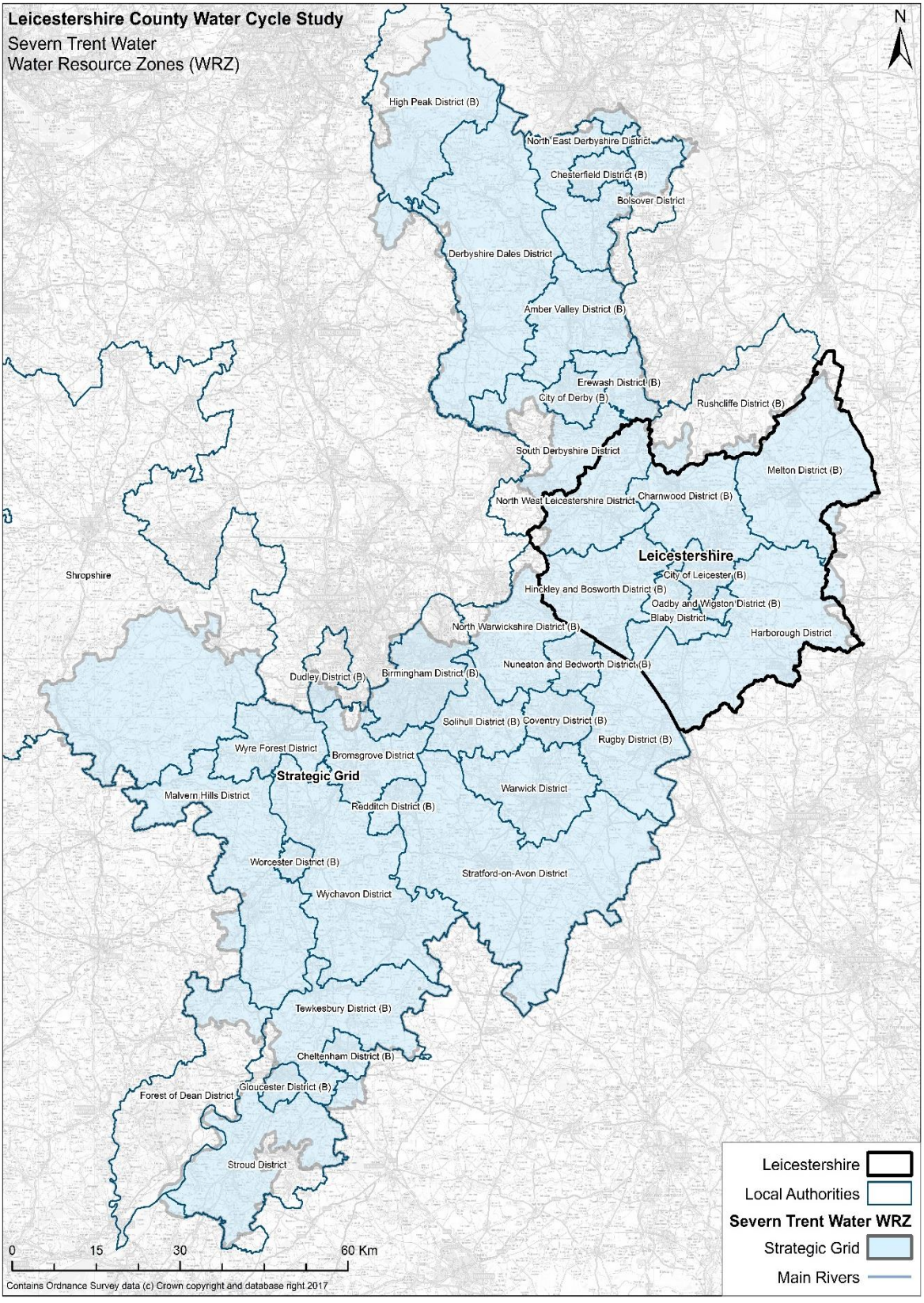


Table 4-9: DCLG 2015 Household Projections in the STWL Strategic Grid WRZ

Local Planning Authority	Est. % pop. within WRZ		2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
Leicester	**100%**		**4693**	**5709**	**5879**	**6052**	**4411**	**26,744**
North West Leicestershire	**90%**		**1,057**	**1,353**	**1,309**	**1,193**	**824**	**824**
			951	**1,218**	**1,178**	**1,074**	**742**	**742**
Charnwood	**100%**		**3349**	**3770**	**3877**	**3780**	**2638**	**17,414**
Melton	**100%**		**749**	**901**	**809**	**713**	**506**	**3,678**
Harborough	**100%**		**1,701**	**1,994**	**1,839**	**1,662**	**1,149**	**8,345**
Oadby and Wigston	**100%**		**36**	**227**	**442**	**466**	**338**	**1,509**
Blaby	**100%**		**1,048**	**1,327**	**1,215**	**1,134**	**758**	**5,482**
Hinckley and Bosworth	**100%**		**1,465**	**1,857**	**1,762**	**1,597**	**1,024**	**7,705**
Erewash	100%		1,620	1,989	1,788	1,683	1,268	8,348
North East Derbyshire	100%		985	1,316	1,165	972	603	5,041
Amber Valley	100%		1,599	1,992	1,777	1,571	1,017	7,956
Derbyshire Dales	100%		922	1,192	1,143	984	627	4,868
Chesterfield	100%		842	1,164	978	898	595	4,477
Gloucester	100%		2,487	3,023	2,783	2,721	2,050	13,064
Cheltenham	100%		1888	2,428	2275	2296	1783	10,670
Rugby	100%		1868	2425	2247	2189	1700	10,429
Warwick	100%		2186	3013	2946	2879	2123	13,147
Stratford-On-Avon	100%		1885	2463	2270	2060	1405	10,083
Nuneaton and Bedworth	100%		1805	2318	2136	2011	1538	9,808
Malvern Hills	100%		785	1073	1159	1097	727	4,841
Wychavon	100%		1164	1542	1525	1394	898	6,523
Worcester	100%		1470	1868	1616	1367	1002	7,323
Redditch	100%		868	1090	975	800	464	4,197
Coventry	100%		7722	9194	9210	9165	6988	42,279
Solihull	100%		2181	3060	3225	3193	2417	14,076
Derby	100%		3813	4814	4639	4656	3449	21,371
Wyre Forest	100%		1,070	1,399	1,315	1,178	815	5,777
High Peak	50%	Total	1,221	1,496	1,340	1,166	726	5,949
		WRZ	610	748	670	583	363	2,975
South Derbyshire	60%	Total	2,223	2,568	2,375	2,158	1,480	10,804
		WRZ	1,334	1,541	1,425	1,295	888	6,482
Bolsover	50%	Total	943	1,141	980	827	592	4,483
		WRZ	471	570	490	413	296	2,242
Forest of Dean	10%	Total	1,062	1,358	1,215	1,038	664	5,337
		WRZ	106	136	122	104	66	534
Stroud	60%	Total	1,814	2,333	2,237	2,044	1,422	9,850
		WRZ	1,088	1,400	1,342	1,226	853	5,910
Tewkesbury	95%	Total	1,666	2,006	1,882	1,733	1,233	8,520
		WRZ	1,583	1,906	1,788	1,646	1,171	8,094
Rushcliffe	10%	Total	1,836	2,209	2,181	2,001	1,393	9,620
		WRZ	184	221	218	200	139	962
North Warwickshire	85%	Total	600	865	851	744	503	3,563
		WRZ	510	735	723	632	428	3,029
Birmingham	80%	Total	16,449	21,680	22,536	21,801	16,884	99,350
		WRZ	13,159	17,344	18,029	17,441	13,507	79,480

Local Planning Authority	Est. % pop. within WRZ		2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
Bromsgrove	85%	Total	1,130	1,405	1,500	1,416	957	6,408
		WRZ	960	1,194	1,275	1,204	813	5,447
Dudley	30%	Total	2,466	3,160	3,204	2,924	2,259	14,013
		WRZ	740	948	961	877	678	4,204
Shropshire	20%	Total	4,413	5,064	4,530	3,786	2,331	20,124
		WRZ	883	1,013	906	757	466	4,025
TOTAL			**72,781**	**92,122**	**90,122**	**85,971**	**62,704**	**403,700**

Household projections are shown for the full Local Authority area and, if the Local Authority is only partially covered by the Strategic Grid, an estimation of growth within the Strategic Grid WRZ has also been provided for analysis.

The comparison shows that STWL forecast a housing yield of **359,450** between 2015-2039 in the Strategic Grid. The latest DCLG household growth estimates forecast a value of **403,700**. This is a 12% increase on the housing yield used in the 2014 WRMP, a discrepancy which will need to be considered and addressed in the next WRMP currently in preparation for 2019 publication.

4.3.5 Conclusions

All sites considered in this WCS are supplied by Severn Trent Water and are located within the Strategic Grid WRZ. Severn Trent Water's WRMP demonstrates the pressures on water resources across the water company's area due to the impacts of population increases, resource uncertainty, climate change and the need to reduce abstractions to reduce impacts on the environment.

There is a 12% disparity between the predicted housing growth allowed for in the STWL WRMP and the DCLG household growth estimates. The difference between these figures will require some review as the STWL WRMP is planning for a growth rate below what is predicted by the DCLG.

Although STWL has not relied on new homes being more water-efficient than existing metered homes, the opportunity, through the planning system, to ensure that new homes do meet the higher standard of domestic usage, at no additional developer cost, would be in line with general principals of sustainable development, and reducing energy consumed in the treatment and supply of water.

4.3.6 Recommendations

Table 4-10 summarises the recommendations from the initial water resources assessment of the STWL WRMP, the proposed strategies for the Strategic Grid and the assessment of population and housing growth forecasts for the Strategic Grid compared to DCLG estimates.

Table 4-10: Water Resources Assessment Recommendations

Action	Responsibility	Timescale
Review population and housing growth forecasts within Severn Trent Water Strategic Grid WRZ	Severn Trent Water, LC local authorities	ASAP
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	Severn Trent Water	Ongoing
Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	Local authorities and other LPAs in the Strategic Grid	Ongoing
Consider using planning policy to meet the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas. The STWL supply region is currently considered to be moderately stressed.	Local authorities	In draft Local Plan
Water companies should advise Leicestershire County Council of any strategic water infrastructure developments, where these may require safeguarding of land to prevent other type of development occurring. However, at present, no major potential schemes have been identified.	STWL, Leicestershire Local authorities	In draft Local Plan

4.4 Water Resource Assessment: Water Supply Infrastructure Assessment

4.4.1 Introduction

Increases in water demand leads to additional pressures on the existing water supply infrastructure in the study area. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrades will be required to support the proposed residential and employment developments proposed across the study area. The time required to plan, obtain funding and construct major water supply infrastructural upgrades can be considerable and therefore water companies and planners need to work closely together to ensure that water supply infrastructure can meet growing demand.

Water supply companies, including Severn Trent Water, make a distinction between supply infrastructure, including major pipelines, reservoirs and pumps that transfer water around the Water Resource Zone (WRZ) and distribution infrastructure, smaller scale assets which convey water around settlements and neighbourhoods to customers. This assessment is focussed on the larger scale supply infrastructure for these water companies. It is expected that developers should fund any detailed assessments and/or modelling of the distribution systems required to identify if local distribution infrastructure needs upgrading in order for development to occur.

4.4.2 Methodology

Due to the strategic nature of this Water Cycle Study, a quantitative assessment of the water supply infrastructure across Leicestershire and the impacts of strategic and non-strategic growth has not been completed. STWL was therefore asked to comment on the impacts of proposed growth on water supply infrastructure.

4.4.3 Data Collection

The following datasets will be used to assess the water supply and distribution capacity in the STWL Strategic Grid WRZ:

- Site allocations in GIS format (Provided by local authorities within Leicestershire)
- A technical note outlining the growth scenarios and housing numbers for each site
- The site tracker spreadsheet containing all information on each site

4.4.4 Results

The following comment was received from STWL in the early stages of this project:

"Through our involvement in other WCS's we have sometimes encountered difficulties where the appointed consultant has used Severn Trent datasets to inform their analysis, but had been inappropriately interpreted to determine whether Severn Trent assets have sufficient capacity to accommodate proposed growth in the future.

This often then results in concerns, particularly from the Environment Agency, where the findings of a Water Cycle Study conclude there are potential capacity constraints but overlooks that under Section 94 of the Water Industry Act 1991 a sewerage undertaker has a general duty to provide effectual drainage which includes providing additional capacity as and when required to accommodate planned development. There are similar requirements for water supply under Section 66 of the WIA and that future demand planning is an integral part of the Water Resources Management Plan.

Water and sewerage undertakers have an obligation to accommodate new development through the provision of additional waste water capacity (both sewerage and treatment) and to ensure adequate clean water supply (covering resources, treatment and distribution). For clean water our Water Resources Management Plan already considers the supply/demand issues for the future 25 years, whereas with the water distribution system being pressurised is therefore more flexibility with regards to water supply but there is still a requirement on us to ensure water can be provided to meet the needs of new development.

What can also be overlooked is the fact that, alongside the requirement to provide additional capacity to accommodate new development, there is also a requirement to manage our assets efficiently to minimise our customers' bills. Consequently, many of our assets will not have significant amounts of spare headroom and it is financially and operationally inefficient to do so.

Our experiences with Water Cycle Studies is that they can often conclude that today's current spare capacity (in particular sewage treatment) is insufficient to meet long term Local Plan development plans but fails to recognise that providing spare capacity for development which may/may not take place in 15-20 years' time is not always the best use of our resources and can result in abortive investment. It also overlooks that we have a general duty to ensure sufficient capacity, as and when it is provided, whereby in most instances additional sewage treatment capacity can be provided within 2-3 years, with infrastructure upgrades to the sewerage/water distribution systems within 18 months to 2 years. Consequently, providing additional capacity is often not a constraint to development and as larger development sites can take several years before they are fully occupied this usually gives sufficient time for capacity improvement to be completed before additional flow/demand materialises."

4.4.5 Conclusions

The response from the water company indicates that water supply is not expected to be a constraint to development as the water supply network is pressurised and therefore has more flexibility. There would still be a requirement for STWL to ensure that water could be supplied to each development adequately so, as development occurs within the study area, detailed modelling of water supply infrastructure will allow any infrastructural upgrades to be completed without restricting the timing, location or scale of the planned development.

4.4.6 Recommendations

The recommendations from the water supply assessments are shown in Table 4-11.

Table 4-11: Water Supply Infrastructure Recommendations

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

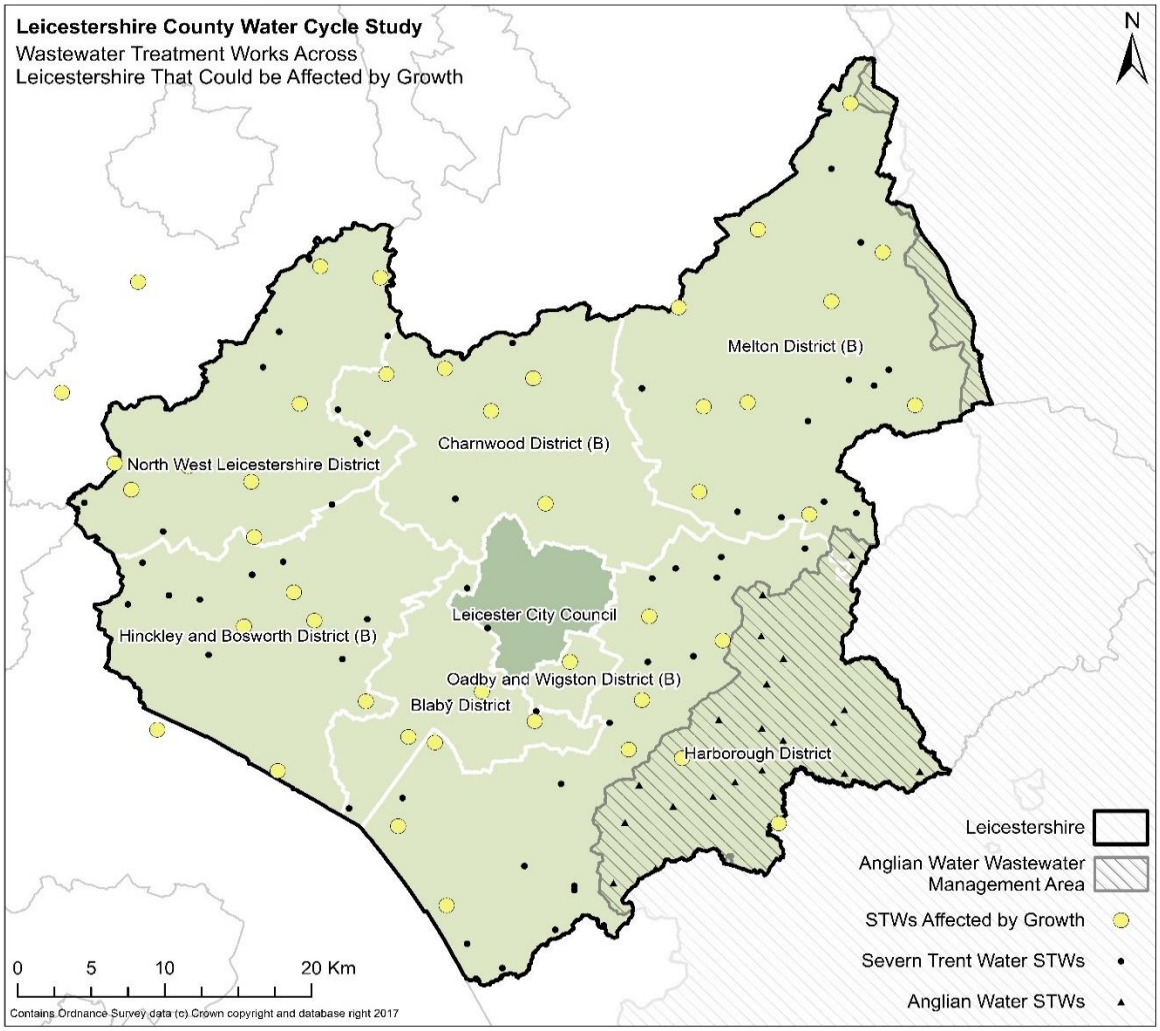
5 Wastewater Collection and Treatment

5.1 Introduction

Severn Trent Water (STWL) and Anglian Water (AW) are the sewerage undertakers (SU) for the study area. The role of SU includes the collection and treatment of wastewater from domestic and commercial premises, and in some cases, the drainage of surface water from building curtilages to combined or surface water sewers. It excludes, unless adopted by the SU, systems that don't connect directly to the network, e.g. SuDS or highway drainage. Increased wastewater flows into collection systems, as a result of population growth or per-capita consumption increases, can lead to the overloading of the existing infrastructure, increasing the risk of sewer flooding discharges from Combined Sewer Overflows, having an impact on water quality.

Headroom at STWs can be eroded by growth, requiring investment in additional treatment capacity. As the volumes of treated effluent rise, even if the effluent quality is maintained, the pollutant load discharged to the receiving watercourse will increase. In such circumstances, the Environment Agency, as the environmental regulator, may tighten effluent consents to achieve a "load standstill", i.e. ensuring that as effluent volume increases the pollutants does not increase. This would require investment by the water company to improve the treated effluent quality and protect water quality in the receiving watercourses.

Figure 5-1: Sewerage Undertaker Boundaries and Treatment Works in Leicestershire



To assess the impact of growth on the existing wastewater infrastructure from 2011 to 2050, the three growth types, 2011 - 2031 sites, 2031 - 2050 Non-Strategic Sites and SGP Growth Areas have been assessed to create a full picture of the impacts of all types of growth and to identify the STWs that may be most affected by future strategic or non-strategic growth across Leicestershire from 2050 onwards..

5.2 Wastewater Assessment - Wastewater Treatment Assessment: 2011 to 2031

5.2.1 Introduction

This assessment analyses the impacts of the 2011 - 2031 sites located across the study area. This high-level wastewater infrastructure assessment has been completed in order to develop a baseline for the less certain growth areas planned for 2031 - 2050.

5.2.2 Methodology

Based on the locations of the 2011-31 sites, each has been allocated to the most appropriate STW to understand how the proposed growth may affect the STW capacities. This has been completed to identify if STWs within the SGP Growth Areas will already have diminished ability to manage additional wastewater because of development already expected to take place up to 2031. The calculated increases in Dry Weather Flow (DWF) from the STWs, have been compared to the Maximum DWF permits at each STW. Permitted DWF has been used as a proxy for STW capacity; in reality, some works may have a physical capacity beyond their permitted DWF.

5.2.3 Data Collection

The datasets used to identify STWs that may be affected by the 2011 to 2031 sites and the potential impacts that these developments may have include:

- List and GIS locations of all 2011 to 2031 sites;
- Planned housing numbers and employment areas for each of the proposed sites;
- STWL and AW STWs locations and drainage areas boundaries/networks;
- The occupancy rate, water demand and the percentage of water that reaches the STW has been utilised to calculated the increases in Dry Weather Flow from the development sites.

5.2.4 Results

The locations of the 2011-2031 sites were analysed in comparison to the locations of the STWs and their associated drainage networks. This was completed to identify the most appropriate nearby STW that would manage the wastewater flows from each site. Figure 5-1 highlights the locations of all the STWs that could be affected by the proposed sites within each local authority up to 2050. Table 5-1 provides details of the 45 STWs that could be affected by growth and the total additional wastewater demand that could occur.

Of the 45 STWs affected, 42 are located within Leicestershire and three of the STWs fall outside the study area. Milton STW and Stanton STW are located in Derbyshire, to the west of North West Leicestershire District. Nuneaton-Hartshill STW is located in Warwickshire, to the south-west of Hinckley and Bosworth Borough. Most of the STWs that could be affected by growth to 2031 are Severn Trent Water assets, however Kibworth and Market Harborough STWs affected by proposed growth in Harborough are Anglian Water assets.

Some large-scale development is proposed at sites adjacent to the existing Magna Park Industrial Estate, these sites are located at a significant distance from any of the existing public STWs and their associated wastewater networks. However, there are likely to be existing private STWs serving Magna Park Industrial Estate. Before the development of these sites occurs, it is important that developers ensure that the private STWs have capacity to manage the additional wastewater flows, and if necessary to agree amended permit conditions with the EA and implement capacity upgrades.

Wanlip, Loughborough and Snarrows STWs are expected to receive the greatest increase in wastewater demand to 2031 due to the number of the proposed developments sites located within their drainage networks. Castle Donington, Earl Shilton, Packington and Somerby are expected to receive the greatest percentage increase in wastewater demand in relation to their maximum DWF Permits.

Table 5-1 identifies that these STWs that could receive additional wastewater flows as a result of the proposed growth to 2031. The scale of growth proposed in Leicestershire is significant and this could have a major impact on the capacity of the existing wastewater infrastructure.

Table 5-1: STWs Affected by Growth within Leicestershire Between 2011 - 2031

Sewage Treatment Works (STW)	Local Authority Area	SU	Max DWF Permit (Ml/d)	Number of Sites draining to the STW	Sum of Potential Housing Numbers (Units)	Sum of the Potential Employment Use (m^2)	Sum of Additional Wastewater Demand (Ml/d)	Add Wastewater Demand (% of the DWF Permit)
Wanlip	Charnwood	STWL	135.00	165	30,962	1,298,605	10.26	8%
Loughborough	Charnwood	STWL	21.50	20	5,644	723,000	2.17	10%
Snarrows	North West Leicestershire	STWL	9.45	22	5,291	360,731	1.84	19%
Earl Shilton	Hinckley and Bosworth	STWL	5.64	10	5,172	1,254	1.57	28%
Melton	Melton	STWL	9.27	25	4,568	29,408	1.41	15%
Packington	North West Leicestershire	STWL	4.58	16	3,375	276,236	1.20	26%
Hinckley	Hinckley and Bosworth	STWL	16.39	28	2,841	196,107	0.99	6%
Castle Donington	North West Leicestershire	STWL	3.04	8	1,201	920,772	0.95	31%
Market Harborough	Harborough	AW	6.03	5	2,450	30,700	0.76	13%
Shepshed	Charnwood	STWL	4.27	10	1,643	160,000	0.60	14%
Lutterworth	Harborough	STWL	2.97	8	668	307,987	0.40	13%
Private STW	Harborough	N/A	-	2	0	520,644	0.33	N/A
Measham	North West Leicestershire	STWL	1.39	4	1008	0	0.31	22%
Countesthorpe	Blaby	STWL	1.50	7	886	0	0.27	18%
Stoney Stanton	Blaby	STWL	3.07	9	877	1,964	0.27	9%
Whetstone	Blaby	STWL	6.17	9	669	44,525	0.23	4%
Barrow and Quorn	Charnwood	STWL	3.36	7	739	0	0.22	7%
Oadby	Oadby and Wigston	STWL	4.98	3	676	0	0.21	4%
Kegworth	North West Leicestershire	STWL	1.59	5	355	110,400	0.18	11%
Asfordby	Melton	STWL	1.59	13	477	46,675	0.17	11%
Broughton Astley	Harborough	STWL	2.39	3	559	5,500	0.17	7%
Harby	Melton	STWL	1.20	17	516	0	0.16	13%
Bottesford	Melton	STWL	1.06	8	448	5,500	0.14	13%

Sewage Treatment Works (STW)	Local Authority Area	SU	Max DWF Permit (Ml/d)	Number of Sites draining to the STW	Sum of Potential Housing Numbers (Units)	Sum of the Potential Employment Use (m^2)	Sum of Additional Wastewater Demand (Ml/d)	Add Wastewater Demand (% of the DWF Permit)
Fleckney	Harborough	STWL	0.92	3	440	8,500	0.14	15%
Kibworth	Harborough	AW	1.70	4	366	12,250	0.12	7%
Ibstock	North West Leicestershire	STWL	1.93	2	345	0	0.10	5%
Great Glen	Harborough	STWL	1.16	2	270	0	0.08	7%
Nuneaton Hartshill	Hinckley and Bosworth	STWL	22.60	1	0	115,305	0.07	0%
Milton	Derbyshire	STWL	3.22	1	190	0	0.06	2%
Market Bosworth	Hinckley and Bosworth	STWL	0.64	2	157	0	0.05	7%
Waltham	Melton	STWL	0.93	2	131	0	0.04	4%
Burton on the Wolds	Charnwood	STWL	0.70	2	105	0	0.03	5%
Somerby	Melton	STWL	0.12	3	105	0	0.03	26%
Newbold Verdon	Hinckley and Bosworth	STWL	0.73	1	93	0	0.03	4%
Donisthorpe	North West Leicestershire	STWL	0.73	1	80	0	0.02	3%
Croxton Kerrial	Melton	STWL	0.19	3	76	0	0.02	12%
Nether Broughton	Melton	STWL	0.45	3	74	0	0.02	5%
Houghton on the Hill	Harborough	STWL	0.36	1	70	0	0.02	6%
Wymondham	Melton	STWL	0.16	3	66	0	0.02	13%
Barlestone	Hinckley and Bosworth	STWL	0.64	1	63	0	0.02	3%
Claybrooke Magna	Harborough	STWL	0.37	1	60	0	0.02	5%
Ashby Folville	Melton	STWL	0.28	3	55	0	0.02	6%
Ravenstone	North West Leicestershire	STWL	0.42	1	50	0	0.02	4%
Billesdon	Harborough	STWL	0.18	1	0	3,630	0.00	1%
Stanton	Derbyshire	STWL	8.94	1	0	1,639	0.00	0%
Total				***446***	***73821***	***5,181,332***	***25.75***	

5.2.5 Conclusions

This assessment has identified the STWL and AW STWs across Leicestershire that could be impacted by growth from 2011 to 2031. This high-level assessment has identified 45 STWs that could receive additional wastewater as a result of the proposed growth.

- Castle Donington, Earl Shilton, Packington, Somerby, Measham, Snarrows, Countesthorpe, Melton, Fleckney, Shepshed, Lutterworth, Bottesford, Harby, Market Harborough, Wymondham, Croxton Kerrial, Kegworth, Asfordby and Loughborough could potentially receive additional wastewater flows equating to 10% or greater of their existing Maximum DWF Permit. As these STWs could potentially receive a significant quantity of additional wastewater in the future, it is likely that extensive upgrades to the existing infrastructure or, the construction of new wastewater treatment facilities will be required to manage future growth, in addition to any strategic scale growth proposed in similar areas.
- Many other STWs identified in Table 5-1 could face significant increases wastewater flows, equating to a large portion of their maximum permitted DWF. In these locations, infrastructural upgrades are likely to be required to increase the capacity of the receiving STWs to allow them to manage the additional flows.
- Due to the scale of growth across Leicestershire, it is recommended that a more detailed assessment of how wastewater flows will affect each individual STW are also completed by the SUs, this may require modelling so that impacts can be fully understood and mitigated.
- Development will be phased across the study area, it is therefore important that increases in wastewater flows are investigated and modelled so that infrastructural upgrades are completed at each phase of future development to prevent the STWs and networks becoming overloaded by the new developments.
- Some significant growth is proposed adjacent to the Magna Park Industrial Estate, which is served by private STWs. These sites will need to be assessed individually by the developer to ensure that wastewater can be managed by the existing infrastructure or if upgrades will be required.
- For the three STWs located outside of Leicestershire, it is important that any growth from outside the study area that could be received by these STWs is also considered in any future assessments so that upgrades can be implemented appropriately.

In summary, it is recommended that as development progresses across the study area, growth is assessed in relation to each STW in greater detail. It is also recommended that details of developments, their locations and notional capacities are supplied to STWL and AW so that detailed infrastructural and capacity assessments can be completed as development progresses. Upgrades are likely to be required across the study area to meet future demand, it is recommended that in-depth assessments of where wastewater from each site will be managed are completed, for used in association with this high-level assessment.

5.2.6 Recommendations

The recommendations from the high-level wastewater infrastructure assessment are shown in Table 5-2 below in terms of the 2011-31 sites.

Table 5-2: Wastewater Treatment Assessment: 2011-31 Growth

Action	Responsibility	Timescale
Provide updates to STWL and AW on projected development	LAs within Leicestershire	Annually
STWL and AW to assess growth demands as part of their wastewater asset planning activities and feedback to relevant parties where concerns arise.	STWL and AW	Ongoing
Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity.	STWL and AW	Ongoing
STWL, AW, EA and local authorities within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LAs within Leicestershire	Ongoing

5.3 Wastewater Assessment - Wastewater Treatment Assessment 2031 - 2050 Strategic Growth

5.3.1 Introduction

The SGP sets out the aspirations for delivering residential, economic and infrastructural growth to 2050. It has identified a range of potential locations for strategic development in Leicester and Leicestershire, including a Primary Growth Area, Secondary Growth Areas and Growth Centres as discussed in Section 2.3. Due to the scale of the SGP Growth Areas, a high-level wastewater infrastructure assessment has been completed to better understand how these sites could be managed in terms of wastewater collection and treatment.

5.3.2 Methodology

Based on the indicative locations of the SGP Growth Areas in Leicestershire, a strategic level assessment of wastewater infrastructure has been completed based on the locations of Severn Trent Water and Anglian Water STWs and wastewater catchments, and the identification of any major constraints that may affect how these large-scale developments are connected into the existing wastewater network. As the specific locations of development within the Growth Areas are not currently known, this assessment is qualitative as additional wastewater flows could connect to several STWs located within or adjacent to them.

5.3.3 Data Collection

The datasets used to complete the high-level wastewater network assessment include:

- The indicative Growth Area locations in GIS format (Produced by JBA based on indicative site location descriptions)
- Notional levels of growth within each Growth Area (Provided by the Partners)
- The locations of Severn Trent Water and Anglian Water STWs and drainage areas boundaries/networks

5.3.4 Results

The results of the high-level wastewater infrastructure assessment for the SGP Growth Areas are discussed below, detailing each Growth Area individually. For each, the notional housing and employment capacities were utilised to calculate estimated additional wastewater flows that would need to be managed by the existing wastewater infrastructure in the vicinity or by any new infrastructure that may be required due to the large scale of these Growth Areas. The total estimated additional wastewater flows from each Growth Area as a result of the indicative levels of growth proposed in the Strategic Growth Plan are shown in Table 5-3.

The indicative locations of the Growth Areas were also used to identify the nearest existing Sewage Treatment Works, their drainage catchments and any constraints that may affect a connection into these areas of the wastewater network. Due to the scale of the development proposed within these Growth Areas, it is likely that either significant upgrades to the existing wastewater infrastructure or the construction of new infrastructure will be required to manage the additional wastewater flows from future strategic development.

Table 5-3: Estimated Additional Wastewater Flows from the Growth Areas

Growth Area	Levels of Development Proposed (Residential Only)	Calculated Additional Wastewater Flows (Ml/d)
A46 Growth Corridor	30,000	9.6
Southern Gateway	17,000	5.4
Northern Gateway	10,000	3.2
Melton Growth Centre	2,000	0.6
Lutterworth Growth Centre	3,000	1.0
Six Hills Garden Village	3,000	1.0
TOTAL	**62,000 (65,000 including the Six Hills Garden Village)**	**20.8**

5.3.4.1 The A46 Growth Corridor

A significant level of growth is proposed along the A46 Growth Corridor, with the potential to contain residential developments accommodating 30,000 dwellings and significant levels of economic development, supported by the dramatically improved infrastructure in the area. Table 5-4 identifies the 12 STWL Sewage Treatment Works in the Growth Area that could potentially receive additional wastewater flows from strategic development. It is difficult to calculate the additional wastewater demands that could be produced from individual areas of the A46 Growth Corridor and where they will be due to the large area of Leicestershire the Growth Corridor covers and the lack of information on the specific locations of future development.

Table 5-4: A46 Growth Corridor: STWs that could be Affected by Strategic Growth

STWs that could be affected by Strategic Development in the Growth Area	Maximum Permitted DWF (Ml/d)	Also receive growth from LA Sites?	Main Constraints Impacting Connection to Wastewater Network
Wanlip STW Could receive growth in the north A46 Growth Corridor	135.0	Yes	• STW could receive a significant amount of additional growth from other Strategic and non-strategic sites • Located to the West of the growth area
Keyham STW Could receive growth in the central A46 Growth Corridor	0.031	No	• The scale of development is significant in comparison to the size of the STW
Houghton on the Hill STW Could receive growth in the central A46 Growth Corridor	0.36	Yes	• The scale of development is significant in comparison to the STW size
Little Stretton STW Could receive growth in the central A46 Growth Corridor	0.017	No	• The scale of development is significant in comparison to the STW size
Oadby STW Could receive growth in the central A46 Growth Corridor	4.98	Yes	• Could receive a significant amount of growth from other LA/Strategic sites
Great Glen STW Could receive growth in the central A46 Growth Corridor	1.16	Yes	• The scale of development is significant in comparison to the STW size
Countesthorpe STW Could receive growth in the south east A46 Growth Corridor	1.50	Yes	• The scale of development is significant in comparison to the size of the STW • Could potentially receive a significant growth from other Strategic/LA sites
Arnesby STW Could receive growth in the SE A46 Growth Corridor	0.35	No	• The scale of development is significant in comparison to the size of the STW • STW located outside the growth area, pumping may be required
Whetstone STW Could receive growth in the southern A46 Growth Corridor	6.17	Yes	• Located to the north of the growth area, pumping may be required • Could potentially receive a significant growth from other Strategic/LA sites
Broughton Astley STW Could receive growth in the southern A46 Growth Corridor	2.39	Yes	• Could potentially receive a significant add growth from other Strategic/LA sites • The scale of development is significant in comparison to the size of the STW
Stoney Stanton STW Could receive growth in the southern A46 Growth Corridor	3.07	Yes	• Could potentially receive a significant add growth from other Strategic/LA sites • The scale of development is significant in comparison to the size of the STW
Hinckley STW Could receive growth in the southern A46 Growth Corridor	16.39	Yes	• Located to the west of the Growth Corridor • M69 may form a barrier to connection to network

5.3.4.2 The Southern Gateway

It is proposed that strategic development at the Southern Gateway to Leicestershire could accommodate around 17,000 residential dwellings in association with significant levels of economic development. Table 5-5 identifies the STWL STWs that could be affected by future strategic growth in this area. Calculating assumed additional flows that could be received by each STW is challenging due to the lack of information on the precise locations of development in the Southern Gateway.

Table 5-5: Southern Gateway: STWs that could be Affected by Growth

STWs that could be affected by Strategic Development in the Growth Area	Maximum Permitted DWF (Ml/d)	Also receive growth from LA Sites?	Main Constraints Impacting Connection to Wastewater Network
Earl Shilton STW Located to the north east of the Southern Gateway	5.64	Yes	• STW could potentially receive a significant amount of additional growth from other strategic and non-strategic sites • North of the growth area, pumping may be needed due to topography
Hinckley STW Located within the Southern Gateway	16.39	Yes	• STW could potentially receive a significant amount of additional growth from other strategic and non-strategic sites
Stoney Stanton STW Located to the east of the Southern Gateway	3.07	Yes	• STW could potentially receive a significant amount of additional growth from other strategic and non-strategic sites • STW located to the east of the growth area, pumping may be required • M69 could form a barrier to connection
Wigston Parva STW Could receive growth in the southern A46 Growth Corridor	0.014	No	• The scale of development is significant in comparison to the size of the STW

5.3.4.3 The Northern Gateway

The Strategic Growth Plan proposes that the Northern Gateway could accommodate around 10,000 residential dwellings. Table 5-6 identifies the five STWL STWs that could be affected by the strategic development proposed for the Northern Gateway.

Table 5-6: Northern Gateway: STWs that could be Affected by Growth

STWs that could be affected by Strategic Development in the Growth Area	Maximum Permitted DWF (Ml/d)	Also receive growth from LA Sites?	Main Constraints Impacting Connection to Wastewater Network
Breedon STW Located in the west of the Northern Gateway	0.21	No	• The scale of development is significant in comparison to the size of the STW
Kegworth STW Located in the north east of the Northern Gateway	1.59	Yes	• STW at a significant distance to the north east, pumping may be required • STW could potentially receive additional growth from other Strategic and LA sites • M1 and A42 may be a barrier to connection
Long Whatton STW Located in the east of the Northern Gateway	1.00	No	• STW at a significant distance to the NE, pumping may be required for some areas • STW could receive significant additional growth from other Strategic and LA sites • M1 may be a barrier to connection
Shepshed STW Located in the south-eastern boundary of the Northern Gateway	4.27	Yes	• M1 may be a barrier to connection • STW could potentially receive a significant amount of additional growth from other strategic and non-strategic sites • The scale of development is significant in comparison to the size of the STW
Snarrows STW Located to the south of the Northern Gateway	9.45	Yes	• Located to the south of the Gateway pumping may be required due to topo • STW could potentially receive a significant amount of additional growth from other strategic and non-strategic sites • The scale of development is significant in comparison to the size of the STW

5.3.4.4 Lutterworth Growth Area

In the Lutterworth Growth Centre, the Strategic Growth Plan proposes that around 3,000 residential dwellings could be accommodated around the market town. Table 5-7 details the two STWs that could be affected by the proposed strategic levels of growth.

Table 5-7: Lutterworth Growth Area: STWs that could be Affected by Growth

STWs that could be affected by Strategic Development in the Growth Area	Maximum Permitted DWF (Ml/d)	Also receive growth from LA Sites?	Main Constraints Impacting Connection to Wastewater Network
Kimcote STW Located to the north east of the Lutterworth Growth Area	0.023	No	• The scale of development is significant in comparison to the size of the STW • Located to the north east, may require pumping due to topography and distance
Lutterworth STW Located in the west of the Lutterworth Growth Area	2.97	Yes	• STW could potentially receive a significant amount of additional growth from other strategic and non-strategic sites • The scale of development is significant in comparison to the size of the STW • M1 may be a barrier to connection

5.3.4.5 Melton Growth Area

In the Melton Growth Centre, the Strategic Growth Plan proposes that around 2,000 residential dwellings could be accommodated around the town. Table 5-8 details the two Sewage Treatment Works that could be affected by the proposed strategic levels of growth.

Table 5-8: Melton Growth Area: STWs that could be Affected by Growth

STWs that could be affected by Strategic Development in the Growth Area	Maximum Permitted DWF (Ml/d)	Also receive growth from LA Sites?	Main Constraints Impacting Connection to Wastewater Network
Melton STW This STW manages most of Melton Mowbray	9.27	Yes	• STW could potentially receive a significant amount of additional growth from other strategic and non-strategic sites • The scale of development is significant in comparison to the size of the STW
Burton Lazars STW This STW is located on the periphery of the Melton Growth Area	0.118	No	• The scale of development is significant in comparison to the size of the STW

5.3.4.6 Six Hills Garden Village

There are proposals for a new settlement to the west of Melton Mowbray. It is proposed to develop a 'Garden Village' on the triangular package of land to the east of the A46 and north of Six Hills Lane, containing Six Hills Golf Course. It is proposed that the development will include around 3,000 residential dwellings, associated business development and local facilities to support the new development which is a significant distance away from the surrounding major settlements and amenities.

There are no STWs located within the vicinity of the proposed development site of a scale that could manage additional wastewater flows for 3,000 residential dwellings and associated economic development sites. It is likely that the development of this site would require the construction of new wastewater infrastructure to manage wastewater from the Garden Village, or the pumping of wastewater to Nether Broughton, Ragdale or Asfordby STWs nearby.

5.3.5 Conclusions

This high-level wastewater infrastructure assessment has identified 23 STWs that could potentially be affected by any future development proposed within the SGP Growth Areas:

- Wanlip
- Snarrows
- Lutterworth
- Hinckley
- Shepshed
- Kegworth
- Whetstone
- Melton
- Early Shilton
- Broughton Astley
- Stoney Stanton
- Countesthorpe
- Oadby
- Great Glen
- Houghton on the Hill
- Keyham
- Arnesby
- Breedon
- Burton Lazars
- Kimcote
- Little Stretton
- Long Whatton
- Wigston Parva

This assessment has identified high-level concerns that are common across the SGP Growth Areas:

- Of the 23 STWs that could receive additional flows, 15 STWs could also receive additional flows from the 2011-31 sites (Section 5.2). The combination of Strategic and Non-Strategic development could significantly increase additional flows, putting greater demand on the STWs and network.
- Due to the scale of growth proposed, additional wastewater flows could be considerable compared to the capacity of some STWs. As specific SGP growth locations are unknown, it is challenging to accurately identify which STWs could be affected.
- In several cases, despite the network being within the Growth Areas, the STWs are located at a considerable distance. Significant wastewater network upgrades and/or pumping could therefore be required to connect future sites to the existing network.
- In some cases, there may be significant constraints to connecting the sites to the local wastewater networks, such as large settlements and major roads, where the associated costs of network upgrades and disruption may be considerable.

This assessment demonstrates the significant impact that strategic level growth in Leicestershire could have on existing wastewater infrastructure. It is likely that, due to the scale of the SGP Growth Areas, the construction of new STWs and wastewater networks may be required for some or all of the Growth Areas. In the future, as specific sites are planned and constructed, wastewater infrastructure should be analysed and modelled in detail to identify the most suitable option for wastewater management. The timescales considered for development of the SGP opportunities are such that, with sufficient engagement between planners, wastewater service providers and developers, treatment capacity can be planned and provided in advance of developments coming on- stream.

Due to the strategic nature of this assessment and that the precise locations of growth within the SGP Growth Areas is currently unknown, we are unable to identify the exact risks associated with this scale of growth in each area. Further investigation on the impacts of growth on the existing wastewater infrastructure may be required as the precise locations of growth become clearer.

5.3.6 Recommendations

The recommendations from the wastewater infrastructure assessment are shown in Table 5-9.

Table 5-9: Wastewater Treatment Assessment: 2031-2050 Strategic Growth

Action	Responsibility	Timescale
Provide updates to STWL and AW on strategic level development within the SGP growth so that detailed assessments of STW and network capacities can be calculated to inform future upgrades.	LAs within Leicestershire	Annually
STWL and AW to assess growth demands as part of their wastewater planning activities and feedback to relevant parties if concerns arise.	STWL and AW	Ongoing
Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity in Leicestershire.	STWL and AW	Ongoing
STWL, AW, EA and LAs within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LAs within Leicestershire	Ongoing

5.4 Wastewater Assessment - Wastewater Treatment Assessment: 2031 - 2050 Non-Strategic Growth

5.4.1 Introduction

From 2031 to 2050, the SGP Growth Areas are proposed to deliver around 60% of the overall need in Leicestershire. It is therefore proposed that the remaining 40%, equating to around 34,000 dwellings across Leicester and Leicestershire, will be provided on a range of smaller sites distributed across the LPAs.

5.4.2 Methodology

The 34,000 dwellings proposed to be delivered as via the 2031 to 2050 Non-Strategic local authority development have been proportioned and allocated to the Leicester City Council and the seven non-unitary authorities in Leicestershire. Due to the uncertainty around the specific future geographical locations of the proposed non-strategic sites it is not possible to allocate the growth to specific STW, therefore the broad distribution of dwelling numbers within each local authority area is assumed to reflect the pattern of 2011-2031 growth across the study area.

The occupancy rate, water demand and the percentage of water that reaches the STW has been utilised to calculate the estimated increases in Dry Weather Flow that would be received by the identified STWs as a result of the non-strategic development sites. It is recommended that, once site locations and capacities have been identified across Leicestershire, this high-level assessment is revisited to ensure that 2031-2050 non-strategic growth in Leicestershire has been analysed accurately alongside the SGP Growth Areas.

5.4.3 Data Collection

- 2031-2050 Non-Strategic local authority housing numbers assigned to each local authority.
- STWL and AW STWs locations and drainage areas boundaries/networks of STWs that are most likely to be affected by non-strategic growth across Leicestershire post 2031.
- The occupancy rate, water demand and the percentage of water that reaches the STW has been utilised to calculate the increases in Dry Weather Flow from the development sites.

5.4.4 Results

This assessment has identified the STWL and AW Sewage Treatment Works across Leicestershire that could be affected by additional wastewater flows produced from non-strategic growth across the eight local authorities from 2031 to 2050. It is proposed that around 34,000 dwellings will be constructed on such sites across Leicestershire during that period.

Within this high-level assessment, where the precise distribution of proposed growth across Leicestershire is currently unknown, 41 STWs have been identified as potentially receiving additional wastewater flows in the future. Table 5-10 provides details of the STWs that could receive additional wastewater from non-strategic growth from 2031 to 2050.

Of the 41 STWs affected, Packington, Earl Shilton, Measham, Fleckney, Somerby, Snarrows, Market Harborough, Oadby, Shepshed and Castle Donington STWs could receive additional flows equating to greater than 5% of their maximum Dry Weather Flow Permit. Apart from Kibworth and Market Harborough STWs, which are Anglian Water assets, the majority of STWs affected are Severn Trent Water Assets.

Table 5-10: STWs Affected by Non- Strategic Growth within Leicestershire Between 2031 - 2050

STW Affected by Growth	Local Authority	SU	Maximum Permitted DWF (Ml/d)	2031 - 2050 Housing Allocation	Sum of Additional Water Demand (Ml/d)	Additional Wastewater Demand as a % of the Permit
Asfordby STW	Melton	STWL	1.59	117	0.036	2%
Ashby Folville STW	Melton	STWL	0.28	14	0.004	1%
Barlestone STW	Hinckley and Bosworth	STWL	0.64	19	0.006	1%
Barrow & Quorn STW	Charnwood	STWL	3.36	350	0.106	3%
Bottesford STW	Melton	STWL	1.06	110	0.034	3%
Broughton Astley STW	Harborough	STWL	2.39	292	0.089	4%
Burton on the Wolds STW	Charnwood	STWL	0.7	50	0.015	2%
Castle Donington STW	North West Leicestershire	STWL	3.04	457	0.139	5%
Claybrooke Magna STW	Harborough	STWL	0.37	31	0.010	3%
Countesthorpe STW	Blaby	STWL	1.5	221	0.067	4%
Croxton Kerrial STW	Melton	STWL	0.19	19	0.006	3%
Donisthorpe STW	North West Leicestershire	STWL	0.73	30	0.009	1%
Earl Shilton STW	Hinckley and Bosworth	STWL	5.64	1561	0.474	8%
Fleckney STW	Harborough	STWL	0.92	230	0.070	8%
Great Glen STW	Harborough	STWL	1.16	141	0.043	4%
Harby STW	Melton	STWL	1.2	127	0.039	3%
Hinckley STW	Hinckley and Bosworth	STWL	16.39	860	0.261	2%
Houghton on the Hill STW	Harborough	STWL	0.36	37	0.011	3%
Ibstock STW	North West Leicestershire	STWL	1.93	131	0.040	2%
Kegworth STW	North West Leicestershire	STWL	1.59	135	0.041	3%
Kibworth STW	Harborough	AW	1.7	191	0.058	3%

STW Affected by Growth	Local Authority	SU	Maximum Permitted DWF (Ml/d)	2031 - 2050 Housing Allocation	Sum of Additional Water Demand (Ml/d)	Additional Wastewater Demand as a % of the Permit
Loughborough STW	Charnwood	STWL	21.5	2675	0.812	4%
Lutterworth STW	Harborough	STWL	2.97	349	0.106	4%
Market Bosworth STW	Hinckley and Bosworth	STWL	0.64	48	0.014	2%
Market Harborough STW	Harborough	AW	6.03	1281	0.389	6%
Measham STW	North West Leicestershire	STWL	1.39	383	0.116	8%
Melton STW	Melton	STWL	9.27	1125	0.342	4%
Milton STW	Derbyshire	STWL	3.22	72	0.022	1%
Nether Broughton STW	Melton	STWL	0.45	18	0.006	1%
Newbold Verdon STW	Hinckley and Bosworth	STWL	0.73	28	0.009	1%
Oadby STW	Oadby and Wigston	STWL	4.98	957	0.291	6%
Packington STW	North West Leicestershire	STWL	4.58	1283	0.390	9%
Ravenstone STW	North West Leicestershire	STWL	0.42	19	0.006	1%
Shepshed STW	Charnwood	STWL	4.27	779	0.236	6%
Snarrows STW	North West Leicestershire	STWL	9.45	2011	0.611	6%
Somerby STW	Melton	STWL	0.12	26	0.008	7%
Stoney Stanton STW	Blaby	STWL	3.07	219	0.066	2%
Waltham STW	Melton	STWL	0.93	32	0.010	1%
Wanlip STW	Charnwood	STWL	135	17556	5.330	4%
Whetstone STW	Blaby	STWL	6.17	167	0.051	1%
Wymondham STW	Melton	STWL	0.16	16	0.005	3%
TOTAL				**34,171**	**10.37**	

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5.4.5 Conclusions

This high-level wastewater treatment assessment has identified the STWL and AW Sewage Treatment Works across the study area that could be affected by non-strategic growth across the eight local authorities from 2031 to 2050.

- Due to the uncertainty surrounding the future geographical locations of the non-strategic sites, the notional 34,000 dwellings have been proportioned and assigned to the STWs that are most likely to be affected by non-strategic development.
- Within this assessment, 41 STWs have been identified as potentially receiving additional wastewater flows from non-strategic growth from 2031 to 2050.
- Of the 41 STWs affected, Packington, Earl Shilton, Measham, Fleckney, Somerby, Snarrows, Market Harborough, Oadby, Shepshed and Castle Donington STWs could receive additional flows equating to greater than 5% of their maximum Dry Weather Flow Permit.
- Apart from Kibworth and Market Harborough STWs, which are Anglian Water assets, the majority of STWs affected are Severn Trent Water Assets.
- It is recommended that this assessment should be updated when sites and notional capacities are identified across Leicestershire so that increases in wastewater demand to be correctly assigned to each STW.
- The increase in wastewater flows as a result of the non-strategic growth across Leicestershire will occur over the same time period as the increase in wastewater flows as a result of the Strategic Growth Plan Growth Areas. Increases in wastewater demand from both sources of growth across Leicestershire should therefore be assessed together when considering increases in demand on wastewater infrastructure.

5.4.6 Recommendations

The recommendations from the wastewater infrastructure assessment for the non-strategic growth levels from 2031 to 2050 are shown in Table 5-11.

Table 5-11: Wastewater Treatement Assessment: 2031-50 Non-Strategic Growth Recommendations

Action	Responsibility	Timescale
Provide updates to STWL and AW on the locations of non-strategic development across Leicestershire so that detailed assessments of infrastructure and network capacities can be completed to inform future upgrades.	LA's within Leicestershire	Ongoing
STWL and AW to assess the 2031-2050 growth demands as part of their wastewater planning activities and feedback to relevant parties if concerns arise.	STWL and AW	Ongoing
Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity in Leicestershire.	STWL and AW	Ongoing
STWL, AW, EA and LA's within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LA's within Leicestershire	Ongoing

5.5 Wastewater Assessment - Cumulative Wastewater Treatment Assessment

5.5.1 Introduction

The wastewater assessments completed in Sections 5.2, 5.3 and 5.4 assess the impacts of growth from three separate strategic and non-strategic sources. These assessments analyse the different areas of growth individually but don't give an assessment of the cumulative impacts of all growth for the period 2011-2050. This summary assessment aims to identify the STWs across the study area that will be impacted the most from all potential sources of future growth.

5.5.2 Methodology

The results of the three separate wastewater assessments have been combined and analysed to identify the STWs that could be affected by multiple sources of growth from 2011-50 and therefore may need to be prioritised in terms of detailed infrastructure analysis and future upgrades.

5.5.3 Results

Table 5-13 analyses the STWs, with those that are considered to be most impacted by growth at the top of the table, to those that would be impacted in a small way at the bottom. The following findings have been identified:

- Stoney Stanton and Hinckley STWs are expected to be significantly impacted by the high levels of growth between 2011-31 and Non-Strategic Growth between 2031-50, producing large quantities of additional wastewater within their drainage catchments. These STWs could also be impacted by Strategic Growth within both the Southern Gateway and A46 Growth Corridor. Multiple growth sources mean that these STWs should be prioritised for detailed capacity analysis.
- There are 11 STWs that are proposed to receive significant flows from growth between 2011-31 and Non-Strategic Growth between 2031-50, equating to greater than 10% of the STWs maximum permitted DWF and potentially large flows from the proposed SGP Growth Areas.
- Houghton on the Hill and Whetstone STWs, despite receiving smaller flows from Non-Strategic development, could potentially receive large wastewater flows from Strategic development due to their locations within the A46 Growth Corridor.
- There are 13 STWs, including Barrow and Quorn, Market Bosworth and Claybrooke Magna that are unlikely to receive any additional flows from Strategic Growth but could receive some wastewater flows from growth between 2011-31 and Non-Strategic Growth between 2031-50 equating to between 9.8% and 2.5% of the STWs Maximum Permitted DWF. These increases are less significant than those identified above but could still put some strain on the STWs.
- Keyham, Little Stretton, Wigston Parva, Breedon, Long Whatton, Kimcote and Burton Lazars are all smaller STWs compared to most analysed. They are not expected to receive any Non-Strategic Growth but are located within a range of SGP Growth Areas. Due to the sizes of these STWs, it is unlikely that they would be suitable to manage significant wastewater flows from the scale of strategic development proposed in these areas.

5.5.4 Conclusions and Recommendations

This assessment has identified the STWs most likely to be significantly impacted by cumulative growth across Leicestershire. There are still some uncertainties present within this assessment due to the lack of information on the precise locations of growth between 2031 and 2050. It is recommended that once detailed information on growth is known, a detailed cumulative assessment is completed to fully understand how each STW across Leicestershire could be affected to 2050.

Table 5-12: Cumulative Wastewater Treatment Assessment 2011 - 2050 Recommendations

Action	Responsibility	Timescale
Provide updates to STWL and AW on the locations of strategic and non-strategic development so that detailed assessments of infrastructure and network capacities can be completed to inform future upgrades.	LA's within Leicestershire	Ongoing
STWL and AW to assess the 2011-2050 growth demands as part of their wastewater planning activities and feedback if concerns arise.	STWL and AW	Ongoing

Action	Responsibility	Timescale
Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity in Leicestershire.	STWL and AW	Ongoing
STWL, AW, EA and LA's within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LA's within Leicestershire	Ongoing

Table 5-13: Wastewater Infrastructure Cumulative Assessment: 2011-50 Strategic and Non-Strategic Growth

STW Affected	Maximum Permitted DWF (Ml/d)	Sum Wastewater Demand 2011-31 (Ml/d) (1)	Sum Wastewater Demand 2031-50 (Ml/d) (2)	Non-Strategic Growth Sum 2011-50 (Ml/d)	AddWastewater Demand as a % of the Permit (3)	Affected by 2031 - 2050 Strategic Growth?	Comments on Cumulative Growth Impacts
Stoney Stanton	3.07	0.27	0.07	0.33	10.9%	A46 Growth Corridor and Southern Gateway	Could be significantly affected due to high levels of potential Non-Strategic Growth and wastewater flows from two SGP Growth Areas
Hinckley	16.39	0.99	0.26	1.25	7.6%	A46 Growth Corridor and Southern Gateway	
Earl Shilton	5.64	1.57	0.47	2.05	36.3%	Southern Gateway	These STWs are likely to receive Non-Strategic growth equating to greater than 10% of their Maximum DWF Permit and possible additional wastewater flows from the SGP Growth Areas
Snarrows	9.45	1.84	0.61	2.45	25.9%	Northern Gateway	
Countesthorpe	1.5	0.27	0.07	0.34	22.4%	A46 Growth Corridor	
Shepshed	4.27	0.60	0.24	0.84	19.6%	Northern Gateway	
Melton	9.27	1.41	0.34	1.75	18.9%	Melton Growth Area	
Lutterworth	2.97	0.40	0.11	0.50	17.0%	Lutterworth Growth Area	
Kegworth	1.59	0.18	0.04	0.22	13.8%	Northern Gateway	
Wanlip	135	10.26	5.33	15.59	11.6%	A46 Growth Corridor	
Broughton Astley	2.39	0.17	0.09	0.26	11.0%	A46 Growth Corridor	
Great Glen	1.16	0.08	0.04	0.12	10.8%	A46 Growth Corridor	
Oadby	4.98	0.21	0.29	0.50	10.0%	A46 Growth Corridor	
Burton on the Wolds	0.12	0.03	0.02	0.05	39.1%	No	These STWs could receive significant Non-Strategic growth equating to greater than 10% of their Maximum DWF Permit
Castle Donington	3.04	0.95	0.14	1.09	35.8%	No	
Packington	4.58	1.20	0.39	1.59	34.7%	No	
Measham	1.39	0.31	0.12	0.42	30.4%	No	
Fleckney	0.92	0.14	0.07	0.21	22.7%	No	
Market Harborough	6.03	0.76	0.39	1.15	19.1%	No	
Bottesford	1.06	0.14	0.03	0.17	16.4%	No	
Harby	1.2	0.16	0.04	0.20	16.3%	No	
Wymondham	0.16	0.02	0.01	0.03	15.6%	No	
Croxton Kerrial	0.19	0.02	0.01	0.03	15.3%	No	
Loughborough	21.5	2.17	0.81	2.99	13.9%	No	
Asfordby	1.59	0.17	0.04	0.21	13.2%	No	
Kibworth	1.7	0.12	0.06	0.18	10.4%	No	

STW Affected	Maximum Permitted DWF (Ml/d)	Sum Wastewater Demand 2011-31 (Ml/d) (1)	Sum Wastewater Demand 2031-50 (Ml/d) (2)	Non-Strategic Growth Sum 2011-50 (Ml/d)	AddWastewater Demand as a % of the Permit (3)	Affected by 2031 - 2050 Strategic Growth?	Comments on Cumulative Growth Impacts
Houghton on the Hill	0.36	0.02	0.01	0.03	9.0%	A46 Growth Corridor	Likely to receive additional wastewater flows from both the Non-Strategic Growth and the SGP Growth Areas
Whetstone	6.17	0.23	0.05	0.28	4.6%	A46 Growth Corridor	
Barrow and Quorn	3.36	0.22	0.11	0.33	9.8%	No	These STWs could be affected by some additional flow from Non-Strategic development from 2011-2050
Market Bosworth	0.64	0.05	0.01	0.06	9.6%	No	
Claybrooke Magna	0.37	0.02	0.01	0.03	7.6%	No	
Ibstock	1.93	0.10	0.04	0.14	7.5%	No	
Ashby Folville	0.28	0.02	0.00	0.02	7.4%	No	
Nether Broughton	0.45	0.02	0.01	0.03	6.3%	No	
Somerby	0.7	0.03	0.01	0.04	5.7%	No	
Waltham	0.93	0.04	0.01	0.05	5.4%	No	
Newbold Verdon	0.73	0.03	0.01	0.04	5.1%	No	
Ravenstone	0.42	0.02	0.01	0.02	5.0%	No	
Donisthorpe	0.73	0.02	0.01	0.03	4.6%	No	
Barlestone	0.64	0.02	0.01	0.03	3.9%	No	
Milton	3.22	0.06	0.02	0.08	2.5%	No	
Billesdon	0.18	0.00	0.00	0.00	1.3%	No	Could be affected by a very small amount of Non-Strategic Growth between 2011 - 2050.
Nuneaton Hartshill	22.6	0.07	0.00	0.07	0.3%	No	
Stanton	8.94	0.00	0.00	0.00	0.0%	No	
Keyham	0.031	0.00	0.00	0.00	0.0%	A46 Growth Corridor	These are very small STWs that are in close proximity to the SGP Growth Areas. It is likely that these STWs will be unsuitable for the management of large additional wastewater flows that could occur as a result of Strategic development in the area.
Little Stretton	0.017	0.00	0.00	0.00	0.0%	A46 Growth Corridor	
Wigston Parva	0.014	0.00	0.00	0.00	0.0%	Southern Gateway	
Breedon	0.21	0.00	0.00	0.00	0.0%	Northern Gateway	
Long Whatton	1	0.00	0.00	0.00	0.0%	Northern Gateway	
Kimcote	0.023	0.00	0.00	0.00	0.0%	Lutterworth Growth Area	
Burton Lazars	0.118	0.00	0.00	0.00	0.0%	Melton Growth Area	

(1): Wastewater flows highlighted in yellow identifiy STWs where Section 5.2 identified that the Non-Strategic wastewater demand could be greater than 10% of the max DWF Permit for that STW
(2): Wastewater flows highlighted in yellow identifiy STWs where Section 5.4 identified that the Non-Strategic wastewater demand could be greater than 5% of the max DWF Permit for that STW
(3): Wastewater flows highlighted in grey identify STWs where the cumulative non-strategic wastewater demand could be greater than 10% of the max DWF Permit for that STW

5.6 Wastewater Assessment - Wastewater Network Capacity Assessment:

5.6.1 Introduction

New residential developments can add pressure to the existing wastewater network. An assessment is required to identify the available capacity within the existing systems, and the potential to upgrade overloaded systems to accommodate future growth. The scale and cost of upgrading wastewater infrastructure may vary significantly depending upon the location and size of the development in relation to the network itself and the receiving Sewage Treatment Work.

It may be the case that an existing sewerage system is already working at its full capacity and further investigations may have to be carried out to define a solution necessary to increase capacity and accommodate the proposed growth in this area of the network. New infrastructure may be required if, for example, a site is not served by an existing system or if the levels of proposed development are significant.

Sewerage Undertakers must consider the growth in demand for wastewater services when preparing their five-yearly Strategic Business Plans (SBPs) which set out investment for the next Asset Management Plan (AMP) period. Typically, investment is committed to provide new or upgraded sewerage capacity to support allocated growth with a high certainty of being delivered. Additional sewerage capacity to service windfall sites, smaller infill development or to connect a site to the sewerage network across third party land are normally funded via developer contributions.

5.6.2 Methodology

Severn Trent Water (STWL) and Anglian Water (AW) were asked to comment on potential future residential and economic development as part of the Leicester and Leicestershire Strategic Growth Plan.

5.6.3 Data Collection

The datasets used to assess the sewerage system capacity include:

- Site locations in GIS format (Provided by local authorities within Leicestershire);
- A technical note outlining the growth scenarios and housing numbers for each site;
- The site tracker spreadsheet containing all information on each site proposed.

5.6.4 Results

The following comment was received from Severn Trent Water in the early stages of this project:

"Through our involvement in other WCS's we have sometimes encountered difficulties where the appointed consultant has used Severn Trent dataset to inform their analysis, but had been inappropriately interpreted to determine whether Severn Trent assets have sufficient capacity to accommodate proposed growth in the future. This often then results in concerns, particularly from the Environment Agency, where the findings of a Water Cycle Study conclude there are potential capacity constraints but overlooks that under Section 94 of the Water Industry Act 1991 a sewerage undertaker has a general duty to provide effectual drainage which includes providing additional capacity as and when required to accommodate planned development. There are similar requirements for water supply under Section 66 of the WIA and that future demand planning is an integral part of the Water Resources Management Plan.

Water and sewerage undertakers have an obligation to accommodate new development through the provision of additional waste water capacity (both sewerage and treatment) and to ensure adequate clean water supply (covering resources, treatment and distribution). For waste water there is a requirement to ensure additional development flows do not unduly increase flood risk from the sewerage system and that there is no adverse effect on the environment by ensuring we provide appropriate levels of treatment at each of our sewage treatment works.

What can also be overlooked is the fact that, alongside the requirement to provide additional capacity to accommodate new development, there is also a requirement to manage our assets efficiently to minimise our customers' bills. Consequently, many of our assets will not have significant amounts of spare headroom and it is financially and operationally inefficient to do so.

Our experiences with Water Cycle Studies is that they can often conclude that today's current spare capacity (in particular sewage treatment) is insufficient to meet long term Local Plan development plans but fails to recognise that providing spare capacity for development which may/may not take place in 15-20 years' time is not always the best use of our resources and can result in abortive investment. It also overlooks that we have a general duty to ensure sufficient capacity, as and when it is provided, whereby in most instances additional sewage treatment capacity can be provided within 2-3 years, with infrastructure upgrades to the sewerage/water distribution systems within 18 months to 2 years. Consequently, providing additional capacity is often not a constraint to development and as larger development sites can take several years before they are fully occupied this usually gives sufficient time for capacity improvement to be completed before additional flow/demand materialises."

The following comment was received from Anglian Water:

" Developers have a legal right to connect to public sewers for sites as set out in the Water Industry Act 1991. We are also obliged to provide sewage treatment for sites which the benefit of planning permission and are responsible for any investment through our business planning process. However, we are able to seek contributions to improvements to the foul sewerage network relating to new development (where required) in accordance with the provisions of the Water Industry Act 1991."

5.6.5 Conclusions

Although detailed assessments of wastewater network capacity have not been completed by the Leicestershire sewerage undertakers Severn Trent Water and Anglian Water due to the strategic nature of this Water Cycle Study, sewerage undertakers have an obligation to accommodate new development through the provision of additional waste water capacity covering resources, treatment and distribution. There would be a requirement for both Severn Trent Water and Anglian Water to ensure that new developments have the wastewater infrastructure required to supply the development.

5.6.6 Recommendations

The recommendations from the wastewater infrastructure assessments are shown in Table 5-14.

Table 5-14: Wastewater Collection and Treatment Recommendations

Action	Responsibility	Timescale
Consider wastewater infrastructure constraints when allocating and phasing development across Leicestershire in partnership with Severn Trent Water and Anglian Water.	Leicestershire County Council, LAs, Developers, STWL and AW	Ongoing
Provide updates to STWL and AW on projected development within Leicestershire	LAs within Leicestershire	Annually
STWL and AW to assess growth demands as part of their wastewater asset planning activities and feedback to the commissioning group where concerns arise.	STWL and AW	Ongoing
Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity in Leicestershire.	STWL and AW	Ongoing
STWL, AW, EA and local authorities within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LAs within Leicestershire	Ongoing
STW, AW and developers will be expected to work closely and early in the planning process to develop an outline drainage strategy for sites. The outline drainage strategy should set out sufficient detail to determine the likely timescales for the delivery of the infrastructure and the likely costs. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	STWL, AW and Developers	Ongoing
Developers will be expected to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to sewer seen as the last option.	Developers LLFA	Ongoing

6 Wastewater Treatment Flow and Water Quality

6.1 Introduction

Within Leicester and Leicestershire, Severn Trent Water (STWL) and Anglian Water (AW) are the Sewerage Undertakers (SU). STWL manages wastewater from the majority of the county with AW managing the eastern portion of the Harborough district and small areas of the eastern border of the Melton borough. Chapter 5 has identified 45 STWs that are likely be affected by the proposed growth across the seven LPAs within Leicestershire and the City of Leicester. The SGP Growth Areas have also been analysed based on their locations in relation to the existing wastewater infrastructure. It is likely that, due to the scale of the proposed strategic developments, new wastewater treatment facilities may have to be developed in order to manage wastewater from these strategic sites.

6.2 Assessing Wastewater Flow and Water Quality

In order to complete a high-level assessment of the impact of the proposed growth on wastewater flows and water quality, two assessments have been completed:

1. Wastewater Treatment Flow Headroom Assessment
2. Scoping Water Quality Assessment (WQA)

These scoping assessments aim to answer the following questions, and, where necessary, to recommend further actions to fully assess the impact of growth on wastewater flows and water quality within Leicestershire. The questions are based on Environment Agency Water Cycle Study Guidance for the completion of Scoping Studies:

1. Will the proposed housing and economic growth have a detrimental impact on water quality?
2. Is there sufficient environmental capacity within the receiving water environment to accommodate the resulting increase in flow and pollutant loads from the sewage treatment works because of the planned growth?
3. If not, are there alternative discharge locations that will not cause a failure of water quality targets or cause a deterioration in water quality?
4. Is there an increased risk of discharge from storm water overflows causing an adverse water quality impact?
5. Will the sewerage undertaker need to apply to increase the levels of treated sewage effluent that can be discharged under the existing environmental permits, to allow for future growth?
6. Will the quality standard on the environmental permit need to be tightened to meet existing or future water quality standards because of the proposed growth (e.g. Water Framework Directive (WFD))?
7. Can the existing sewerage and wastewater treatment networks cope with the increased wastewater the proposed growth will generate?
8. If new major infrastructure is required (sewage treatment works, major pumping mains or sewer mains) can they be provided and funded in time?

It is recommended that the individual Sewage Treatment Works (STWs) are assessed in greater detail as development is delivered and the level of certainty around the Growth Areas increases. However, it is also recommended that the cumulative impact of growth across Leicester and Leicestershire is assessed from a water quality perspective in order to identify catchment scale limitations to development that may be present. The assessments contained within this section aim to identify high level issues that may require further investigation to aid with the planning and phasing of development.

6.3 Data Requirements

The data required to assess the impacts of growth on the Dry Weather Flows (DWF) discharged from the identified STWs and the impacts on water quality is shown in in Table 6-1. Environment Agency river and sewage treatment works flow and quality data was requested for use within the following flow and water quality assessments.

Table 6-1: Data Required for the Assessment of Water Quality

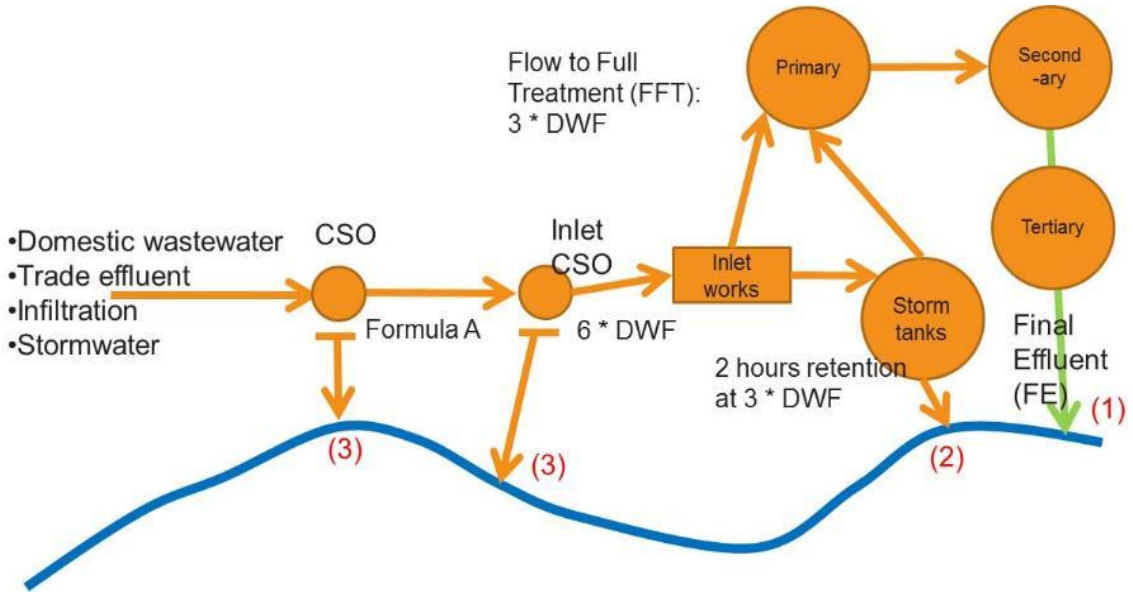
Data Required	Data Source	Received?
Sewage Treatment Works		
STW Locations	Severn Trent Water and Anglian Water	Yes
Discharge Locations	Severn Trent Water and Anglian Water	Yes
Upstream River Data		
Mean flow	Environment Agency	No
95th exceedance flow	Environment Agency	No
Contaminant means	Environment Agency	No
Contaminant standard deviations	Environment Agency	No
STW Discharge Data		
Effluent flow statistics	Environment Agency	No
Contaminant statistics	Environment Agency	No
River Quality Target Data		
No deterioration targets	Environment Agency	No
Good status Target	Environment Agency	No
Flow Data		
Dry Weather Flows (DWF)	Environment Agency	Yes
Permits	Environment Agency	Yes

6.4 Wastewater Treatment Flow Permit Assessment

6.4.1 Introduction

The Environment Agency is responsible for regulating sewage discharges released via a system of Environmental Permits (EPs). Monitoring for compliance within these permits is the responsibility of both the EA and the Sewerage Undertakers (SU). Figure 6-1 summarises the different types of wastewater releases that can take place at a Sewage Treatment Works (STW), although precise details vary from works to works depending on the type and design of the STW.

Figure 6-1: Overview of a Typical Combined Sewerage Systems and STW Discharges



During dry weather, the final effluent from the Sewage Treatment Works should be the only discharge (1). With rainfall, the storm tanks fill and may eventually start discharging to the watercourse (2) in addition any Combined Sewer Overflows (CSOs) upstream of the storm tanks may start to operate (3). The discharge of storm sewage from treatment works is allowed only under conditions of heavy rain or snow melt, and therefore the flow capacity of treatment systems is required to be sufficient to treat all flows arising in dry weather and the increased flow from smaller rainfall events. After rainfall, storm tanks should be emptied back to full treatment, freeing their capacity for the next rainfall event.

Environmental Permits (EPs) are used as a means of controlling the pollutant load discharged from a STW into a receiving watercourse. Sewage flow rates must be monitored for all WwTWs where the permitted discharge rate is greater than 50 m^3/day in dry weather.

Permitted discharges are based on the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for sewage treatment centre design, as a means of estimating the 'base flow' in sewerage modelling and for determining the flow at which discharges to storm tanks will be permitted by the permit (Flow to Full Treatment, FFT).

STW EPs also consent for maximum concentrations of pollutants, in most cases Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia (NH_4). These are determined by the Environment Agency with the objective of ensuring that the receiving watercourse is not prevented from meeting its environmental objectives, with specific regard to the Chemical Status element of the Water Framework Directive (WFD) classification.

Increased domestic population and/or employment activity can lead to increased wastewater flows arriving at a STW. Where there is insufficient headroom at the works to treat these flows, this could lead to failures in flow consents.

6.4.2 Methodology

In order to complete an assessment of the capacity of the STWs that could be affected by future growth post 2031, the additional wastewater flows generated by the proposed 2011-31 sites has been calculated. This allows an assessment of the potential available capacity at each STW to manage the additional flows. The additional flows have been calculated by:

- Assigning sites to a Sewage Treatment Works using the STW drainage areas boundaries;
- Calculating the population equivalent assuming an occupancy rate of 2.35 and 2.30 p/h for STWL and AW respectively;
- Calculate the additional wastewater effluent demand assuming a per-capita consumption of 136 l/p/d and that 95% of the water resources used is returned to the sewer.

The EA have provided daily flow data for the STWs and this has been used to calculate the current DWF for each works. By combining the calculated increases in DWF as a result of the proposed development with the current DWF rates, the future DWF at each STW can be calculated.

To assess the impact of the proposed development on the capacity of the various STWs the current and future DWF has been compared with the existing Environmental Permit. This assessment indicates the existing capacity and the ability of the works to manage the increased flows. The assessment also identifies where a works is already working close to, or at its permitted daily flow.

6.4.3 Results

Permit conditions for the STWs that could be affected by growth have been obtained from the EA, current DWF rates have been calculated from daily flow datasets and potential increases in DWF as a result of the proposed future growth have been calculated. Current DWF rates and potential future increases in DWF have been compared for each STW in order to gain a better understanding of the available capacity for the local authority sites and how this may affect the SGP Growth Areas.

The results of the flow permit assessment can be found in Table 6-2. This assessment only includes growth from the development proposed up to 2031 as, although growth levels of the SGP Growth Areas are available, the locations of this growth in relation to the existing wastewater infrastructure is not yet known. This assessment identifies the current pressures on the existing wastewater infrastructure and the pressures from the proposed local authority growth, so that this information in known during more detailed strategic planning for the Growth Areas.

The following 5 STWs have not been assessed at this time due to missing daily flow data required to calculate the current DWF. This is not expected to impact the overall conclusions of the assessment as there is only a small amount of growth at these works and they are not expected to receive any flows from the SGP Growth Area. If there is a change in the proposals it is recommended that growth to these STW should be considered in the future:

- Milton
- Donisthorpe
- Barlestone
- Wymondham
- Ravenstone

The following high-level findings have been identified in this assessment:

- Based on current DWF values, calculated using daily flow data for the last 3 years, 6 STWs are predicted to already be at or above their Max Permitted DWF with no additional growth.
- By AMP 6, 2 additional STWs are predicted to discharge at rates greater than their permit.
- By AMP 7, 5 more STWs are predicted to discharge at rates greater than their permit.
- By AMP 8, 1 more STW is predicted to discharge at rates greater than their permit.
- Several other STWs across Leicestershire are predicted to be working closely to their Max DWF Permit during the study period.

Due to the uncertainty around the location of the SGP sites and the number of STW potentially affected it is not possible to provide greater detail for all sites at this point, but it is recommended that this is completed as the details become available in order to confirm increase in wastewater flows to each STW, identify areas where investment is required in greater detail and to prevent serious wastewater management issues in the future.

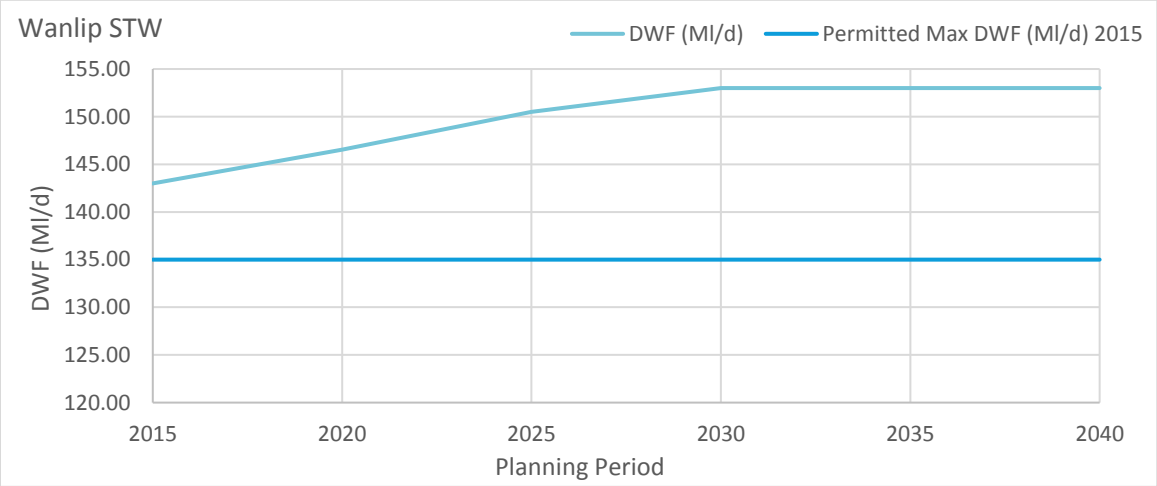
Several STWs, all of which have either met or exceeded their Maximum DWF Permits and could receive additional flows from both Non-strategic LA sites and SGP Growth Areas, are discussed in greater detail below and full flow permit assessment results for all STWs can be found in Table 6-2

6.4.3.1 Wanlip STW

Wanlip STW is the largest treatment works in the study area with a Maximum DWF Permit of 135Ml/d and an extensive drainage area, covering much of the City of Leicester and the surrounding areas including east of the Broadnook Sustainable Extension. Due to this extensive drainage area, 165 local authority sites could potentially be managed by this STW. The STW itself is not located within a SGP Growth Area, but its large drainage network reaches into the A46 Growth Corridor. Strategic growth in the A46 Corridor could therefore impact Wanlip in addition to the local authority sites within its catchment.

Analysis indicates that Wanlip is currently working above its Maximum DWF Permit and demand is set to increase as a result of future growth. It is likely that this STW will require significant investment in order to meet future wastewater treatment demand. Some growth may have to be managed by other STWs or new wastewater treatment facilities may be required due to the scale of demand.

Figure 6-2: Wanlip STW Headroom Forecast

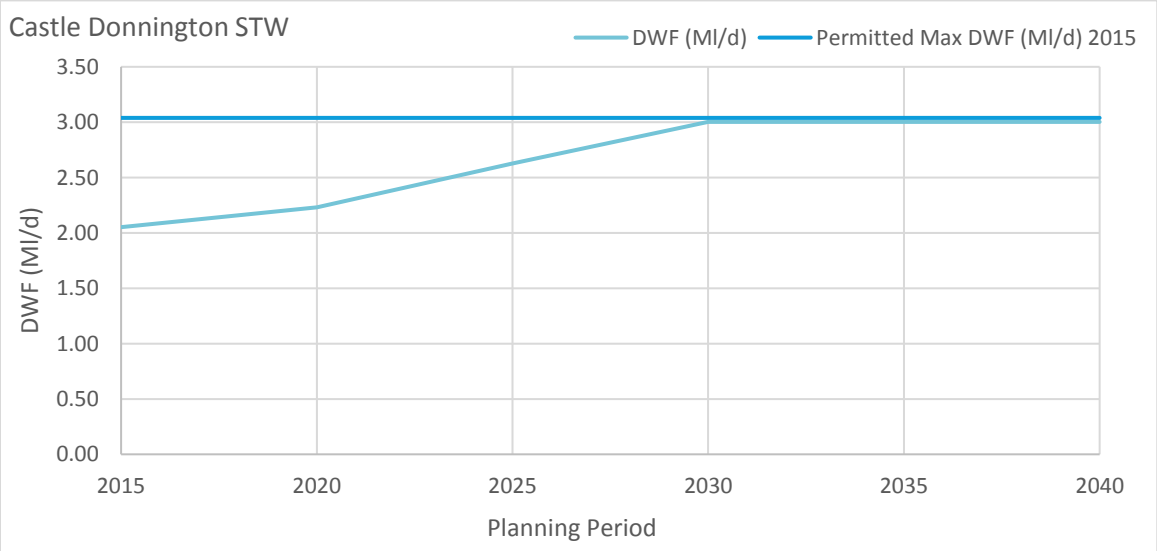


6.4.3.2 Castle Donington STW

Castle Donington is a relatively small STW located in the SGP Northern Gateway. This STW is already predicted to be functioning around 30% below its Max DWF Permit. It is predicted to receive wastewater from 8 local authority sites, including several large employment sites. It is predicted that the STW will be working right up to its DWF Permit from AMP 8 onwards.

This scale of development surrounding Castle Donington is large in comparison to the size of the treatment works itself. Significant investment in wastewater management in this area, potentially including new wastewater treatment facilities, may be required in order to manage these large increases in Dry Weather Flow.

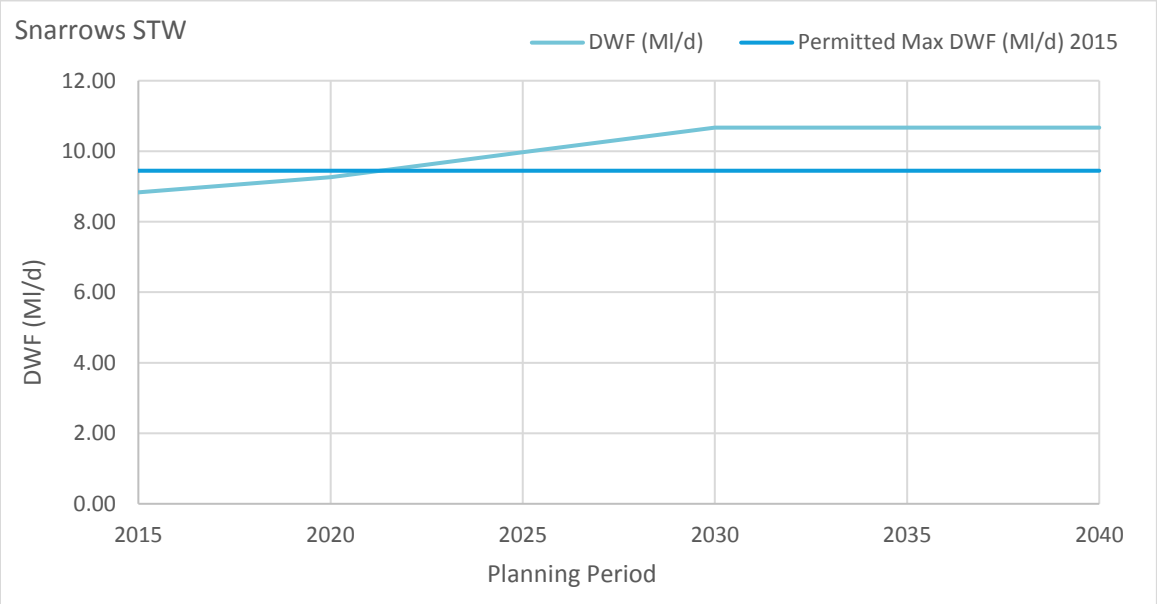
Figure 6-3: Castle Donington STW Headroom Forecast



6.4.3.3 Snarrows STW

Snarrows STW is located 20km to the north west of Leicester, it is possible that in the future it could receive wastewater from 22 proposed development sites and the Northern Gateway SGP Growth Area. Snarrows STW has a Maximum Permitted DWF of 9.45Ml/d. It is predicted that the STWs permitted DWF will be exceeded by the levels of growth and increases in wastewater demand proposed in AMP7. It is therefore likely that investment will be required in this area of the network before this point to allow the increase in wastewater demand to be managed effectively.

Figure 6-4: Snarrows STW Headroom Forecast



6.4.3.4 Packington STW

Packington STW is located in the North-West Leicestershire District and could potentially receive additional wastewater from 16 development sites proposed from residential and employment usage. This STW is located outside the extents of the SGP Growth Areas is therefore unlikely to be affected by additional growth within these areas.

Currently, Packington STW is working below its Maximum Permitted DWF Permit but it is predicted that by the end of AMP7, the STW will reach and exceed this permit without investment in this wastewater treatment facility to increase future capacity.

Figure 6-5: Packington STW Headroom Forecast

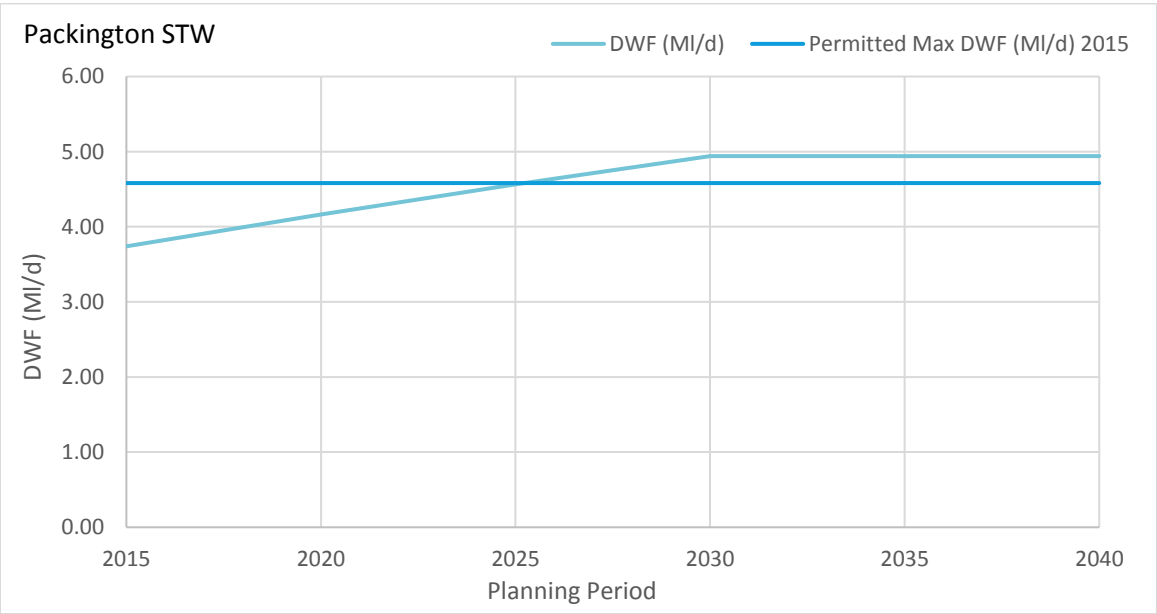


Table 6-2: Flow Permit Assessment Results

STW	Also Affected by SGP Opp Areas?	Permitted Max DWF (Ml/d)	Current DWF (Ml/d)	DWF (Ml/d) End of AMP6	DWF (Ml/d) End of AMP7	DWF (Ml/d) End of AMP8	DWF (Ml/d) End of AMP9	DWF (Ml/d) End of AMP10	AMP10 Headroom % of Permitted
Wanlip STW	Yes	135.00	142.99	146.53	150.50	153.00	153.00	153.00	-13%
Loughborough STW	No	21.50	15.26	15.70	16.39	17.08	17.09	17.09	21%
Snarrows STW	No	9.45	8.83	9.27	9.98	10.67	10.67	10.67	-13%
Earl Shilton STW	Yes	5.64	2.47	2.68	3.37	4.04	4.04	4.04	28%
Melton STW	Yes	9.27	11.16	11.24	11.92	12.57	12.57	12.57	-36%
Packington STW	No	4.58	3.74	4.16	4.56	4.94	4.94	4.94	-8%
Hinckley STW	Yes	16.39	12.44	12.77	13.22	13.43	13.43	13.43	18%
Castle Donington STW	Yes	3.04	2.05	2.23	2.63	3.00	3.00	3.00	1%
Market Harborough STW	No	6.03	5.76	6.24	6.53	6.53	6.53	6.53	-8%
Shepshed STW	Yes	4.27	2.91	2.95	3.16	3.37	3.37	3.37	21%
Lutterworth STW	Yes	2.97	2.14	2.25	2.45	2.54	2.54	2.54	15%
Measham STW	No	1.39	1.08	1.12	1.25	1.39	1.39	1.39	0%
Countesthorpe STW	Yes	1.50	1.34	1.48	1.55	1.61	1.61	1.61	-7%
Stoney Stanton STW	Yes	3.07	2.12	2.31	2.36	2.39	2.39	2.39	22%
Whetstone STW	Yes	6.17	4.94	5.03	5.12	5.17	5.17	5.17	16%
Barrow & Quorn STW	No	3.36	2.56	2.77	2.78	2.79	2.79	2.79	17%
Oadby STW	Yes	4.98	3.65	3.65	3.75	3.86	3.86	3.86	23%
Kegworth STW	Yes	1.59	1.38	1.49	1.55	1.55	1.55	1.55	2%
Asfordby STW	No	1.59	1.18	1.19	1.28	1.36	1.36	1.36	14%

STW	Also Affected by SGP Opp Areas?	Permitted Max DWF (Ml/d)	Current DWF (Ml/d)	DWF (Ml/d) End of AMP6	DWF (Ml/d) End of AMP7	DWF (Ml/d) End of AMP8	DWF (Ml/d) End of AMP9	DWF (Ml/d) End of AMP10	AMP10 Headroom % of Permitted
Broughton Astley STW	Yes	2.39	1.87	1.95	2.04	2.04	2.04	2.04	15%
Harby STW	No	1.20	1.02	1.03	1.11	1.18	1.18	1.18	2%
Bottesford STW	No	1.06	0.74	0.76	0.82	0.88	0.88	0.88	17%
Fleckney STW	No	0.92	0.71	0.71	0.78	0.85	0.85	0.85	8%
Kibworth STW	No	1.70	1.20	1.23	1.29	1.32	1.32	1.32	22%
Ibstock STW	No	1.93	1.58	1.64	1.66	1.68	1.68	1.68	13%
Great Glen STW	Yes	1.16	0.76	0.76	0.80	0.84	0.84	0.84	28%
Nuneaton-Hartshill STW	No	22.60	22.94	22.94	22.98	23.01	23.01	23.01	-2%
Market Bosworth STW	No	0.64	0.69	0.69	0.71	0.74	0.74	0.74	-15%
Waltham STW	No	0.93	0.79	0.79	0.81	0.83	0.83	0.83	10%
Burton on the Wolds STW	No	0.70	0.55	0.57	0.57	0.57	0.57	0.57	19%
Somerby STW	No	0.12	0.05	0.05	0.06	0.08	0.08	0.08	37%
Newbold Verdon STW	No	0.73	0.70	0.73	0.73	0.73	0.73	0.73	0%
Croxton Kerrial STW	No	0.19	0.14	0.14	0.15	0.17	0.17	0.17	12%
Nether Broughton STW	No	0.45	0.36	0.36	0.37	0.38	0.38	0.38	15%
Houghton on the Hill STW	Yes	0.36	0.21	0.22	0.23	0.23	0.23	0.23	35%
Claybrook Magna STW	No	0.37	0.38	0.39	0.40	0.40	0.40	0.40	-8%
Ashby Folville STW	No	0.28	0.12	0.12	0.12	0.13	0.13	0.13	52%
Billesdon STW	No	0.18	0.20	0.20	0.20	0.20	0.20	0.20	-12%
Stanton STW	No	8.94	6.83	6.83	6.83	6.83	6.83	6.83	24%

6.4.4 Conclusions

This headroom assessment aims to assess the impact of the proposed development on the capacity of the STWs across Leicestershire that are likely to be affected by growth to 2050. Additional DWF rates, calculated from the proposed 2011-2031 sites across Leicestershire, have been compared to the Maximum Permitted DWF for each STW. This assessment has highlighted treatment works that may require investment in the future as a result of the increased demand that they may face.

This assessment has identified that:

- In the present day, Melton, Billesdon, Market Bosworth, Wanlip, Claybrooke Magna and Nuneaton Hartshill STWs are already working above their maximum permitted DWF rates without any input from proposed local authority sites or SGP Growth Area developments. Future development would be significant additional pressure on these identified STWs.
- Within AMP6 (2020), Newbold Verdon and Market Harborough STWs are predicted to meet and exceed their maximum DWF permit as a result of new development.
- Within AMP7 (2025), Snarrows, Countesthorpe and Packington STWs are predicted to meet and exceed their maximum DWF permit as a result of new development.
- Within AMP 8 (2030), Measham STW is also predicted to meet and exceed its maximum permitted DWF permits as a result of new development.
- A significant number of STWs across Leicestershire are predicted to currently be working closely to their maximum permitted DWF rates or are predicted to approached their permits over the coming AMP cycles, this shows that proposes growth across the County could put significant additional demand and pressure on wastewater infrastructure.

In areas where significant increases in DWF are predicted and it has been identified that the existing STWs are likely to exceed their Maximum DWF Permits, it may be necessary to design and construct new wastewater treatment infrastructure to manage future demand. This is more likely to be the case for the identified STWs affected by the high levels of local authority growth and those located in one of the proposed SGP Growth Areas where higher levels of growth have been proposed.

Sewerage undertakers have an obligation to accommodate new development through the provision of additional waste water capacity (both sewerage and treatment) in the area. For wastewater, there is also a requirement to ensure additional development flows do not unduly increase flood risk from the sewerage system and that there is no adverse effect on the environment by ensuring we provide appropriate levels of treatment at each of our sewage treatment works. It is crucial that Severn Trent Water and Anglian Water are informed about detailed development plans and proposals so that growth demands can be accurately included within asset planning activities and that investments and upgrades can be appropriately completed in order to meet future demand.

Once the locations of development from 2031 to 2050 on strategic and non-strategic sites is known, it is recommended that this headroom assessment is extended to include the SGP Growth Area sites and Non-Strategic local authority sites to assess the full impacts of growth to 2050.

6.4.5 Recommendations

Table 6-3 details the recommendations that have been found from the flow permit assessment.

Table 6-3: Sewage Treatment Works Flow Permit Assessment Recommendations

Action	Responsibility	Timescale
Assess, in more detail, the combined impacts of local authority and strategic scale on STWs that could be affected by growth in the future when more detailed locations of strategic growth are available.	LAs in Leicestershire	Ongoing
Consider the available STW capacity when phasing developing going to the same STW.	LAs in Leicestershire	Ongoing
Provide annual updated to STWL and AW detailing projected housing growth in the County.	LAs in Leicestershire	Ongoing
STWL and AW to assess growth demands as part of their wastewater asset planning activities and feedback to Leicestershire County Council if concerns arise.	LAs in Leicestershire	Ongoing

6.5 Scoping Water Quality Assessment

6.5.1 Introduction

An increase in the discharge of effluent from STWs as a result of growth and development across Leicester and Leicestershire may lead to negative impacts on the quality of the watercourses receiving the effluent. Under the Water Framework Directive (WFD), a watercourse is not allowed to deteriorate from its current WFD classification (either as an overall watercourse or for the individual elements assess) and objectives are set to improve its water quality, with the goal of meeting 'Good' status before the proposed implementation of the SGP Growth Areas.

It is Environment Agency (EA) policy to model the impacts of increasing effluent volumes on the receiving watercourses. Where the scale of development is such that a deterioration is predicted, a new Environmental Permit (EP) may be required at the STW to improve the quality of the final effluent, so that the increased pollutant load will not result in a deterioration in the water quality of the watercourse. This is known as "no deterioration" or "load standstill". The Environment Agency operational instruction "Water Quality Planning: no deterioration and the Water Framework Directive"[50] sets out a hierarchy for how the no-deterioration requirements of the WFD should be implemented. The impact of development should be assessed in relation to the following objectives:

- **Could the development cause a greater than 10% deterioration in water quality?** This objective is to ensure that all the environmental capacity is not taken up by one stage of development and there is sufficient capacity for future growth.
- **Could the development cause a deterioration in WFD class of any element assessed?** A requirement of the WFD is to prevent a deterioration in class of individual contaminants.
- **Could the development along prevent the receiving watercourse from reaching Good Ecological Status or Potential?**

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

6.5.2 Methodology

The completion of this water quality assessment is designed to determine if the questions listed in Section 6.2 can be answered using existing data or if there are knowledge gaps where further assessment may be required to determine if the STWs can support growth without causing a detrimental impact on water quality. This scoping water quality assessment aims to assess the current situation for water quality in the SGP Growth Areas, this will be completed by:

- Identifying the main watercourses located within the SGP Growth Areas;
- Identifying the current Water Framework Directive 2016 Cycle 2 Overall Classification of the waterbodies and the locations of existing STWs that discharge to these waterbodies;
- Completing a qualitative assessment of how future large-scale development in Leicester and Leicestershire may impact the future water quality in the receiving watercourses;
- Recommending future assessments that can be completed when further information about detailed growth locations in the Growth Areas is available.

The European WFD has been in force since 2000. Its aim is to ensure that rivers, lakes, coastal waters and groundwater achieve a 'good status' by 2027. Due to the strategic nature of this WCS, it aims to assess the current water quality across the study area and progress towards good status.

Because this Scoping Water Quality Assessment (WQA) does not quantitively assess the impacts of growth on water quality in the receiving watercourses, it is likely that a detailed assessment of water quality will be required at a later stage for both non-statregic local authority sites and strategic growth areas. SIMCAT is an open-source, semi-distributed hydrology and water quality model with the ability to study the impacts of growth on watercourse at catchment scale so cumulative impacts can be determined, this would be a suitable method of modelling and analysing the impact of increased effluent discharges on water quality in the receiving watercourses, if a suitable existing SIMCAT model is available for the catchment. In the absence of a suitable existing SIMCAT model, it is recommended that an assessment is conducted using the EA's River Quality Planning (RQP) toolkit.

50 Environment Agency (2012) Water Quality Planning: no deterioration and the Water Framework Directive. Accessed online at http://www.fwr.org/WQreg/Appendices/No_deterioration_and_the_WFD_50_12.pdf on 21/07/2017

6.5.3 Results

A qualitative assessment of each SGP Growth Area is contained within this section, identifying watercourses and their Water Framework Directive Cycle 2 classifications and STWs that could receive additional growth and therefore could impact water quality in the watercourses.

6.5.3.1 The A46 Growth Corridor

The A46 Growth Corridor is extensive and a range of watercourses flowing through the study area could be impacted by future strategic growth. Around 30,000 residential dwellings and extensive areas of employment land could be developed in this area. Figure 6-6 shows the locations and WFD Cycle 2 classifications of watercourses in the A46 Growth Corridor and the locations of existing STWs. Table 6-4 details the watercourses that could be impacted by future growth.

Most watercourses flowing through the A46 Corridor have a Moderate Overall WFD classification, the Eye / Wreake from Langham Brook to Soar has a poor classification and the Grand Union Canal has a good classification. Most watercourses have objectives set to meet the Good status by 2027. As the A46 Corridor is located at the heads of these watercourses, wastewater flows from future strategic scale growth in this area could impact water quality downstream significantly. The watercourses crossing this corridor either originate within the corridor or have only small upstream catchments, and therefore this area is likely to be characterised by relatively low potential dilution of treated effluent, and therefore low available environmental capacity.

Figure 6-6: WFD Cycle 2 2016 Classification in the A46 Growth Corridor

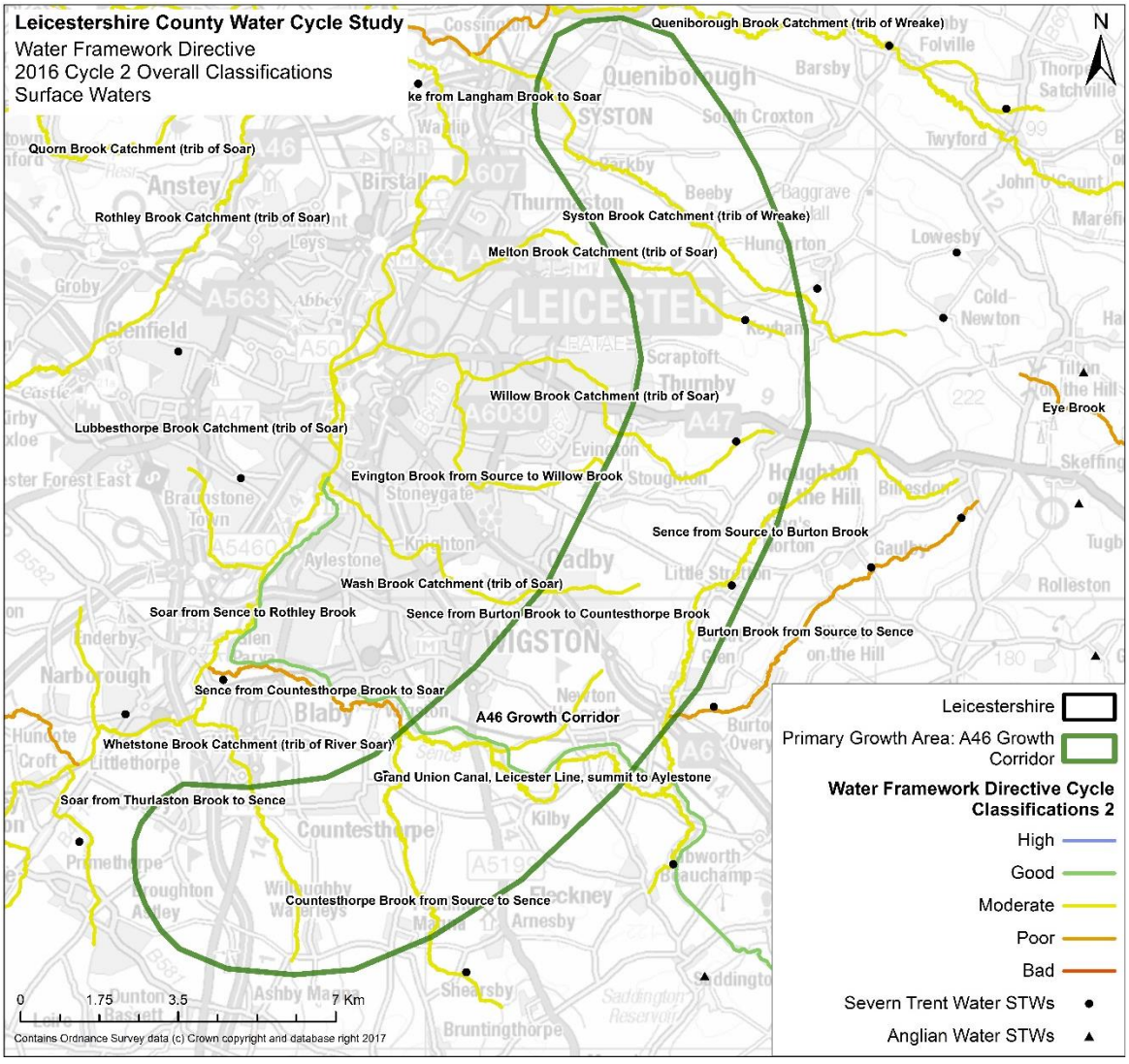


Table 6-4: Key Watercourses in the A46 Growth Corridor

Waterbody Name	ID	STWs in the Growth Area	2016 Cycle 2 Overall Class	Objectives
Syston Brook Catchment (Trib of Wreake)	GB104028047440	Hungarton STW	Moderate	Moderate by 2015
Melton Brook Catchment (Trib of Soar)	GB104028047010	Keyham STW	Moderate	Good by 2027
Willow Brook from Source to Evington Brook	GB104028046960	Houghton on the Hill STW	Moderate	Good by 2027
Evington Brook from Source to Willow Brook	GB104028046960	None	Moderate	Good by 2027
Sence from Source to Burton Brook	GB104028046650	Little Stretton STW	Moderate	Good by 2027
Wash Brook Catchment (Trib of Soar)	GB104028046910	None	Moderate	Good by 2027
Sence from Burton Brook to Countesthorpe Brook	GB104028046620	Wistow STW	Moderate	Good by 2027
Countesthorpe Brook from Source to River Sence	GB104028042560	Arnesby, Countesthorpe and Wigston STW	Moderate	Good by 2027
Whetstone Brook Catchment (Trib of River Soar)	GB104028046810	None	Moderate	Good by 2021
Soar from Soar Brook to Thurlaston	GB104028042620	Broughton Astley, Stoney Stanton	Moderate	Good by 2027
Soar from Source to Soar Brook	GB104028042580	Frolesworth and Claybrook Magna STW	Moderate	Good by 2027
Soar Brook from Source to River Soar	GB104028042590	None	Poor	Good by 2027
Grand Union Canal - Leicester Line, Summit to Aylestone	GB70410194	None	Good	Good by 2015

6.5.3.2 The Southern Gateway

The Southern Gateway contains fewer watercourses compared to the A46 Growth Corridor, as shown in Figure 6-7 and Table 6-5. Apart from the Coventry and Ashby Canals which flow north-westward, most watercourses that could be affected by growth are on the periphery of the Gateway. The Sketchley Brook from Source to River Anker, classified as Moderate, receives treated wastewater from the Hinckley STW, no other public STWs are present in this area of Leicestershire.

Strategic scale growth is most likely to be located to the east and west of Hinckley, due to the scale and location of proposed growth, it has already been identified that new wastewater management infrastructure may be required to manage the additional wastewater flows from strategic development. It is important that any new STW, or upgrades to the existing STWs in the area, are considerate of water quality within the receiving watercourses.

The Stoke Golding Brook from Source to River Sence, Thurlaston Brook Catchment and Soar from Soar Brook to Thurlaston Brook all have a Poor Overall WFD classification. Both the Sketchley Brook and Soar Brook arise within the Southern Gateway, and therefore this area is likely to be characterised by relatively low potential dilution of treated effluent, and therefore low available environmental capacity.

Figure 6-7: WFD Cycle 2 2016 Classification in the Southern Gateway

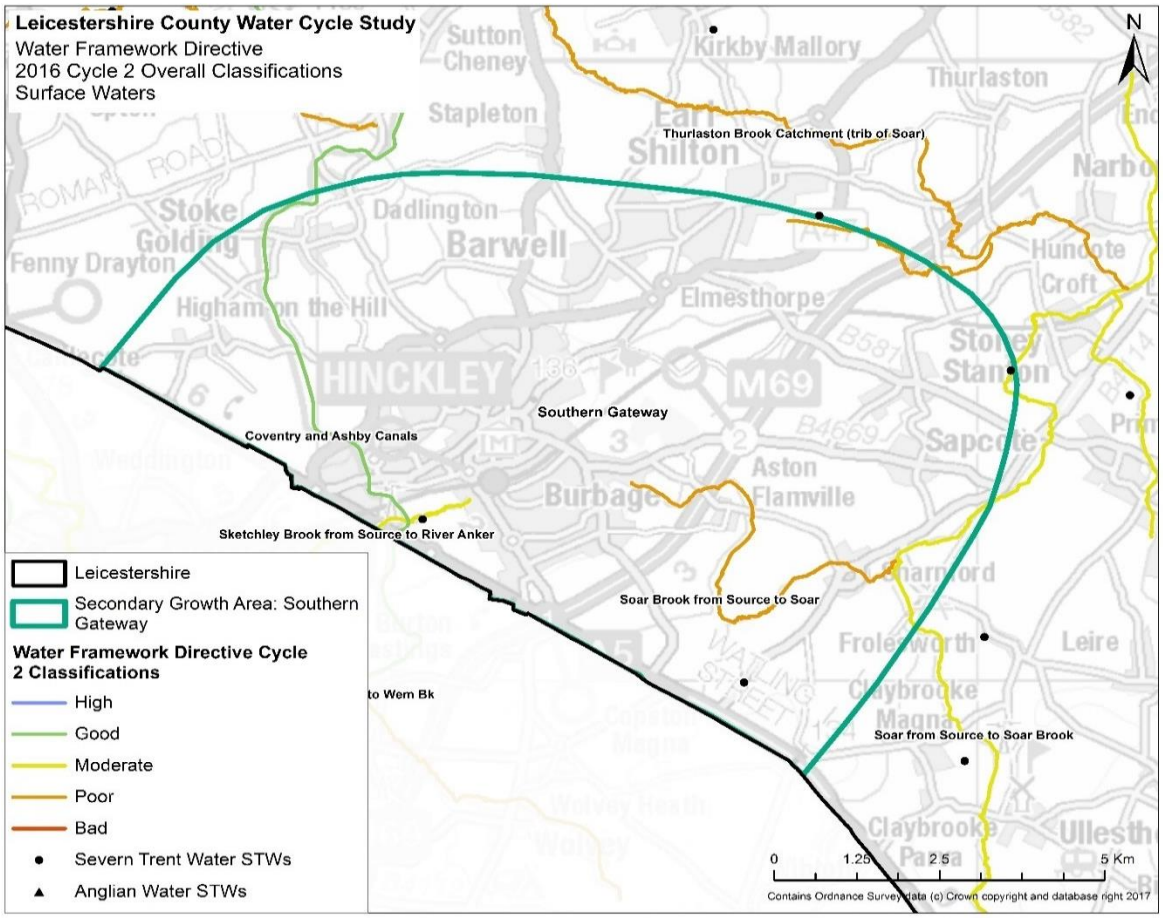


Table 6-5: Key Watercourses in the Southern Gateway

Waterbody Name	ID	Existing STW?	2016 Cycle 2 Class	Objectives
Sketchley Brook from Source to R Anker	GB104028042470	Hinckley STW	Moderate	Good by 2027
Soar Brook from Source to R Soar	GB104028042590	None	Poor	Good by 2027
Stoke Golding Brook from Source to River Sence	GB104028046640	Sibston STW	Poor	Good by 2027
Coventry and Ashby Canals	GB70410212	None	Good	Good by 2015

6.5.3.3 The Northern Gateway

Figure 6-8 and Figure 6-6 details the locations, WFD classifications and STWs in the Northern Gateway. It is likely that growth will be in the southern half of the Growth Area. It is therefore likely that the Ramsley, Long Whatton, Grace Dieu and Black Brooks could be impacted by additional wastewater flows from any strategic development, these are currently classified as moderate to poor. Additional wastewater flows may impact the ability of these watercourses to reach Good Overall Status by 2021 to 2027, as required by the WFD for these surface water features. The watercourses either originate within the Northern Gateway or have small upstream catchments. This area is likely to be characterised by low potential dilution of treated effluent, and therefore low available environmental capacity. This will be particularly true of tributaries of the Soar which are classified as Bad, under WFD, no further deterioration of a Bad water body is permitted.

Figure 6-8: WFD Cycle 2 2016 Classification in the Northern Gateway

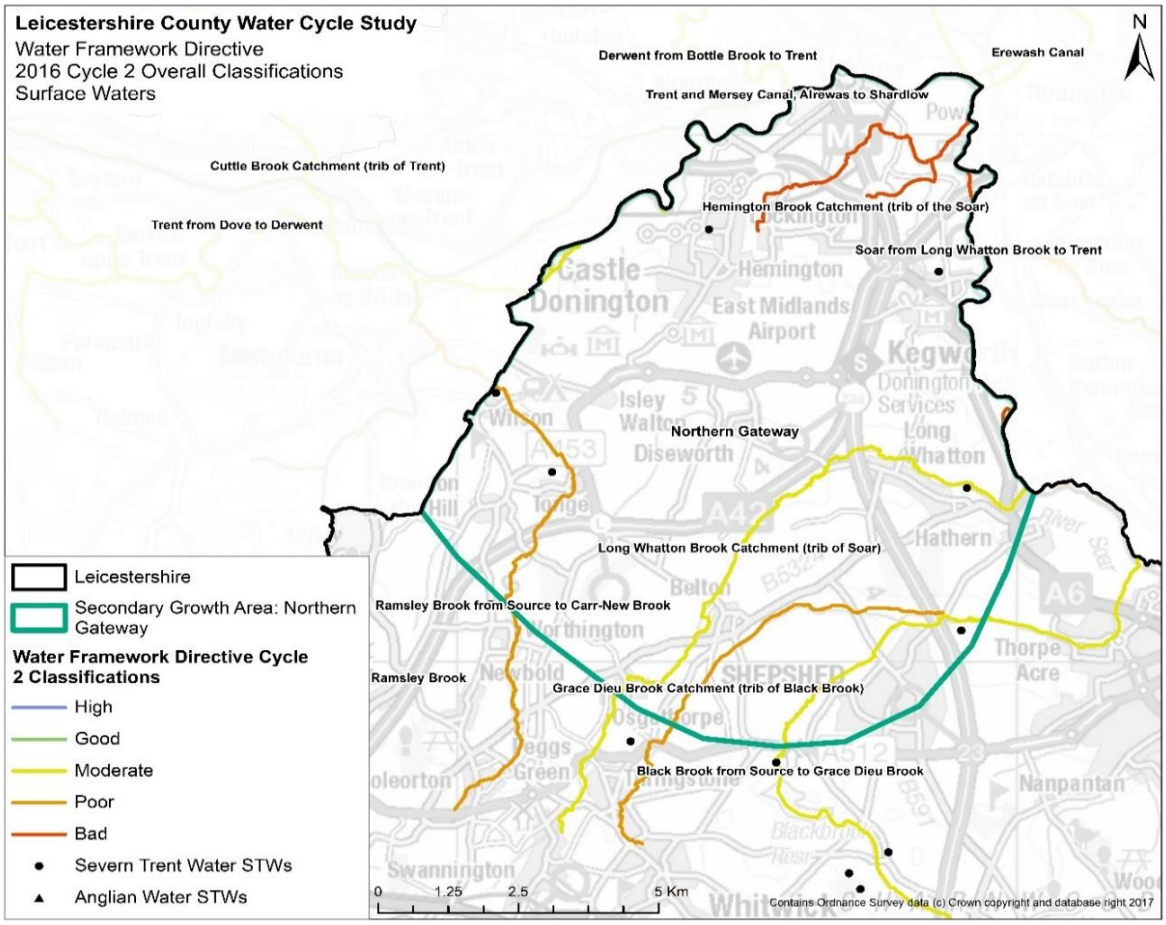


Table 6-6: Key Watercourses in the Northern Gateway

Waterbody Name	ID	Existing STW?	2016 Cycle 2 Overall Class	Objective
Trent from River Dove Confluence to River Derwent	GB104028047420	Castle Donington STW	Moderate	Moderate by 2015
Hemington Brook (Trib of the Soar)	GB104028047410	None	Bad	Good by 2027
Long Whatton Brook Catchment (Trib of Soar)	GB104028047170	Long Whatton and Snarrows STW	Moderate	Good by 2027
Grace Dieu Brook from Source to Black Brook	GB104028047090	Snarrows STW	Poor	Moderate by 2027
Black Brook from Source to Grace Dieu Brook	GB104028047070	Blackbrook and Shepshed STW	Moderate	Good by 2021
Ramsley Brook from Source to Carr-New Brook	GB104028047340	Worthington, Breedon and Wilson	Poor	Good by 2027

6.5.3.4 The Melton Growth Centre

Within the Melton Growth Centre, and beyond the emerging Local Plan period, longer term development is potentially to be located to the east of the town of Melton Mowbray. Figure 6-9 and Table 6-7 identify the watercourses, WFD Cycle 2 Overall Classifications and the STWs present within the Growth Centre. The majority of watercourses within this area are classified as either Moderate or Poor. Due to the location of proposed growth, it is likely that the Eye/Wreake from Langham Brook to Soar, Thorpe Brook Catchment and Burton Brook Catchment (trib of Eye) could receive additional flows from any future development. All watercourses in this Growth Area have WFD objectives to achieve Good Overall Status by 2027, it is important that future growth takes water quality into account and does not have a detrimental impact on the identified watercourses.

The Eye / Wreake from Langham Brook to Soar which flows through Melton Mowbray drains a reasonably large catchment area of over 200km^2, and therefore this area is likely to be characterised by relatively good potential dilution of treated effluent, and therefore is expected to hold some available environmental capacity.

Figure 6-9: WFD Cycle 2 2016 Classification in the Melton Growth Centre

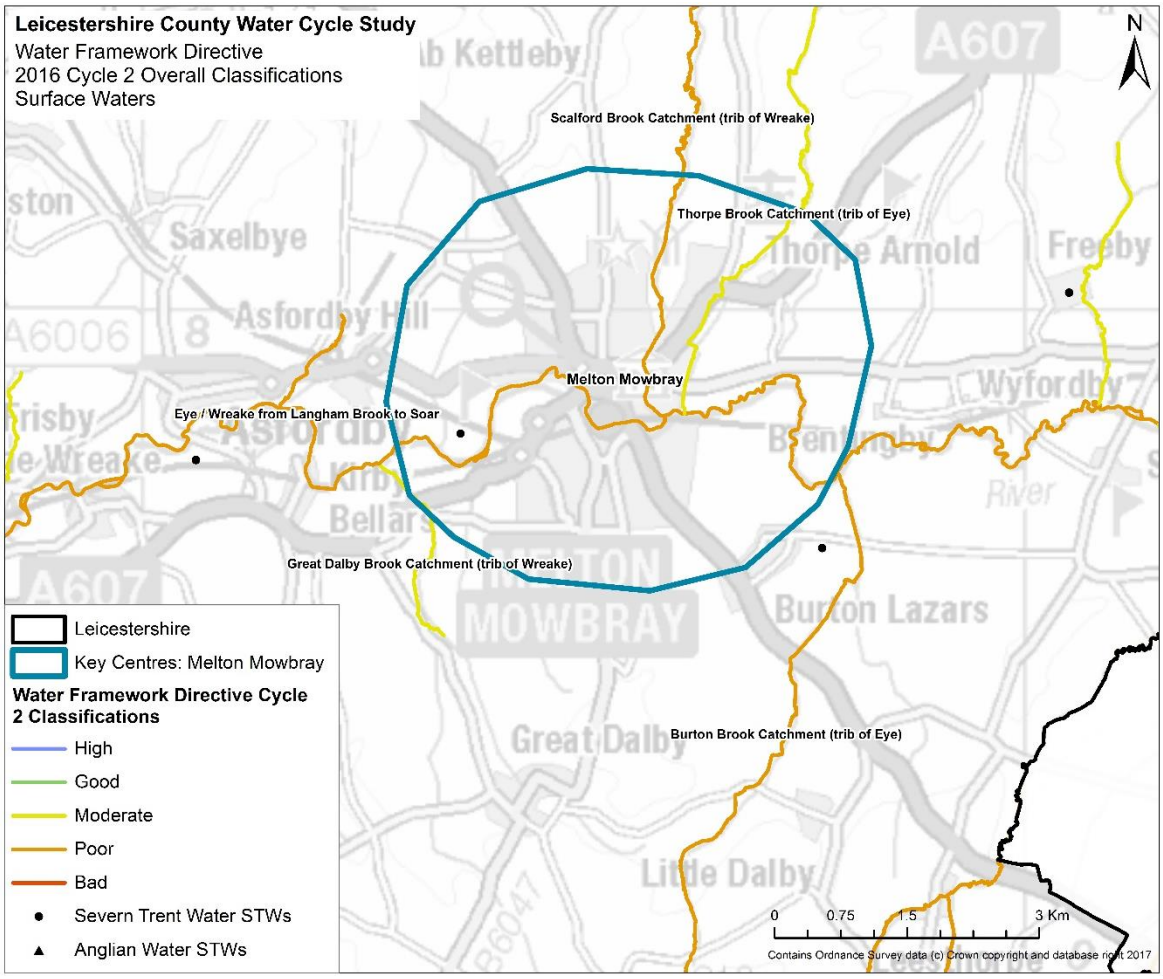


Table 6-7: Key Watercourses in the Melton Growth Centre

Waterbody Name	ID	Existing STW?	2016 Cycle 2 Overall Class	Objectives
Eye/Wreake from Langham Brook to River Soar	GB104028047550	Melton STW	Poor	Good by 2027
Thorpe Brook Catchment (Trib of River Eye)	GB104028047590	Waltham STW	Moderate	Good by 2027
Scalford Brook Catchment (Trib of the River Wreake)	GB104028047600	None	Poor	Good by 2027

6.5.3.5 The Lutterworth Growth Centre

Figure 6-10 and Table 6-8 identify the only main watercourse that flows through the Lutterworth Growth Centre, the River Swift (source to confluence with the River Avon) which has been given a Moderate Overall Classification in Cycle 2 of the WFD. If strategic scale growth is located to the east or west of Lutterworth, this watercourse could be affected by additional wastewater flows produced as a result of development, this could therefore impact the water quality in the watercourse and affect its ability to meet Good Overall Status by 2027. The Swift has only a small catchment area upstream of Lutterworth, and therefore this area is likely to be characterised by relatively low potential dilution of treated effluent, and therefore low available environmental capacity.

Figure 6-10: WFD 2 2016 Classification in the Lutterworth Growth Centre

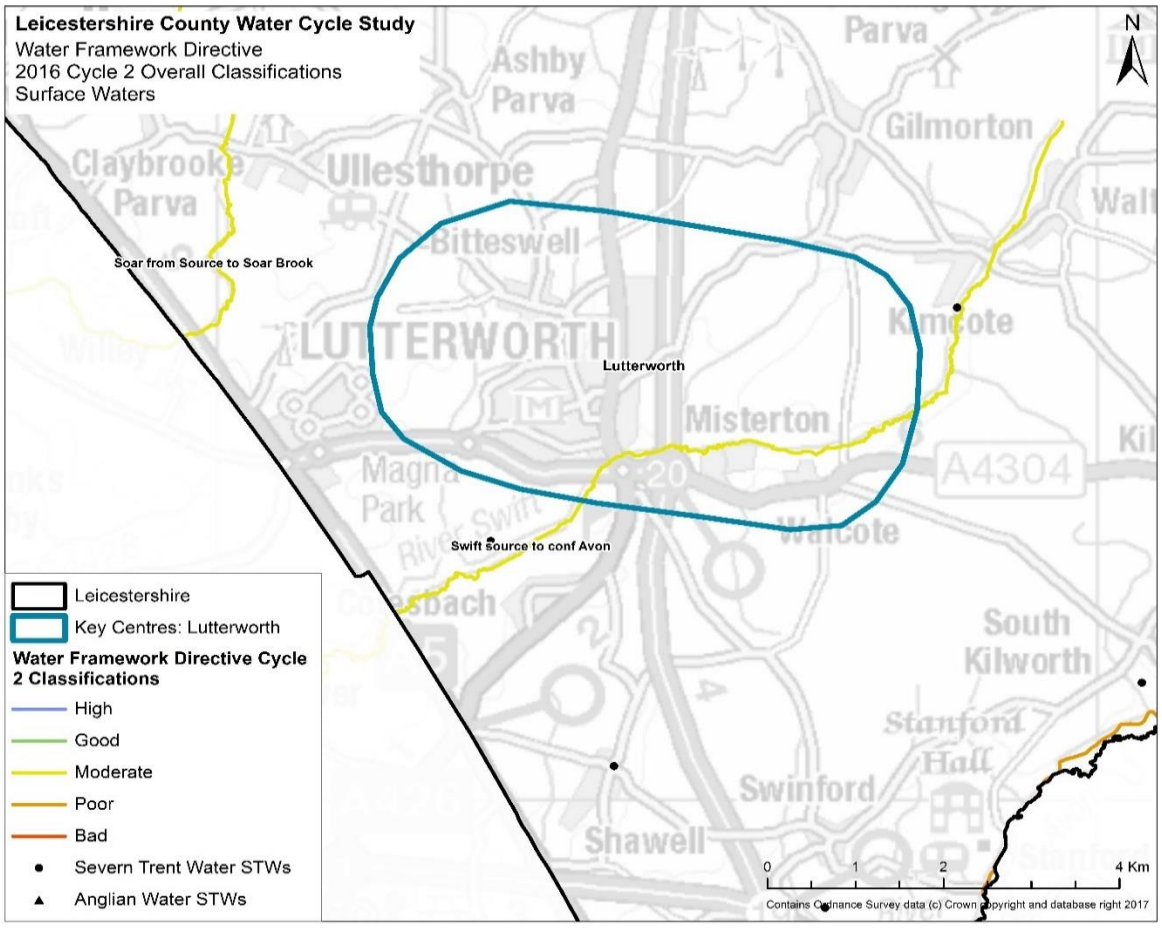


Table 6-8: Key Watercourses in Lutterworth

Waterbody Name	ID	Existing STW?	2016 Cycle 2 Overall Class	Objectives
Swift Source to Confluence with River Avon	GB109054043940	Kimcote and Lutterworth STW	Moderate	Good by 2027

6.5.3.6 Six Hills Garden Village

It is proposed to develop a Garden Village at Six Hills to the west of Melton Mowbray. Figure 6-11 and Table 6-9 identify the only watercourse, the Kingston Brook, that could be affected the additional wastewater flows produced by the proposed development of around 3,000 residential dwellings and employment growth at the garden village. The watercourse currently has a Poor Overall Status as defined by Cycle 2 of the WFD. It has already been identified that there are no major STWs in close proximity to the proposed garden village development site, it is therefore likely that a new STW would be required for the garden village. However, the site is located on a local ridge of high ground, and therefore the nearby watercourses are small with limited dilution capacity and therefore low environmental capacity. It may, therefore, be necessary to transfer wastewater flows north to a point where greater environmental capacity is available.

Figure 6-11: Water Framework Directive Cycle 2 2016 Classification in the Six Hills Garden Village

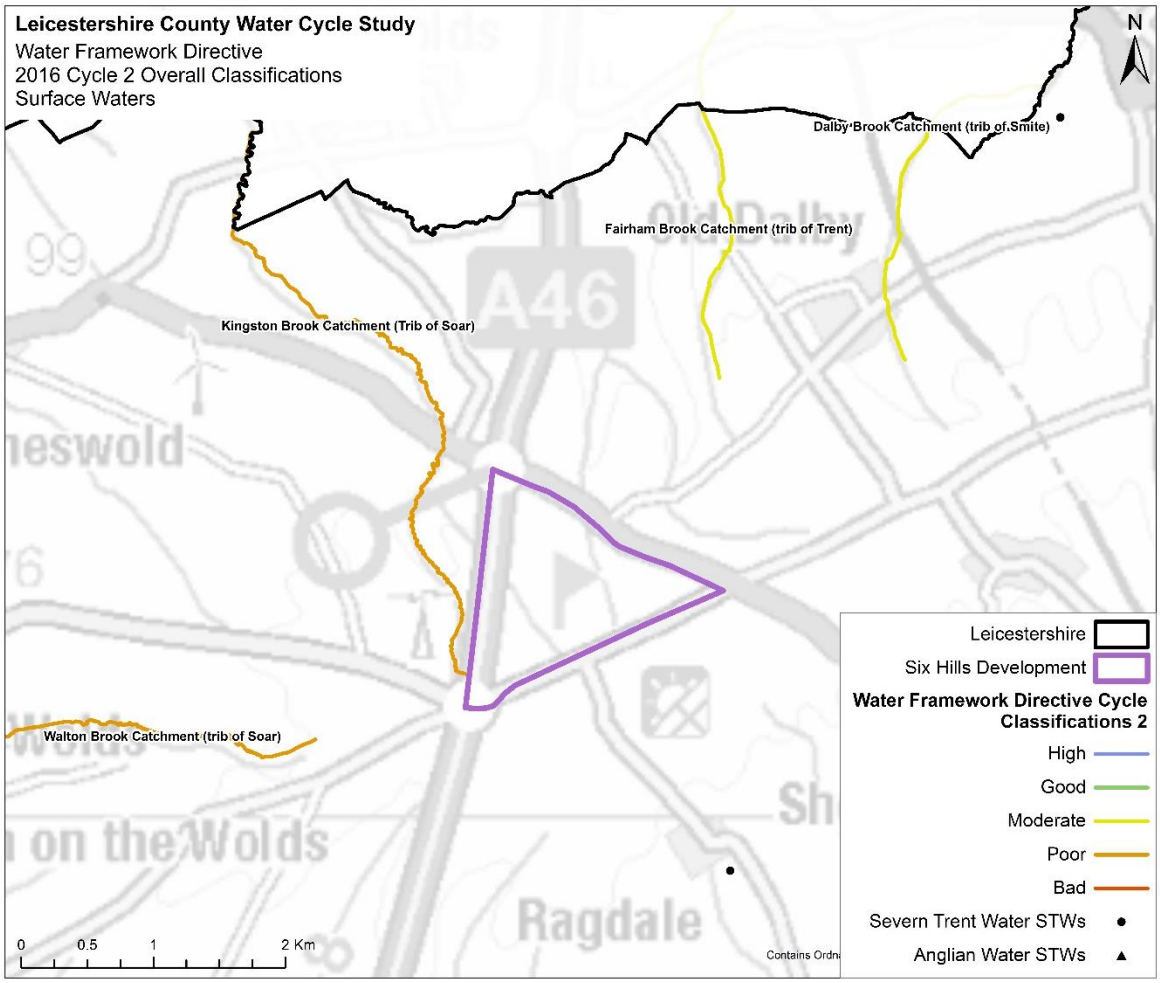


Table 6-9: Key Watercourses in the Six Hills Garden Village

Waterbody Name	ID	Existing STW?	2016 Cycle 2 Overall Class	Objectives
Kingston Brook Catchment (Trib of Soar)	GB104028046600	None	Poor	Good by 2027

6.5.4 Priority Substances and other EU-level Dangerous Substances

As well as the general chemical and physicochemical water quality elements (BOD, NH_4, P etc.) addressed above, a watercourse can fail to meet GES due to exceeding permissible concentrations of hazardous substances. Currently 33 substances are defined as hazardous or priority hazardous substances, with others under review. Such substances may pose risks both to humans (when contained in drinking water) and to aquatic life and animals feeding in aquatic life. These substances are managed by a range of different approaches, including EU and international bans on manufacturing and use, targeted bans, selection of safer alternatives and end-of-pipe treatment solutions.

There is considerable concern within the UK water industry that regulation of these substances by setting permit values which require their removal at wastewater treatment works will place a huge cost burden upon the industry and its customers, and that this approach would be out of keeping with the "polluter pays principle".

Below are some possible ways in which the planning system might be used to manage priority substances:

- Industrial sources – whilst the WCS covers potential employment sites, it doesn't consider the type of industry and therefore likely sources of priority substances are unknown. It is recommended that developers should discuss potential uses which may be sources of priority substances from planned industrial facilities at an early stage with the EA and, where they are seeking a trade effluent consent, with the sewerage undertaker.
- Agricultural sources - There is limited scope for the planning system to change or regulate agricultural practices.
- Surface water runoff sources - some priority substances e.g. heavy metals, are present in urban surface water runoff. It is recommended that future developments would manage these sources by using SuDS, designed following the CIRIA SuDS Manual.
- Domestic wastewater sources - some priority substances are found in domestic wastewater because of domestic cleaning chemicals, detergents, or materials used within the home. Whilst an increase in the population due to housing growth could increase the total volumes of such substances being discharged to the environment, it would seem more appropriate to be managing these substances through regulation at source, rather than through restricting housing growth through the planning system.

No further analysis of priority substances will be undertaken as part of this WCS.

6.5.5 Conclusions

This Scoping Water Cycle Study for Leicester and Leicestershire provides an overview of the STWs located within the SGP Growth Areas and the Water Framework Directive Overall Waterbody Classifications of watercourses also located within the Growth Areas that could be affected by either additional wastewater flow from existing STWs or from new wastewater infrastructure required to manage the scale of the new development proposed.

Due to the lack of detail available about the specific locations of growth within these extensive growth areas, this assessment provides a qualitative assessment to provide a better understanding of the current water quality situation in the Growth Areas in terms of the WFD Classifications and Objectives and identifies which watercourses could be affected by future growth. Due to the geography and nature of the watercourses in the Growth Area, environmental capacity to receive large additional volumes of treated effluent are likely to be limited in all areas except Melton.

To enable development in other areas it may be necessary for wastewater (or effluent) to be conveyed and discharged further downstream at a point where the receiving watercourse has greater environmental capacity. Where this is not possible it may be necessary to increase the level of treatment at the STWs to maintain, or where possible, reduce the overall pollutant load.

It is recommended that, when more information is available about the specific locations and scale of growth, a more in depth qualitative and quantitative assessments of the impacts of growth on water quality are completed when allocating development. This should be done to ensure that development across the area, and specifically within the Growth Areas, is located in the most appropriate locations as to minimise the impacts of growth of water quality and maximise the return on any investment in improved treatment.

6.5.6 Recommendations

Table 6-10 provides a summary of recommendations relating to the Scoping Water Quality Assessment completed as part of this Water Cycle Study.

Table 6-10: Scoping Water Quality Assessment Recommendations

Action	Responsibility	Timescale
Where possible, consider the water quality constraints when allocating and phasing future development sites	LAs	Ongoing
Once more information is known about future growth in the growth areas, more thorough qualitative and quantitative assessments of the impacts of growth on water quality should be completed	Consultants	Ongoing
Water quality impacts from surface water runoff from proposed development sites should be mitigated using Sustainable Drainage Systems (SuDS), in line with national and regional SuDS policy and guidance.	Developers, Leicestershire County Council and LAs	Ongoing

6.6 Sewage Treatment Works Odour Assessment - Strategic Development Sites

6.6.1 Introduction

Where new strategic developments within the SGP Growth Areas encroach upon existing and newly constructed Sewage Treatment Works, odour from those STWs may become a cause for nuisance and complaints from potential residents and businesses in the future. Managing odour from STWs can potentially add considerable capital and operational costs, particularly when retro-fitting existing STWs. National Planning Policy Guidance recommends that planners consider whether new development is appropriate near to sites used (or proposed) for wastewater infrastructure, due to the risk of odour impacting on residents and requiring additional investment.

6.6.2 Methodology

Sewerage Undertakers recommend that a STW odour assessment may be required if the site of a proposed development is close to a STW or is encroaching closer to the STW than any existing of the existing urban areas. If there are no existing developments close to a STW, it is more likely that an odour assessment is required to identify any potential issues. Another important aspect is the location of the proposed site in respect to the STW. Historic wind direction records indicate that the prevailing wind is from the south-west.

Due to the extent of the SGP Growth Areas and the lack of detailed information on where specific development will occur at this stage, a GIS assessments has been carried out to identify STWs within the study areas and identify areas that may be at risk from odour nuisance. For the STWL, the land within an 800m radius of the infrastructure has been identified. For AW, land within a 400m radius has been identified. This information can then be used by developers in the future to guide development within the Growth Areas to the most appropriate locations, avoiding areas in close proximity to STWs that could experience odour issues.

6.6.3 Data Collection

The following datasets have been used to identify the potential areas within the SGP Growth Areas that could be affected by STW odour nuisance in the future in order to direct development to the most appropriate locations in these indicative areas.

- Indicative SGP Growth Areas in GIS format
- Sewage Treatment Works locations (provided by STWL and AW)

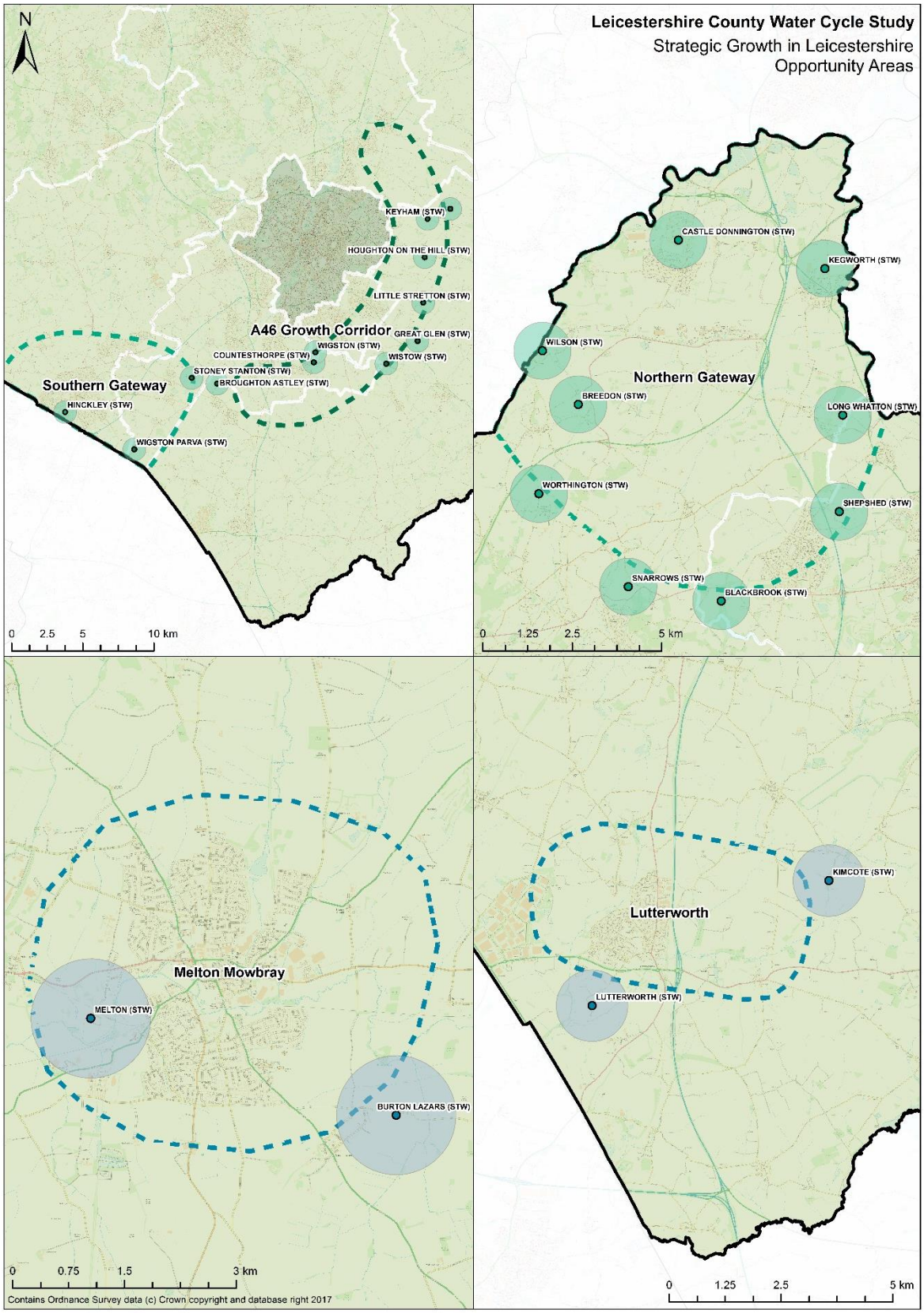
6.6.4 Results

Table 6-11 identifies the Sewage Treatment Works located within the SGP Growth Areas. Figure 6-12 locates the STWs within each Growth Area and identifies the land within an 800m radius of the STW that could potentially be affected by odour in the future. As identified in previous assessments, the scale of development proposed in each Growth Area would be significant and new STWs and associated infrastructure are likely to be required in many locations. Due to the current uncertainty on the specific locations of future development, it is difficult to assess how future wastewater treatment infrastructure could impact new developments.

Table 6-11: STWs in Growth Areas that could Impact Future Development in Terms of Odour

Growth Area	STWs within the Growth Area that Could Impact Future Development		
A46 Growth Corridor	Broughton Astley STW Countesthorpe STW Houghton on the Hill STW	Hungarton STW Keyham STW Little Stretton STW	Wigston STW Wistow STW Great Glen STW
Southern Gateway	Hinckley STW	Stoney Stanton STW	Wigston Parva STW
Northern Gateway	Blackbrook STW Breedon STW Castle Donington STW	Kegworth STW Long Whatton STW Shepshed STW	Snarrows STW Wilson STW Worthington STW
Melton Growth Centre	Melton STW	Burton Lazars STW	
Lutterworth Growth Centre	Lutterworth STW	Kimcote STW	
Six Hills Garden Village	No STWs nearby that could affect the future development in terms of odour		

Figure 6-12: STWs Located in Growth Areas and Land Within an 800m Radius



6.6.5 Conclusions

This assessment has identified the existing Sewage Treatment Works located within the SGP Growth Areas and highlights the potential development land within an 800m radius of these treatment facilities. This aims to make future developers aware of the potential risks associates with developing land in close proximity to STWs in terms of odour, so that development can be located in the most suitable locations within the Growth Areas.

It was found that:

- 9 STWs in the A46 Growth Corridor could impact future development, these are well distributed through the central and southern growth corridor;
- 3 STW in the Southern Gateway, Hinckley STW, could impact future development but this is unlikely as the STW is within an area that is already urbanised;
- 9 STWs, located around the outside of the Growth Area, could impact growth within the Northern Gateway in terms of odour;
- 2 STWs in the Melton Growth Centre, Melton STW and Burton Lazars STW, could impact future development;
- 2 STWs in the Lutterworth Growth Centre, Lutterworth STW and Kimcote STW, could impact future development on the periphery of the growth area.

As identified in previous assessments, the scale of future development proposed in each Growth Area would be significant and new STWs and associated infrastructure are likely to be required in many locations. Due to the current uncertainty on the specific locations of future development, it is difficult to assess in detail how future wastewater treatment infrastructure could impact new developments. It is recommended that STW odour is considered when allocating sites for residential and economic development and when locating sites for new wastewater infrastructure.

It is recommended that detailed odour risk assessments are undertaken as part of the planning application process for any future sites identified within the Growth Areas. Odour should also be considered if new wastewater infrastructure is required to support development as part of the Strategic Growth Plan. It is the developers' responsibility to undertake an odour risk assessment if they are required. All other local authority sites are unlikely to be impacted by odour from Sewage Treatment Works.

6.6.6 Recommendations

Table 6-12 provides a summary of the recommendations relating to the STWs located within the SGP Growth Areas and how these could impact future development. This assessment aims to support and guide development into suitable locations within the Growth Areas, considering the locations of existing wastewater infrastructure.

If odour assessments are required in the future, these should be undertaken by site developers. No additional assessment of odour impacts is required in this Water Cycle Study.

Table 6-12: STWs Odour Assessment Recommendations: 2031-2050 Strategic Growth

Action	Responsibility	Timescale
Consider the locations of existing wastewater infrastructure and the 800m buffer when locating future development within the SGP Growth Areas	Local Authorities and Site Developers	Ongoing
Consider odour risk in the sites identified to be less than 800m from a STW	Local Authorities	Ongoing
Carry out an odour assessment for sites identified as being within 800m from an existing STW	Site Developers	Ongoing

7 Environmental Constraints and Opportunities

7.1 Introduction

As strategic and non-strategic development is proposed across Leicester and Leicestershire, it is important to identify environmental risks and opportunities associated with the SGP Growth Areas because of their geographical location. A range of notable environmental designations and features, listed in Table 7-1, have been assessed in relation to strategic growth areas. This section of the WCS should be considered in conjunction with any available Sustainability Appraisals (SAs) and/or Strategic Environmental Assessments (SEAs) for Leicester and the local authorities during future development. The local authority allocations identified have not been assessed in terms of environment constraints and opportunities as the majority of sites have planning permission, as part of this they should have had these factors investigated.

Mapping has been used to identify environmental features near the strategic sites. The distance at which the feature becomes significant to the development of a site depends on the type and potential sensitivity of the environmental designations. Table 7-2 defines the approximate distance at which an environmental feature may become significant to a development site. The potential adverse impacts associated with the development of sites can then be considered and any potential environmental opportunities can also be identified.

The presence of an environmental designation or feature may present a constraint to the development of the site or may require the implementation of mitigation measures to enable the development to proceed in a manner that does not have any significant adverse effects.

7.2 Data Collection

Geographical information on environmental designations and features within Leicestershire was collected. This data was either provided by the Environment Agency, the Leicester and Leicestershire local authorities or sourced from OS OpenData. Environmental designations have been grouped into two main topic areas that will be assessed in this section:

1. The Water Environment
2. Biodiversity and Landscape

Table 7-1: Environmental Designations and Features

Feature	Description
Water	
Watercourses	A river, stream or other riparian feature i.e., ditch, as shown on OS mapping.
Water Framework Directive (WFD) Classifications	The Water Framework Directive (WFD) requires that all 'water bodies' (rivers, lakes, estuaries, coastal waters and groundwater) achieve good ecological potential by 2015. Under the WFD, all waterbodies are classified by their current and future predicted water quality, and specifically their ecological and chemical status.
Aquifer - Bedrock / Superficial Deposits	Underground layers of water-bearing permeable rock or drift deposits from which groundwater can be extracted. These are split into: **Superficial (Drift)** - permeable unconsolidated (loose) deposits. **Bedrock** - solid permeable formations These classifications are further split into the following designations: **Principle Aquifers** are layers of rock or drift deposits that have high intergranular and/or fracture permeability. **Secondary Aquifers** include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage.
Groundwater Source Protection Zones	**Source Protection Zones (SPZs)** are defined around large and public potable groundwater abstraction sites. The purpose of SPZs is to provide additional protection to safeguard drinking water quality through constraining the proximity of an activity that may impact upon a drinking water abstraction.

Feature	Description
Biodiversity	
Ancient or Semi-Natural Woodland	Ancient woodland is land that has had a continuous woodland cover since at least 1600 AD, and may be ancient semi-natural woodland (ASNW), which retains a native tree and shrub cover that has not been planted.
Local Nature Reserves (LNR)	Local Nature Reserves (LNRs) are for both people and wildlife. They are places with wildlife or geological features that are of special interest locally. They offer people special opportunities to study or learn about nature or simply to enjoy it.
Site of Special Scientific Interest (SSSI)	Protected under a range of UK legislation, a Site of Special Scientific Interest (SSSI) is an area of land of special interest because of any of its flora, fauna, geological or physiographical features. An SSSI is given certain protection against damaging operations, and any such operations must be authorised by the designating body.
Special Area of Conservation / Sites of Community Importance (SAC)	A Special Area of Conservation (SAC) is an area which has been given special protection under the European Union's Habitats Directive (as transcribed into UK law under the Conservation of Habitats and Species Regulations 2010 (As amended) – known as the 'Habitats Regulations'). SACs provide increased protection to a variety of wild animals, plants and habitats and are a vital part of global efforts to conserve the world's biodiversity.

Table 7-2: Environmental Designations and Features

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

7.3 The Water Environment

7.3.1 Surface Waters

There are a wide range of watercourses distributed across the study area, the locations of key watercourses in relation to future strategic development has been discussed previously in Section 4. Figure 7-1 shows the locations of watercourses across the County and shows the Water Framework Directive (WFD) Cycle 2 Overall Classifications for the main watercourses.

The WFD requires the UK to achieve Good status across all surface waterbodies, including rivers, streams, lakes, estuaries and coastal waters. The Environment Agency aims to achieve Good status in at least 60% of waterbodies by 2021 and as many waterbodies as possible by 2027. Strategic scale development across the study area could impact the future classification of waterbodies nearby and impact progress to achieving Good status. It is therefore necessary to identify waterbodies that could be affected by strategic growth in Leicestershire to ensure that this is considered during future development of the strategic growth areas.

Figure 7-1: Overall WFD Cycle 2 Surface Waterbody Classifications in Leicestershire

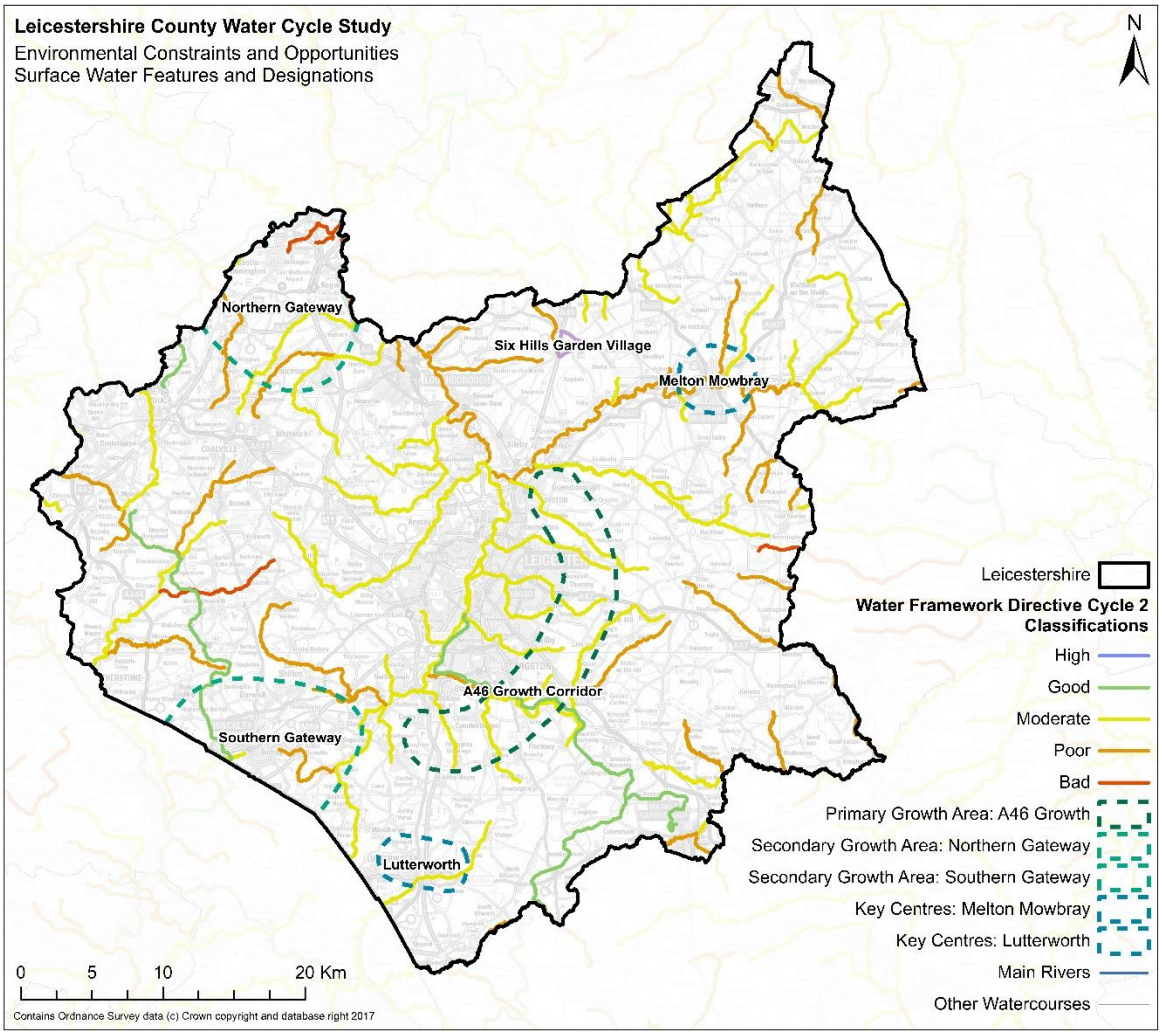


Table 7-3 identifies the main watercourses within each of the five strategic growth areas across Leicestershire and the Water Framework Directive Cycle 2 Overall Classifications of each. This assessment finds that most of the watercourses identified within the strategic growth areas, which could potentially be impacted by future strategic scale development, have either a Moderate or Poor Overall Classifications in Cycle 2 of the WFD. As most SGP Growth Areas are located at the head of watercourses, there is significant potential for development to impact water quality, this is especially the case with the A46 Growth Corridor which contains a significant number of watercourses.

Table 7-3: Watercourses within the Strategic Growth Areas and their WFD Classifications

Strategic Growth Areas	Watercourses Located Within these Strategic Growth Areas	Overall Waterbody Classification
A46 Growth Corridor	Queniborough Brook Catchment (trib of Wreake)	Moderate
	Syston Brook Catchment (trib of Wreake)	Moderate
	Melton Brook Catchment (trib of Soar)	Moderate
	Willow Brook Catchment (trib of Soar)	Moderate
	Evington Brook from Source to Willow Brook	Moderate
	Wash Brook Catchment (trib of Soar)	Moderate
	Sence from Source to Burton Brook	Moderate
	Sence from Burton Brook to Countesthorpe Brook	Moderate
	Burton Brook from Source to Sence	Poor
	Countesthorpe Brook from Source to Sence	Moderate
	Whetstone Brook Catchment (trib of River Soar)	Moderate
Southern Gateway	Sketchley Brook from Source to River Anker	Moderate
	Thurlaston Brook Catchment (trib of Soar)	Poor
	Soar Brook from Source to Soar	Poor
	Soar from Source to Soar Brook	Moderate
Northern Gateway	Trent from R Dove Conf to River Derwent	Moderate
	Trent from River Derwent to River Soar	Moderate
	Hemington Brook (trib of the Soar)	Bad
	Soar from Long Whatton Brook to River Trent	Bad
	Long Whatton Brook Catchment (trib of Soar)	Moderate
	Grace Dieu Brook from Source to Black Brook	Poor
	Black Brook from Source to Grace Dieu Brook	Moderate
	Black Brook from Grace Dieu Brook to R Soar	Moderate
	Ramsley Brook from Source to Carr-New Brook	Poor
Melton Mowbray	Eye / Wreake from Langham Brook to R Soar	Poor
	Burton Brook catchment (trib of River Eye)	Poor
	Thorpe Brook Catchment (trib of R Eye)	Moderate
	Scalford Brook Catchment (trib of R Wreak)	Poor
	Great Dalby Brook Catchment (trib of Wreake)	Moderate
	Welby Brook Catchment (trib of Wreake)	Poor
Lutterworth	Swift source to conf Avon	Moderate

Large scale development has the potential to negatively impact the water environment and specifically water quality. Much of the study area is in the Soar management catchment where priority issues already present in this catchment include:

- Diffuse pollution from urban areas and agriculture
- The modification of river and wetland habitats
- Limited understanding of the multiple benefits of SuDS

Future development within the study area could potentially result in further adverse impacts on the water environment as a direct result of strategic development or due to the associated water supply/sewerage infrastructure alterations/improvements. Adverse impacts could include:

- Increased surface runoff and sediment loading causing increased turbidity in watercourses;
- Pollutants in chemicals and wastewaters affecting water quality in surface waters and groundwaters;
- Increased pressure on water resources due to over-abstraction;

Due to the scale of the SGP Growth Areas, any future development could be located near to watercourses and drainage ditches. During planning stages for any development in the future, a more detailed assessment should be made on the impacts of development on the nearby watercourses, considering both water quality and quantity. Future detailed assessments should identify if measure need to be provided prior to construction to avoid any impact on water quality or channel morphology in these receiving waterbodies.

River corridors also form natural wildlife corridors and are an important feature of the landscape in the County, these require adequate buffer zones free from development. In the future, developers should aim to set back development a minimum of 6m from watercourses (wider buffers of 7-8m are set by the EA regions for Main Rivers), providing buffer strips to 'make space for water' and allow additional capacity for climate change. Developers should also look at opportunities for river restoration, de-culverting and river enhancement as part of the development. Such measures could provide an important contribution to WFD objectives for each associated watercourse.

The following management options summarise how future site allocations can minimise their impact on the neighbouring watercourses by reducing both diffuse and point sources of pollution. New developments are required to attenuate surface water runoff and SuDS are the recommended approach as stated in NPPF, paragraph 51 of the Planning Practice Guidance and Building Regulations H. The implementation of SuDS schemes can:

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

The CIRIA SuDS Manual (C753)[51] discusses SuDS design for water quality in Chapter 4. This document recognises the importance of tackling diffuse pollution from urban and rural environments, SuDS are identified as an important means of reducing urban runoff and preventing further deterioration of water quality.

51 Ciria (2015) The SuDS Manual. Accessed online at https://ciria.sharefile.com/share?#/view/eeadc3f1888a4c40 on 06/06/2017

7.3.2 Groundwater

The bedrock groundwater designations underlying Leicester and Leicestershire and Source Protection Zones (SPZ) are shown in Figure 7-2. Principle aquifers are layers of rock or drift deposits that have high intergranular and/or fracture permeability, providing water storage and supply at the strategic scale. Secondary A aquifers contain permeable layers capable of supporting water supplies at a local rather than strategic scale. Secondary B aquifers have predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features.

Much of the eastern Leicestershire is designated as an undifferentiated secondary aquifer. Within eastern Harborough and north-eastern Charnwood and Melton, there are areas of unproductive geology. North-eastern Melton also contains areas of Principle and Secondary A/B Aquifer.

Western Leicestershire is mostly designated as Secondary B Aquifer. North West Leicestershire contains Principle, Secondary A and Undifferentiated Secondary Aquifers. Source Protection Zones (SPZ) are defined for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. Source Protection Zones are used in conjunction with Groundwater Protection Position Statements to set up pollution prevention measures in higher risk areas. The two main areas of Source Protection Zone are located in North West Leicestershire.

Figure 7-2: Bedrock Groundwater Designations and Source Protection Zones in Leicestershire

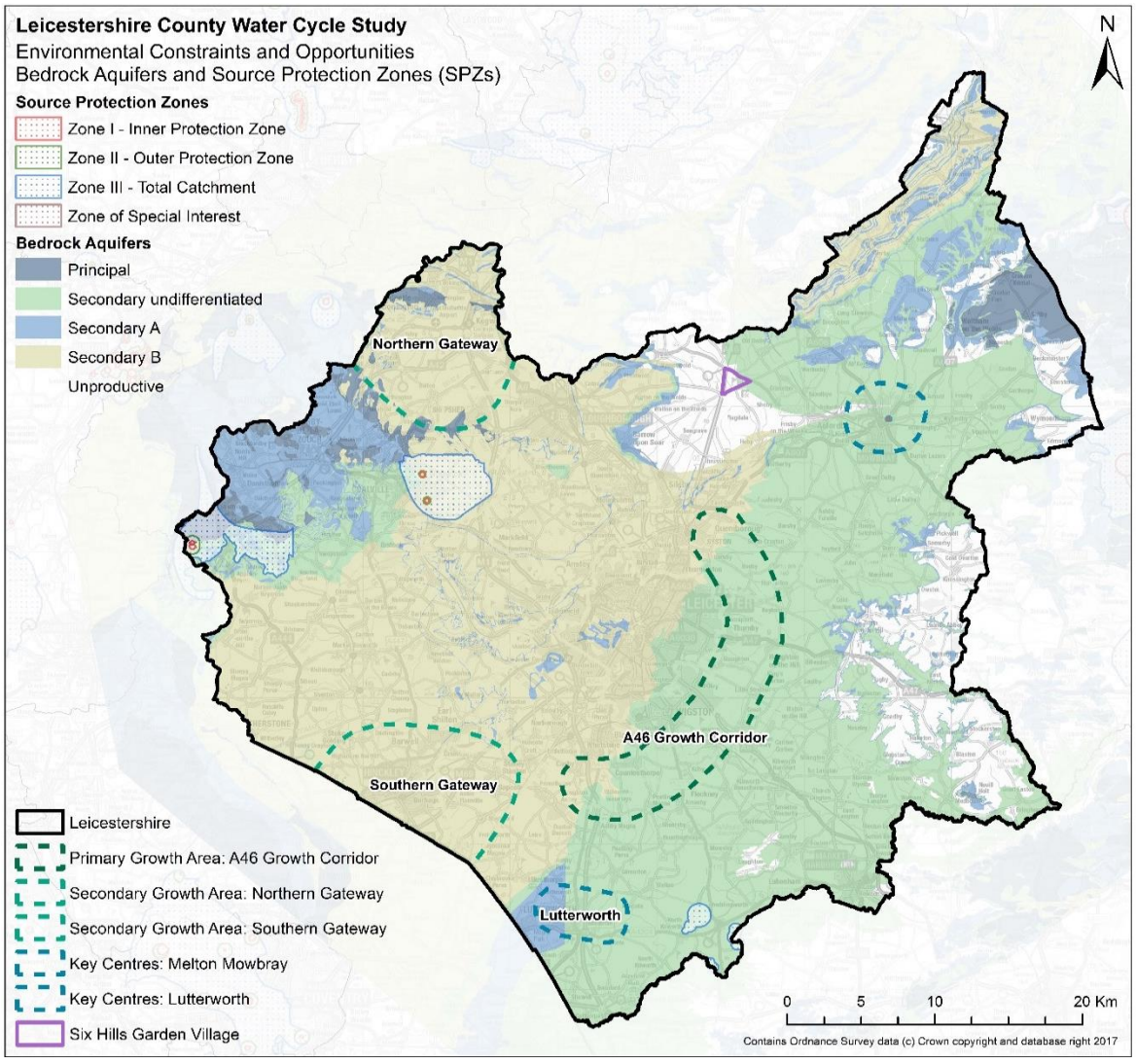
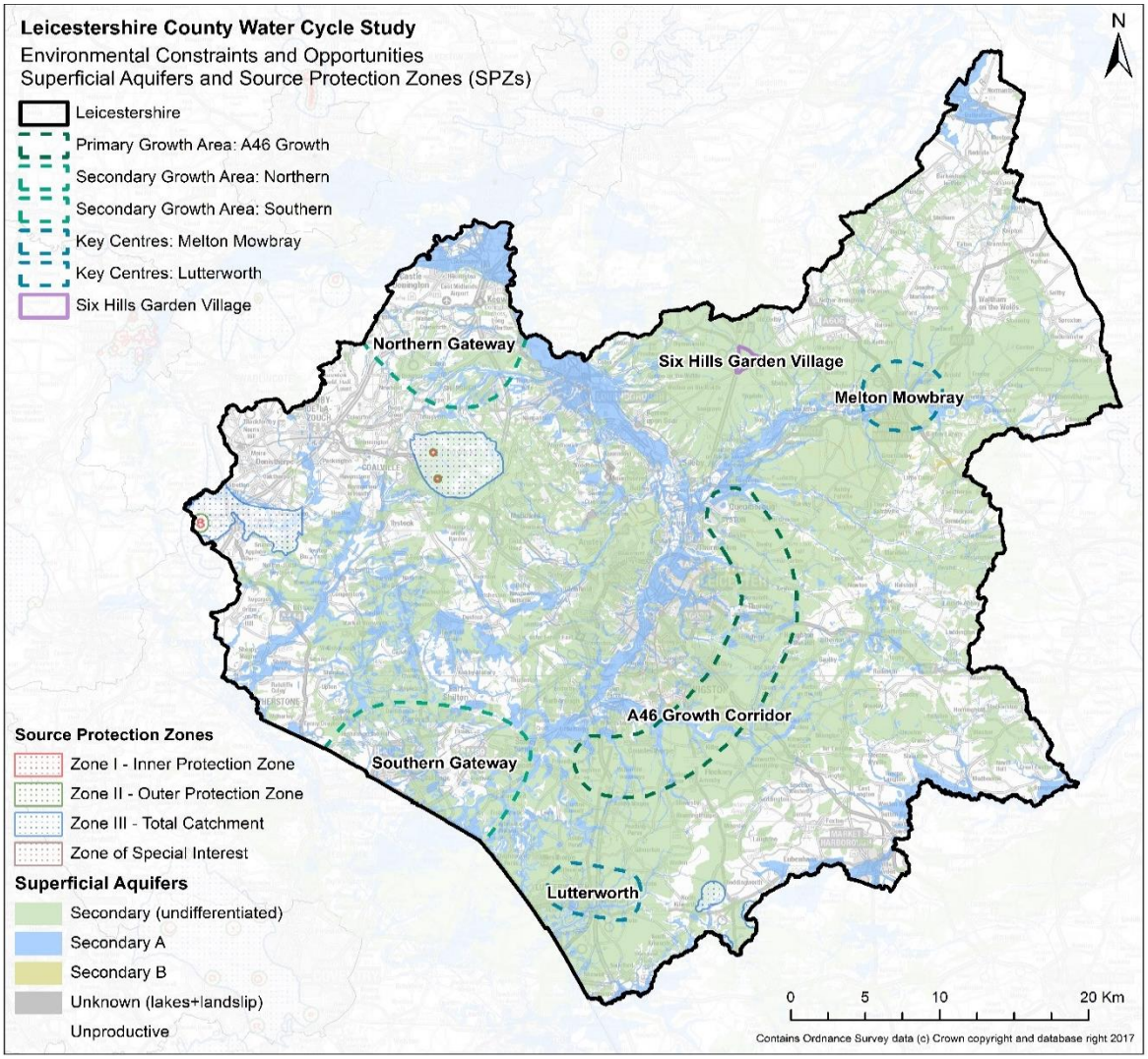


Figure 7-3 shows the locations of the Superficial Aquifers throughout Leicestershire. Much of the County is covered by Secondary Undifferentiated and Secondary A Superficial Aquifer. The main superficial aquifers follow the path of the River Soar northwards through Leicestershire, with Secondary aquifers surrounding it. There are also large areas of unproductive superficial geology.

Figure 7-3: Superficial Groundwater Designations in Leicestershire



Any proposed development located on aquifers or within SPZs must be sensitive to these important environmental designations, this information should be used in combination with guidance based on the EA's Approach to Groundwater Protection[52] and relevant local and national policy.

The use of SuDS on proposed development sites also provides an opportunity to improve (or maintain) recharge of the aquifers present in the study area. SuDS can have numerous benefits by creating wildlife habitats, recreation and amenity areas and improvements to the local landscape. The suitability of proposed infiltration based SuDS will need to be assessed on a site by site basis through a risk assessment which would require approval from the LLFA and EA.

Impermeable surfaces in urban areas reduce rates of infiltration and therefore reduce rates of recharge to the underlying aquifers. Additional impermeable surfaces in areas with poor groundwater status will potentially reduce groundwater recharge further. The use of SuDS can help return water to groundwater by slowing down rainfall runoff in soakaways, permeable surfaces, ponds and wetlands. It is therefore recommended that SuDS are utilised wherever possible and areas assessed as having poor groundwater status. SuDS can also provide ecological gain and in doing so have the potential to contribute towards the green infrastructure network in the study area.

Table 7-4 summarises the bedrock and superficial aquifer conditions and any Source Protection Zones relating to the five SGP Growth Areas.

52 Environment Agency (March 2017) The Environment Agency's Approach to Groundwater Protection. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598778/LIT_7660.pdf on 19/06/2017

Table 7-4: Groundwater Designations in Relation to Strategic Growth Areas

Growth Area	Bedrock Geology	Superficial Geology	Located in SPZ?
A46 Growth Corridor	Northern Extent: Secondary B Aquifers Central Portion: Undifferentiated Secondary Southern Extent: Secondary B	Undifferentiated Secondary Secondary A	No
Southern Gateway	Secondary B Aquifers	Undifferentiated Secondary Secondary A	No
Northern Gateway	Secondary B Aquifer Small Areas of Principle and Secondary A Aquifers	Undifferentiated Secondary Secondary A	No
Melton Mowbray	Undifferentiated Secondary Aquifer	Undifferentiated Secondary Secondary A Secondary B	Small SPZ in the centre of Melton Mowbray
Lutterworth	Eastern Extents: Undifferentiated Secondary Western Extents: Secondary A Aquifer	Undifferentiated Secondary Secondary A	No

In summary, the following points can be made about the proposed Strategic Growth Plan Growth Area locations in relation to the associates surface water and groundwater environments:

- The Strategic Growth Plan Growth Areas contain watercourses that mostly have a Water Framework Directive Overall Waterbody Classification of Moderate or Poor. They are also located at the heads of the catchments, this is particularly the case with the A46 Growth Corridor, so strategic development could potentially have a significant impact on future water quality and the ability to achieve Good Status.
- The Growth Areas are mostly located on secondary bedrock aquifers. The Northern Gateway contains pockets of higher quality principle aquifer. The impacts of development on these areas of principle aquifer should be considered and monitored carefully.
- The Growth Areas are mostly located on undifferentiated superficial aquifers but the superficial geology is highly variable.
- Only the Melton Mowbray Growth Centre contains a Source Protection Zone but this is located in the centre of the town and is unlikely to be affected by strategic development.

7.4 Biodiversity

The County of Leicestershire is predominantly rural in character and biodiversity designations are well distributed across the County There are also a number of nature reserves with the urbanised areas of the City of Leicester. Due to the quantity and distribution of these designations, it is likely that some proposed development sites will be located close to these sites of high environmental importance in terms of biodiversity.

Figure 7-4: Biodiversity Designations in Leicestershire

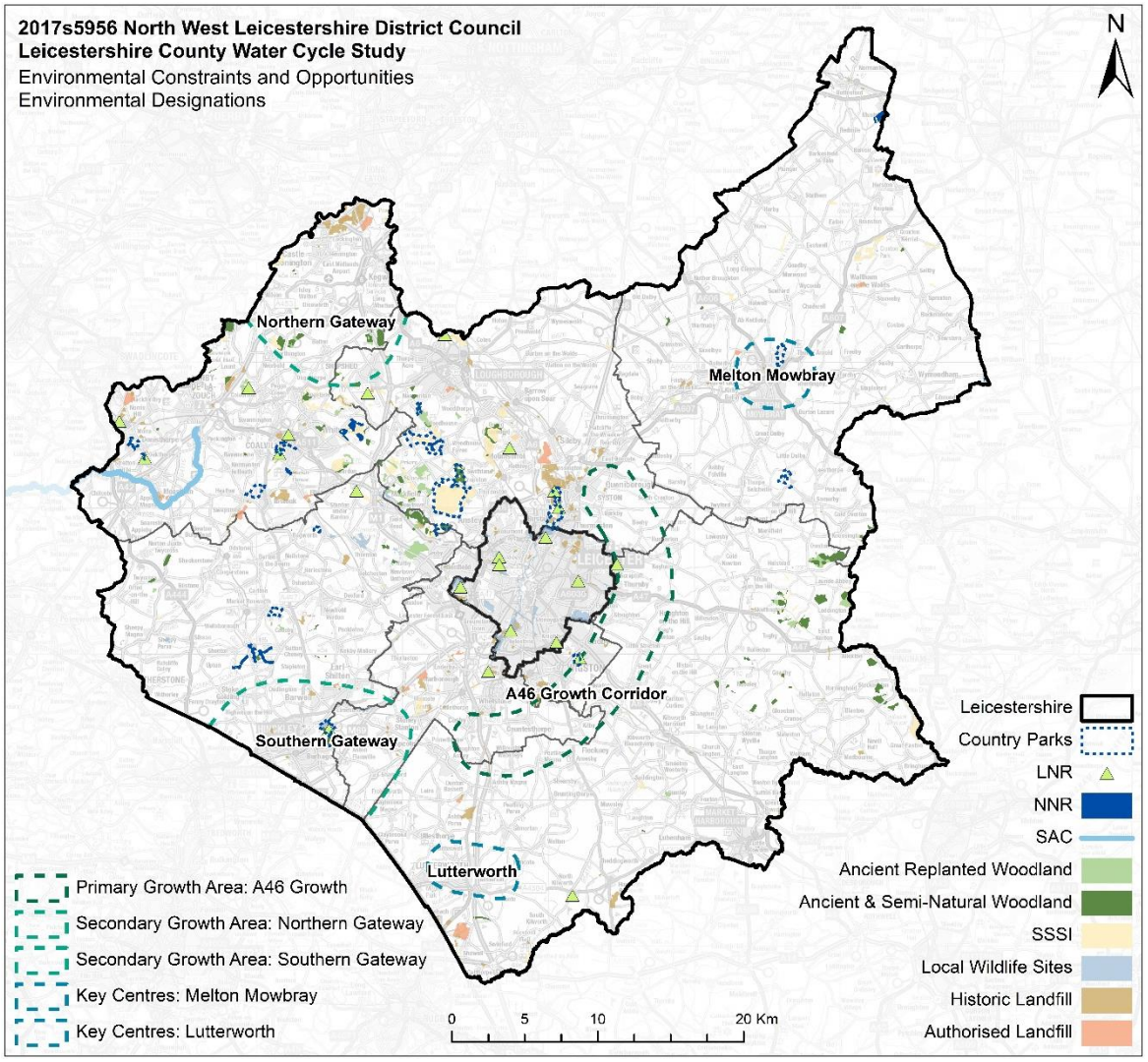


Table 7-5 identifies key environmental and biodiversity designations within each of the SGP Growth Areas. When development is considered within these strategic regions, it is important that any environmental designations in close proximity are considered to ensure that there are not negative impacts on the designations as a result of the proposed development.

The most significant feature identified within the Growth Areas are the historic landfills that are well distributed across the study areas. LPAs must consult with the Environment Agency if development is proposed within 250m of landfill sites. The identification of these features, alongside the additional environmental designations assessed will allow development within the Growth Areas to be located in the most appropriate locations.

Table 7-5: Biodiversity Designations in Relation to Strategic Growth Areas

Opp Area	Biodiversity Sites Located within the Growth Area	
A46 Growth Corridor	**Historic Landfill and Authorised Landfill**	
	Queniborough, Off Barkby Road The Old Railway Cutting, Covert Lane, Keyham Railway Cutting Adjacent to Angus Close Windrush Drive, Oadby Rosemead Drive, Rear of Hidcote Road Rear of Kilby Bridge Garage Ellis Farm, Kilby Bridge, Wigston Kilby Bridge Lock Wigston Urban District Council Rose Farm Business Park, Off Leicester Road Railway Cutting/Rear of Linden Farm Drive Ashville Way Industrial Estate, Whetstone Team Textiles, 85b Narborough Road	Cosby Hill Railway Cutting, Ashby Magna Croft Landfill, Croft, Blaby Off Coventry Road Clint Hill Quarry Church and Long Streets, Stoney Stanton Carey Hill Quarry Railway Cutting Coley's Hole Sapcote Quarry Off Lychgate Lane Off Lychgate Lane/Burbage Lane Off Coventry Road, Shamford Calver Hill Quarry, Sapcote, Blaby
	LNR	**SSSI**
	Scraptoft LNR Lucas Marsh LNR	Kilby-Foxton Canal Croft and Huncote Quarry Croft Pasture
Southern Gateway	**SSSI**	
	Burbage Wood and Aston Firs	
	Historic Landfills and Authorised Landfills	**Local Wildlife Site**
	Urban District Council Refuse Tip, Stapleton Lane, Barwell Urban District Council Refuse Tip, Beryl Avenue, Hinckley Barwell Landfill Site Nelson Burgess Landfill Site Off Barwell Lane Hinckley Road Landfill Site Barwell Landfill Site C, Church Lane Brookfield Road Landfill Site A Stapleton Landfill Site B Brook Farm Landfill Site	Burbage Common & Woods Clarendon Park, Mature Ash Burbage Flood Retention Area Mature Oak, off Barwell Lane Clarendon Park Arboretum Brodick Road Flood Retention Area Courting Stiles Little Fields Farm Meadow Field Rose Hedgerow Meadow and Pond, Brook Farm
Northern Gateway	**SSSI**	
	Breedon Hill Lockington Marshes Oakley Wood	Breedon Cloud Wood and Quarry Pasture and Asplin Woods
	Historic Landfill and Authorised Landfill	
	Trent Lane Hemington Dredging Tip Hemington Gravel Pit Off Grimes Gate, Diseworth Off Main Street, Cavandish Bridge Hemington Pit, North West Leicestershire Cavendish Bridge	Long Mere Lane, Diseworth Off Oakley Road, Shepshed, Charnwood Off Hathern Road Hemington Gravel Pit Hemington Quarry (Authorised Landfill) Lockington Quarry Landfill Site (Authorised Landfill)
Melton Mowbray	**SSSI**	
	River Eye	
	Historic Landfill and Authorised Landfill	
	Land off Lake Terrace, Melton Mowbray Adjacent to White House Farm, Leicester Road Thorpe Road (A607) Railway Cutting off Firwood Road Council Offices, Melton Mowbray	Dixons Metal, Leicester Road, Melton Mowbray Saxby Road, Melton Mowbray Saint-Gobain Construction Products UK Limited (Authorised)
Lutterworth	**SSSI**	**Historic Landfill and Authorised Landfill**
	Misterton Marshes	Milords Farm and Moorbarns Farm

7.5 Opportunities

There are numerous environmental opportunities that could be considered for each of the proposed development sites. Implementation of these opportunities would have the potential to help mitigate the potential environmental impacts that could occur because of the development and deliver environmental benefits, particularly in relation to water quality and biodiversity. The nature and scale of any environmental benefits achieved would depend upon the site characteristics and sensitivity of the surrounding environment. These environmental opportunities are summarised in Table 7-6.

Table 7-6: Environmental Opportunities

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

7.6 Conclusions

Development within the study area has the potential to cause a range of adverse environmental impacts on the water environment and biodiversity features. Environmental designations of all types are will distributed across all the study area. An assessment of the SGP Growth Areas has been completed in relation to the environmental features present. Due to the scale of these sites, most contain or are close to a range of environmental designations that should be considered during the planning process and site allocation. This does not necessarily mean that these sites are unsuitable for development, but more care should be taken to consider these limitation and constraints should be appropriately addressed.

The potential for adverse impacts on the water environment is closely related to the presence and sensitivity of water features within, or near to each development site. Where such features exist, adequate consideration should be implemented in the design of the development to ensure the effective protection during both the construction and operational phases.

Measures should include protecting surface waterbodies, groundwater resources and preventing the contamination of surface water runoff. Such measures would include the provision of wide vegetated buffer zones adjacent to watercourses to reduce the risk of contaminated runoff affecting river water quality and to promote aquatic biodiversity. In addition, measures would be required to protect water quality and water resources in underlying aquifers. The use of SuDS systems would promote infiltration of surface runoff and contribute to groundwater recharge, whilst also offering potential biodiversity, flood risk and amenity benefits.

All planning applications for major developments should include surface water drainage strategies which demonstrates how SuDS will be used to protect receiving surface and/or groundwater from contaminated runoff and prevent an increase in flood risk. These should be completed in line with the CIRIA SuDS Manual and the current Leicestershire County Council and Leicester City Council for guidance. Similarly, all planning applications for minor developments should also demonstrate how SuDS will be used to protect receiving surface and/or groundwater from contaminated runoff.

Proximity to an environmental designation need not prevent development, however the onus is placed on the applicant for any site to prove that deterioration of the environment will not occur because of the proposed development. Likewise, it is the responsibility of the relevant authority (Environment Agency for main rivers, LLFA for ordinary watercourses and groundwater) to ensure that where there is a potential for detrimental impact, that the applicant has submitted suitable plans for the design, implementation and maintenance of mitigation measures.

Development of each site may also result in other environmental risks not specifically related to the water environment. Such effects could include the loss of, or damage to, important archaeological and heritage features, adverse impacts on terrestrial biodiversity, impacts on the setting of landscape or historic environment features, and the loss of high quality agricultural land. Development proposals for these sites would need to consider the sites wider context and planning policy. There are also a range of potential environmental opportunities that could be delivered through any development proposals.

7.7 Recommendations

This study has provided a high-level appraisal of the potential environmental risks and opportunities associated with Leicestershire and the Strategic Growth Plan Growth Areas. This assessment should be used in conjunction with Sustainability Appraisals (SAs) and/or Strategic Environmental Assessments (SEAs) where available. More detailed assessments of the environmental issues associated with the development of each strategic site should be undertaken prior to the approval for development to commence. This should include a thorough desk study and site surveys as required to fully identify sensitive environmental features present on each site.

Table 7-7: Environmental Constraints and Opportunities Recommendations

Recommendations	Responsibility	Timescale
Consultation with LA ecologists should be undertaken in relation to the development of each site to further identify further environment risks, opportunities and mitigation measures.	Developers and local authorities	Ongoing
Developers should seek to maximise water quality and amenity/ecological benefits using SuDS for surface water flood management. SuDS design should be specific to each site to maximise benefits. Careful planning of SuDS schemes in areas identified as aquifers or sensitive to groundwater contamination would be required to ensure no impact on groundwater quality.	Developers and local authorities	Ongoing
Watercourses should be protected through the inclusion of riparian buffer strips. These zones will increase infiltration of surface runoff with potential benefits in terms of flood risks and water quality in the receiving watercourse.	Developers	Ongoing
The removal or modification of existing river culverts should be considered where practicable in line with Environment Agency guidance. Modification of culverts has the potential to reduce flood risk due to blockages, create a more natural river bed profile and hydromorphological process, and also benefit biodiversity. Implementation of these measures could contribute towards delivery of the requirements of the Water Framework Directive.	Developers, EA and local authorities	Ongoing

8 Climate Change Impact Assessment

8.1 Approach

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessment made in this strategic level WCS. This assessment has been completed using a matrix which considers both the potential impact of climate change on the individual assessment in question and the degree to which climate change has been considered within the information used to complete the assessment contained within the Water Cycle Study (Table 8-1).

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

Table 8-1: Climate Change Pressures Scoring Matrix

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

8.2 Results

Table 8-2: Scoring of Climate Change Consequences for the Water Cycle Study

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the assessment?	RAG
Water Resources and Water Supply	High (1 and 2)	Yes - qualitative within the WRMP and RMBP	
Water Supply Infrastructure	Medium - some increased demand in hot weather	No - not considered	
Wastewater Collection	High - Intense summer rainfall and higher winter rainfall increases flood risk	No - not considered in STWL or AW assessment	
Wastewater Treatment	Medium - Increased winter flows and more extreme weather events reduces flow headroom	No - not considered in assessment	
WwTW Odour	Low	No - not considered	
Water Quality	Nutrients: High (1) Sanitary determinands: Medium (1)	No - not considered	
Environmental Constraints	Low	No - Not Considered	

8.3 Recommendations

Table 8-3: Climate Change Assessment Recommendations

Recommendations	Responsibility	Timescale
When undertaking detailed assessments of environmental or asset capacity, consider how climate change guidance can be included.	EA, STWL, AW, Leicestershire County Council, LAs in Leicestershire	As required
Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change. E.g. consider surface water exceedance pathways when designing site layouts.	Leicestershire County Council, Developers	As required

9 Summary and Recommendations

9.1 Water Cycle Study Summary

This Water Cycle Study has been carried out in cooperation with the Environment Agency, Severn Trent Water and Anglian Water for the City of Leicester and County of Leicestershire and covers the following non-unitary local authorities:

- North West Leicestershire District
- Charnwood Borough
- Melton Borough
- Harborough District
- Oadby and Wigston Borough
- Blaby District
- Hinckley and Bosworth

The high-level study has identified no significant strategic-scale water, wastewater or environment constraints to growth within the general SGP Growth Areas. Due to a lack of detailed information of the specific locations of growth within the five broad SGP Growth Areas, this WCS aims to provide background information on the growth locations and where future development would be most suitable. **It is recommended that once detailed information is known about the locations of SGP development, further assessments will be required to identify site-specific constraints that should be taken into account before development can occur.**

Future Growth in Leicestershire

The nine organisations within Leicester and Leicestershire, have formed a partnership to prepare a non-statutory Strategic Growth Plan (SGP) for the City and County. This aims to set out aspirations for delivering residential, economic and strategic infrastructural growth to 2050. The SGP has identified several strategic locations to potentially accommodate the projected growth from 2031 to 2050:

Primary Growth: A46 Growth Corridor and the City of Leicester

Secondary Growth: Northern Gateway | **Secondary Growth:** Southern Gateway

Key Centre: Melton Mowbray | **Key Centre:** Lutterworth

This WCS provides a high-level analysis of the impacts of strategic growth at the identified Primary Growth Centre, Secondary Growth Centres and Key Growth Centres across the County to assess the potential impacts of future growth on the water cycle in Leicestershire.

The Leicester and Leicestershire Housing and Economic Development Needs Assessment (HEDNA) was also produced in 2017, providing an integrated assessment of the future housing needs and the scale of future economic growth across the County to 2031/2036. The local authorities within Leicestershire have also produced lists of committed sites that are expected to be constructed to 2031. **These sites have been assessed alongside the Growth Areas to give a full picture of the impacts of large scale growth across Leicestershire.**

Water Resources

Water Resource Assessment - Availability of Water Resources

The County of Leicestershire is covered by six CAMS (prepared by the EA for water resource management) in which water resources were assessed:

- **Lower Trent and Erewash CAMS:** Water is available for licensing during the high flows and restricted flow available during low flows.
- **Soar CAMS:** Water is available for licensing during the high flows and restricted flow is available during low flows.
- **Tame, Anker and Mease CAMS:** Water is available for licensing during the high flows and restricted flow is available during low flows.
- **Warwickshire Avon CAMS:** The River Swift has water available for licensing in the high flows but none in the low flows. The Upper River Avon has no water available for licensing.
- **Welland CAMS:** In the Welland catchment, there is no water available for abstraction except in extremely high flows and the Eyebrook Reservoir plays a role in availability.

Water Resource Assessment: Water Resources Management Plans

When new development within a County or local authority is planned, it is important to ensure that there are adequate water resource provisions in the area to supply the increases in demand without risking shortages in the future or during periods of significantly high water demand. **The STWL supply region is classed as an area of "moderate" water stress in all scenarios assessed. The AW supply region, which includes small parts of Harborough and Melton, is identified as an area of "serious" water stress.**

Leicestershire is almost entirely within the STWL Strategic Grid Water Resource Zone (WRZ) and would therefore be managed in the same way over the next 25 years. **The Strategic Grid is likely to require significant investment to cope with rapid growth**, reduce unsustainable abstractions and to manage the long-term impacts of climate change. This is detailed in the WRMP.

Water Resource Assessment: Water Supply Infrastructure Assessment

Water and sewerage undertakers have an obligation to accommodate new development through the provision of additional waste water capacity (both sewerage and treatment) and to ensure adequate clean water supply (covering resources, treatment and distribution).

The response from the water company indicates that **water supply is not expected to be a constraint to development**. There would still be a requirement for Severn Trent Water to ensure that water could be supplied to each development adequately so, as development occurs within the study area, detailed modelling of water supply infrastructure will allow any infrastructural upgrades to be completed without restricting the timing, location or scale of the planned development.

Wastewater Collection and Sewerage System Capacity

Wastewater Assessment - High Level Wastewater Treatment Assessment - local authority Sites

This assessment identified **45 STWs** that could receive additional wastewater from the development of residential and employment sites. Many treatment works in the study area could receive significant increases in wastewater flows in the future due to the quantity and scale of some sites. It is recommended that as development progresses in Leicestershire, allocations are assessed in relation to each STW in detail so that upgrades or new infrastructure can be planned appropriately.

Wastewater Assessment - High Level Wastewater Treatment Assessment - Strategic Sites

This high-level assessment has identified that **23 STWs** could be affected by future development proposed in the SGP. Once more is known about the precise locations of growth, assessment will be required to fully understand the impact of strategic growth on wastewater infrastructure.

Wastewater Assessment - Wastewater Network Capacity Assessment

Developers have a legal right to connect to public sewers for newly developed sites as set out in the Water Industry Act 1991. Sewerage undertakers are also obliged to provide sewage treatment for sites which benefit from planning permission and are responsible for any required investment through their business planning process. **Therefore, wastewater network capacity should not be a constraint to future development but any identified capacity issues could have an impact on the timescale of development delivery in the future.**

Wastewater Assessment - Cumulative Wastewater Treatment Assessment: 2011 - 2050

This assessment has identified the STWs most likely to be significantly impacted by cumulative growth across Leicestershire. It has **identified STWs likely to be receiving significant additional wastewater flows from multiple sources and ranked them based on priority**. There are still some uncertainties present within this assessment due to the lack of information on the precise locations of growth between 2031 and 2050. It is recommended that once detailed information on growth is known, a detailed cumulative assessment is completed to fully understand how each STW across Leicestershire could be affected to 2050.

Wastewater Treatment Flow and Water Quality

Wastewater Treatment Flow Permit Assessment

The increases in Dry Weather Flow (DWF) at each STW have been compared to the maximum permitted DWF at each STW, identifying if there is capacity available at the STW to manage the additional wastewater flows from the local authority sites and the SGP Growth Areas. This assessment has identified that several STWs are already working close to, or over, their permitted Max DWF rates with the current development levels. Additional wastewater flows, from local authority allocated sites, could therefore put significant additional demand on these STWs. Other STWs are predicted to exceed their permits in the near future as a result of the development.

It is likely that, due to the significant levels of growth proposed throughout the study area to 2050, significant wastewater infrastructural upgrades and investment will be required to manage the levels of development proposed.

Scoping Water Quality Assessment

This scoping Water Quality Assessment (WQA) provides an overview of the STWs located within the SGP Growth Areas and the Water Framework Directive Overall Waterbody Classifications for watercourses also located within these areas. This assessment shows the current water quality situation within the Growth Areas and how future development could impact these watercourses in terms of meeting their future water quality objectives.

Due to the lack of information currently available on the specific locations of growth, this assessment provides a background understanding of the current water quality situation in the Growth Areas. However, due to the geography and nature of the watercourses in the SGP Growth Areas, environmental capacity to receive large additional volumes of treated effluent is likely to be limited in all areas except the Melton Growth Centre. It is therefore likely that significant investment will be required in treatment to reduce the pollutant load discharged into the water environment.

It is recommended that, when more information is available about the specific locations of development and the scale of growth, that a more in depth quantitative assessment of the impacts of growth on water quality is completed. This should take into account phased local authority and Strategic Growth and, where appropriate existing SIMCAT water quality models exist, should be undertaken on a catchment scale in line with Environment Agency guidance.

Sewage Treatment Works Odour Assessments

In terms of the SGP Growth Areas, STW have been identified within the strategic areas. **This assessment aims to make future developers aware of the potential risks associates with developing the land near STWs in terms of odour**, so that development can be allocated in the most suitable locations within the Growth Areas.

The scale of future development proposed in each Growth Area would be significant and new STWs and associated infrastructure are likely to be required in many locations. Due to the current uncertainty on the specific locations of future development, it is difficult to assess how future wastewater treatment infrastructure could impact new developments.

Environmental Constraints and Opportunities

Development within Leicestershire has the potential to cause a range of adverse impacts on the water environment, biodiversity features, historical features and agricultural uses. Environmental designations of all types are will distributed across all the local authorities making up Leicestershire. An assessment of the SGP Growth Areas has been completed to identify key environmental features that may affect development in specific locations of the Growth Area. **Due to the scale of these sites, most contain a range of environmental designations that should be considered in detail during the site allocation and planning process.**

Climate Change Assessment

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

The capacity of the sewerage system and the water quality of receiving water bodies stand out as two elements of the assessment where the consequences of climate change are expected to be high but no account has been made of climate impacts in the assessment. Where feasible, these should be taken into account in the additional assessment included within any future assessment of the water cycle when more detailed information on site allocations in available.

9.2 Timescales for Implementing Water and Wastewater Upgrades

Where it is identified that potential growth may exceed the existing capacity of the water and wastewater systems, further quantitative assessment will be required to further assess the situation within the study area, when more detailed information about the locations of development within the SGP Growth Areas is available. The timescale required to implement any specific infrastructure upgrade will depend on many site-specific factors, including but not limited to the scale of works, engineering complexity, planning and environmental constraints, negotiation of land purchase, access and wayleave, ground conditions and traffic conditions.

It is beyond the scope of this Water Cycle Study to assess the timescales required to make individual infrastructure upgrades, however, Table 9-1, developed utilising advice from Water Companies, provides indicative timescales for different types and sizes of upgrade if they are required.

Table 9-1: Indicative Timescales for Implementing Water Infrastructure Upgrades

Infrastructure Type	Trigger for water company to assess requirements and develop plans	Indicative project timescales for infrastructure upgrades or other interventions	
		Minor	Major
Water resources	Publication of LPA Local Plans and associated updates	Demand management measures, minor new resource e.g. borehole: 3-5 years	New strategic asset e.g. water reuse plant, reservoir: 5-20 years
Water supply	Pre-development enquiries Planning applications	Localised supply pipe upgrades: 1-2 years	New supply mains, boosters, service reservoirs, treatment works 3-5 years
Wastewater treatment	Pre-development enquiries Planning applications	Minor upgrade of existing treatment works: 2-4 years	Major upgrade or new treatment works 3-5 years
Sewerage	Pre-development enquiries Planning applications	Localised sewerage upgrades: 1-3 years	New collector sewers or other strategic assets: 3-5 years

As is emphasised throughout this study, early developer engagement with water companies is essential to ensure that water and wastewater providers have adequate time to provide infrastructure upgrades required to accommodate growth.

9.3 Recommendations

Table 9-2: All Water Cycle Study Recommendations

	Action	Responsibility	Timescale
Water Resources and Water Supply	Review population and housing growth forecasts within Severn Trent Water Strategic Grid WRZ	Severn Trent Water, LC local authorities	ASAP
	Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	Severn Trent Water	Ongoing
	Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	Local authorities and other LPAs in the Strategic Grid	Ongoing
	Consider using planning policy to meet the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas. The STWL supply region is currently considered to be moderately stressed.	LC local authorities	In draft Local Plan
	Water companies should advise Leicestershire County Council of any strategic water infrastructure developments, where these may require safeguarding of land to prevent other type of development occurring. However, at present, no major potential schemes have been identified.	STWL, Leicestershire local authorities	In draft Local Plan
Water Supply Infrastructure	Where necessary, identify the scale of likely solutions to accommodate growth, and build the likely timescale for delivering the infrastructure into the overall delivery programme to identify key dates and potential programme constraints	STWL	Ongoing
	Undertake technical studies to understand options to provide sufficient bulk and local transfer capacity and communicate results within Leicestershire	STWL	Ongoing
	Developers seek early consultation with Severn Trent Water to ensure adequate time is available to provide local distribution main upgrades to meet additional demand.	STWL	Ongoing
Wastewater Infrastructure Assessment: 2011 – 2031 Growth	Provide updates to STWL and AW on projected development	LAs within Leicestershire	Annually
	STWL and AW to assess growth demands as part of their wastewater asset planning activities and feedback to relevant parties where concerns arise.	STWL and AW	Ongoing
	Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity.	STWL and AW	Ongoing
	STWL, AW, EA and local authorities within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LAs within Leicestershire	Ongoing
Wastewater Infrastructure Assessment: 2031-2050 Strategic Growth	Provide updates to STWL and AW on strategic level development within the SGP growth so that detailed assessments of STW and network capacities can be calculated to inform future upgrades.	LAs within Leicestershire	Annually
	STWL and AW to assess growth demands as part of their wastewater planning activities and feedback to relevant parties if concerns arise.	STWL and AW	Ongoing
	Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity in Leicestershire.	STWL and AW	Ongoing
	STWL, AW, EA and LAs within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LAs within Leicestershire	Ongoing

	Action	Responsibility	Timescale
Wastewater Infrastructure Assessment: 2031-50 Non-Strategic Growth	Provide updates to STWL and AW on the locations of non-strategic development across Leicestershire so that detailed assessments of infrastructure and network capacities can be completed to inform future upgrades.	LA's within Leicestershire	Ongoing
	STWL and AW to assess the 2031-2050 growth demands as part of their wastewater planning activities and feedback to relevant parties if concerns arise.	STWL and AW	Ongoing
	Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity in Leicestershire.	STWL and AW	Ongoing
	STWL, AW, EA and LA's within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LA's within Leicestershire	Ongoing
Wastewater Collection and Treatment	Consider wastewater infrastructure constraints when allocating and phasing development across Leicestershire in partnership with Severn Trent Water and Anglian Water.	Leicestershire County Council, LAs, Developers, STWL and AW	Ongoing
	Provide updates to STWL and AW on projected development within Leicestershire	LAs within Leicestershire	Annually
	STWL and AW to assess growth demands as part of their wastewater asset planning activities and feedback to the commissioning group where concerns arise.	STWL and AW	Ongoing
	Undertake technical studies to understand the impacts of growth on the sewerage system infrastructure and capacity in Leicestershire.	STWL and AW	Ongoing
	STWL, AW, EA and local authorities within Leicestershire should work closely to ensure the timely delivery of any necessary STW upgrades.	STWL, AW and LAs within Leicestershire	Ongoing
	STW, AW and developers will be expected to work closely and early in the planning process to develop an outline drainage strategy for sites. The outline drainage strategy should set out sufficient detail to determine the likely timescales for the delivery of the infrastructure and the likely costs. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	STWL, AW and Developers	Ongoing
	Developers will be expected to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to sewer seen as the last option.	Developers LLFA	Ongoing
Sewage Treatment Works Flow Permit Assessment	Assess, in more detail, the combined impacts local authority and strategic scale on STWs that could be affected by growth in the future when more detailed locations of strategic growth are available.	LAs in Leicestershire	Ongoing
	Consider the available STW capacity when phasing developing going to the same STW.	LAs in Leicestershire	Ongoing
	Provide annual updated to STWL and AW detailing projected housing growth in the County.	LAs in Leicestershire	Ongoing
	STWL and AW to assess growth demands as part of their wastewater asset planning activities and feedback to Leicestershire County Council if concerns arise.	LAs in Leicestershire	Ongoing

	Action	Responsibility	Timescale
Scoping Water Quality Assessment	Where possible, consider the water quality constraints when allocating and phasing future development sites	LAs	Ongoing
	Once more information is known about future growth in the growth areas, more thorough qualitative and quantitative assessments of the impacts of growth on water quality should be completed	Consultants	Ongoing
	Water quality impacts from surface water runoff from proposed development sites should be mitigated using Sustainable Drainage Systems (SuDS), in line with national and regional SuDS policy and guidance.	Developers, Leicestershire County Council and LAs	Ongoing
STWs Odour Assessment Recommendations: 2031-2050 Strategic Growth	Consider the locations of existing wastewater infrastructure and the 800m buffer when locating future development within the SGP Growth Areas	Local Authorities and Site Developers	Ongoing
	Consider odour risk in the sites identified to be less than 800m from a STW	Local Authorities	Ongoing
	Carry out an odour assessment for sites identified as being within 800m from an existing STW	Site Developers	Ongoing
Environmental Constraints and Opportunities	Consultation with LA ecologists should be undertaken in relation to the development of each site to further identify further environment risks, opportunities and mitigation measures.	Developers and local authorities	Ongoing
	Developers should seek to maximise water quality and amenity/ecological benefits using SuDS for surface water flood management. SuDS design should be specific to each site to maximise benefits. Careful planning of SuDS schemes in areas identified as aquifers or sensitive to groundwater contamination would be required to ensure no impact on groundwater quality.	Developers and local authorities	Ongoing
	Watercourses should be protected through the inclusion of riparian buffer strips. These zones will increase infiltration of surface runoff with potential benefits in terms of flood risks and water quality in the receiving watercourse.	Developers	Ongoing
	The removal or modification of existing river culverts should be considered where practicable in line with Environment Agency guidance. Modification of culverts has the potential to reduce flood risk due to blockages, create a more natural river bed profile and hydromorphological process, and also benefit biodiversity. Implementation of these measures could contribute towards delivery of the requirements of the Water Framework Directive.	Developers, EA and local authorities	Ongoing
Climate Change Assessment	When undertaking detailed assessments of environmental or asset capacity, consider how climate change guidance can be included.	EA, STWL, AW, Leicestershire County Council, LAs in Leicestershire	As required
	Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change. E.g. consider surface water exceedance pathways when designing site layouts.	Leicestershire County Council, Developers	As required

Offices at

Coleshill
Doncaster
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Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office

South Barn
Broughton Hall
SKIPTON
North Yorkshire
BD23 3AE
United Kingdom

t: +44(0)1756 799919
e: info@jbaconsulting.com

Jeremy Benn Associates Ltd

Registered in England 3246693

Visit our website

www.jbaconsulting.com