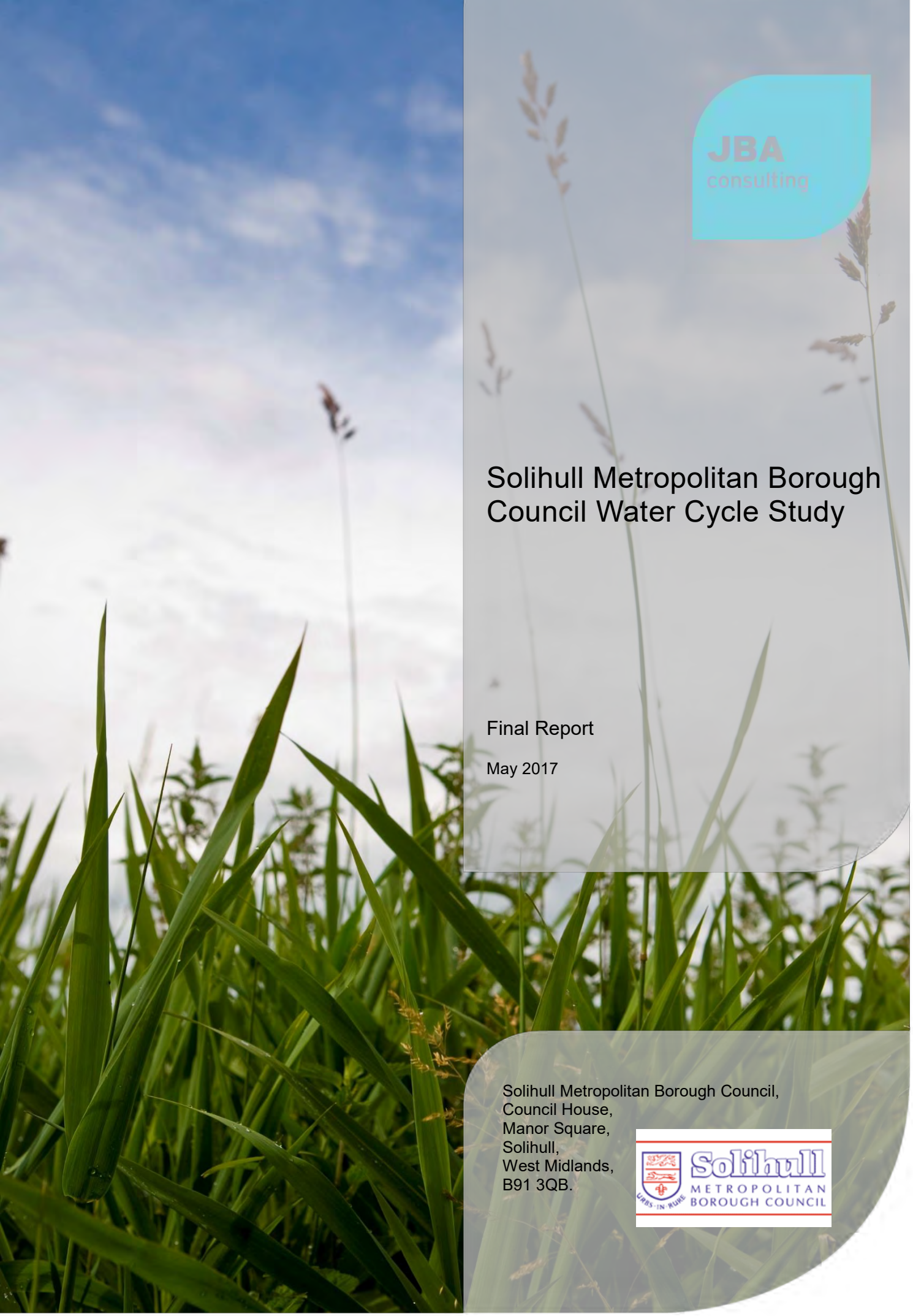

Solihull Metropolitan Borough Council Water Cycle Study

Final Report

May 2017

Solihull Metropolitan Borough Council,
Council House,
Manor Square,
Solihull,
West Midlands,
B91 3QB.

JBA Project Manager

Claire Gardner
The Library
St Philips Courtyard
Church Hill
COLESHILL
Warwickshire
B46 3AD
t: 01827 722710

Revision History

Revision Ref / Date Issued	Amendments	Issued to
Draft v1.0 / 1st February 2017		Solihull Metropolitan Borough Council. Environment Agency, Severn Trent Water
Final v2.0 / 19th May 2017	Amended following comments from project partners	Solihull Metropolitan Borough Council. Environment Agency, Severn Trent Water

Contract

This report describes work commissioned by Solihull Metropolitan Borough Council. The Council's representative for the contract was Maurice Barlow. Cheryl Briars and Paul Eccleston of JBA Consulting carried out this work.

Prepared by .....Cheryl Briars
Assistant Analyst

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

Purpose

This document has been prepared as a Draft Report for Solihull Metropolitan Borough Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Solihull Metropolitan Borough Council.

Acknowledgements

JBA Consulting would like to thank Solihull Metropolitan Borough Council, the Environment Agency and Severn Trent Water Limited for assistance in preparing this report.

Carbon Footprint

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Executive Summary

Introduction

In September 2016, JBA Consulting was commissioned by Solihull Metropolitan Borough Council (SMBC) to undertake a Phase 1 Water Cycle Study (WCS) which assesses the potential issues relating to future development within the Borough and the impacts on water supply, wastewater collection and wastewater treatment. The Water Cycle Study is required to assess the constraints and requirements that will arise from potential growth on the water infrastructure.

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. The allocation of large numbers of new homes in certain locations may result in the capacity of existing available infrastructure being exceeded, a situation that could potentially cause service failures to water and wastewater customers, adverse impacts to the environment, or high costs for the upgrade of water and wastewater assets being passed on to bill payers.

In addition to increased housing demand, future climate change presents further challenges to pressures on the existing water infrastructure network, including increased intensive rainfall events and a higher frequency of drought events. Sustainable planning for water must now take this into account. The water cycle can be seen in Figure 1-1 below, and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

Figure 1-1: The Water Cycle

*Source: Environment Agency – Water Cycle Study Guidance

This study will assist the council to select and develop sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure, and flood risk. This has been achieved by identifying areas where there may be conflict between any proposed development, the requirements of the environment and by recommending potential solutions to these conflicts.

The WCS has been carried out in co-operation with the Environment Agency and Severn Trent Water. Overall, there are no major issues identified which indicate that the planned scale, location and timing of planned development within the Borough is achievable from the perspective of supplying water and wastewater services, and preventing deterioration of water quality in receiving waters. However, significant WwTW capacity issues have been identified at 10 of the 21 sites[1]. Early developer engagement will, as in all major developments, be essential to ensure that sufficient time is available to build capacity upgrades prior to the development connecting to the network.

1 Please note that for the purpose of this report, site 8 (one of the 20 sites identified in the DLP) on Hampton Road has been split into A and B, and therefore this Water Cycle Study reports that there are 21 sites in total.

This Water Cycle Study also identified whether infrastructure upgrades are expected to be required to accommodate planned growth. Timely planning and provision of infrastructure upgrades will be undertaken through cooperation between Solihull Metropolitan Borough Council, Severn Trent Water, the Environment Agency, and specific developers.

Development Scenarios and Policy Issues

This Water Cycle Study is an assessment of the impacts of the planned development within the Metropolitan Borough of Solihull. A "call-for-sites" returned a total of 245 sites of which 20 sites are being proposed for development as part of the Draft Local Plan allocation (please note that for the purpose of this report, site 8 on Hampton Road has been split into A and B and therefore this study reports that there is a total of 21 sites). The Water Cycle Study forms part of the evidence base supporting the Draft Local Plan (DLP) and will assist in determining the final site allocations.

Legal agreements under the Town and Country Planning Act Section 106 agreement, and Community Infrastructure Levy agreements are not intended to be used to obtain funding for water or wastewater infrastructure. It is not therefore necessary for Solihull MBC to identify requirements for developers to contribute towards the cost of upgrades in its Local Plan.

The Water Industry Act sets out arrangements for connections to public sewers and water supply networks, and developers should ensure that they engage at an early stage with Severn Trent Water to ensure that site specific capacity checks can be undertaken, and where necessary, additional infrastructure is constructed to accommodate the development. Where permitted, Severn Trent Water may seek developer contributions towards infrastructure upgrades. Upgrades to water resources and wastewater treatment works are funded through Severn Trent Water's company business plans.

Water Resources

All proposed development sites are located within the Environment Agency Catchment Abstraction Management Strategies (CAMS) of the Warwickshire Avon and the Tame, Anker and Mease. Both CAMS and therefore the borough of Solihull have restricted water available for licensing and therefore the sites have been considered to be under moderate water stress by the EA.

All proposed developments sites within the Metropolitan Borough of Solihull would be supplied by Severn Trent Water and are located within the large Strategic Grid Water Resource Zone (WRZ). The Water Resource Management Plan (WRMP) demonstrates the pressures on water resources throughout the STW supply area but makes adequate provision for the proposed growth in housing within the Solihull Borough and other LPAs within the WRZ. Therefore, water resources would not be considered a barrier to planned growth in the Borough.

The Planning Practice Guidance advises planning authorities on how to gather evidence to set optional requirements, including those for water efficiency. It states that all new homes already have to meet the mandatory national standard set out in Building Regulations (of 125l/ppd). This guidance recommends that where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110l/ppd. It is recommended that SMBC take the opportunity, through the planning system, to ensure that new homes do meet the higher standard of domestic water usage, at nominal additional cost to the developer, given the area's status as moderately water stressed. This would be in line with general principals of sustainable development, and will contribute to reducing energy consumed in the treatment and supply of water.

Water Supply Infrastructure

Severn Trent Water (STW) responded to the request for an assessment of water supply infrastructure within the Metropolitan Borough of Solihull. STW stated that the WRMP considers supply and demand issues for the next 25 years. As development within the Borough of Solihull occurs, it will be necessary to undertake detailed modelling of the water supply infrastructure to allow for appropriate infrastructure upgrades and local reinforcements. STW does not expect water supply to be a constraint to development within the Borough of Solihull.

Wastewater Collection and Treatment

Severn Trent Water completed a Sewage System Capacity Assessment for all the development sites. Overall 35% (7 sites) of the sites have capacity available to serve the proposed growth. 20% (4 sites) would require infrastructure and/or treatment updates and 50% (10 sites) have major constraints to growth.

Sewerage Undertakers have a duty under Section 94 of the Water Industry Act 1991 to provide sewerage and treat wastewater arising from new domestic development. Except where strategic upgrades are required to serve very large or multiple developments, infrastructure upgrades are usually only implemented following an application for a connection, adoption, or requisition from a developer. Early developer engagement with water companies is therefore essential to ensure that sewerage capacity can be provided without delaying development.

Severn Trent Water's preferred method of surface water disposal is using a sustainable drainage system (SuDS) discharging to ground or open watercourses, with connection to the sewerage system seen as the last option.

Wastewater Treatment Works quality Consent Assessments

An assessment of the WwTW capacity was carried out by assessing the available headroom within the current DWF permit at each WwTW and converting it to an equivalent number of new homes, using the 90-percentile flow recorded at the treatment works. The results showed that Coleshill and Meriden WwTW have capacity for growth, however it is only Meriden that would have surplus upon meeting the proposed new housing numbers. Balsall Common, Barston and Norton Green WwTW have a shortfall from full growth number in DWF and will therefore require infrastructure or treatment upgrades, to serve proposed growth.

Wastewater Treatment Works Odour Assessment

An odour screening assessment was completed to identify sites that are in close proximity to existing WwTWs where odour may be a cause of nuisance and complaints. Results concluded that two sites may be at risk of experiencing odour due to their proximity to existing WwTWs. The two sites that may be at risk are LPR09 South of Knowle and LPR10 West of Meriden. It is recommended that an odour assessment is carried out at these sites. All other sites are unlikely to be impacted by odour from WwTW.

Water Quality Impact Assessment

Six WwTW for the Borough of Solihull were identified, however, water quality assessments were only carried out for five of the WwTW as a result of Minworth serving 1.7M people in Birmingham and only a tiny proportion of that is served to Solihull. This approach was communicated to STW and the Environment Agency and it was recommended that a strategic scale water quality assessment should be undertaken. The five WwTW that were used in this assessment were Balsall Common, Barston, Coleshill, Meriden, and Norton Green.

The results found that:

- Balsall Common, Barston, Meriden and Norton Green are all operating above the Phosphorous permit conditions.
- The proposed growth is not predicted to lead to any class deteriorations, or deteriorations of quality greater than 10% for any determinand.
- Environmental capacity is not considered to be a constraint to growth at any of the WwTWs assessed. However, it would be anticipated that Balsall Common, Barston, Meriden and Norton Green WwTWs will need to be brought into compliance with their Phosphorous permits before any significant growth is connected to these treatment works.

The key constraints to achieving Good Ecological Status at all WwTWs are the limits of current technology rather than the impact of the planned growth. Therefore, environmental capacity is not considered to be a constraint upon growth.

Flood Risk

A detailed assessment of flood risk can be found within the Solihull Strategic Flood Risk Assessment (SFRA).

An assessment was carried out to determine whether increased discharges of treated effluent from each WwTW due to the increased development within the Metropolitan Borough of Solihull could lead to an increase in fluvial flood risk from the receiving watercourse. This assessment was carried out at all six WwTW that will receive additional flows from the preferred draft Local Plan development site options. Results showed that the impact of increased effluent flows is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

Environmental Constraints and Opportunities

Data from the Environment Open data from the EA were used to create maps to allow for a range of notable environmental designations and features to be displayed in order to identify the presence of environmental features within or close to the proposed sites. The maps should be used in conjunction with Sustainability Appraisals (SA) and/or Strategic Environmental Assessments (SEAs) when these are available.

The environmental assessment provides an overview of the wider environment within the Borough and the potential risks and opportunities associated with the development of the proposed sites.

Climate Change

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

The capacity of the sewerage system and the water quality of receiving waterbodies 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. This is a matter to be addressed at detailed assessment stage.

Recommendations

A table of recommendations is made at the end of this report , outlining actions that are advised for each of the different sections, the stakeholder responsible for carrying out the recommendation and the timescale at which it is advised that the action is implemented.

Contents

List of Figures

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Abbreviations

ALC ..... Agricultural Land Classification
ALS ..... Abstraction Licensing Strategy
AMP ..... Asset Management Plan
AONB ..... Area of Outstanding Natural Beauty
AP ..... Assessment Point
ASNW ..... Ancient Semi-Natural Woodland
BOD ..... Biochemical Oxygen Demand
BREEAM ..... Building Research Establishment Environmental Assessment Methodology
CAMS ..... Catchment Abstraction Management Strategies
CAPEX ..... Capital Expenditure
CfSH ..... Code for Sustainable Homes
CSO ..... Combined Sewer Overflow
DWF ..... Dry Weather Flow
DWI ..... Drinking Water Inspectorate
DYAA ..... Dry Year Annual Average
EA ..... Environment Agency
EFI ..... Ecological Flow Indicator
EP ..... Environmental Permit
EU ..... European Union
FWMA ..... Flood and Water Management Act
FZ ..... Flood Zone

GES ..... Good Ecological Status
GIS ..... Geographic Information Systems
HOF ..... Hands-Off Flow
IDB ..... Internal Drainage Board
IDP ..... Infrastructure Delivery Plan
JBA ..... Jeremy Benn Associates
LDE ..... Level Dependent Environments
LLFA ..... Lead Local Flood Authority
LPA ..... Local Planning Authority
l/p/d ..... Litres per person per day
LWS ..... Local Wildlife Site
Ml/d ..... Million litres per day
NH_4 ..... Ammonia
NNR ..... National Nature Reserve
NPPF ..... National Planning Policy Framework
OfWAT ..... Water Service Regulation Authority
OPEX ..... Operational Expenditure
OS ..... Ordnance Survey
PE ..... Population Equivalent
p/h ..... Person per house
PPS ..... Planning Policy Statement
PR ..... Price Review
R/A/G ..... Red / Amber / Green assessment
RBD ..... River Basin District
RBMP ..... River Basin Management Plan
RMA ..... Risk Management Authority
RQP ..... River Quality Planning tool
RSS ..... Regional Spatial Strategy
RZ ..... Resource Zone
SA ..... Sustainability Appraisals
SAB ..... SuDS Approving Body
SAC ..... Special Area of Conservation
SDS ..... Strategic Direction Statements
SEA ..... Strategic Environmental Assessment
SEPA ..... Scottish Environmental Protection Agency
SFRA ..... Strategic Flood Risk Assessment
SHLAA ..... Strategic Housing Land Availability Assessment
SINC ..... Site of Importance for Nature Conservation
SMBC ..... Solihull Metropolitan Borough Council

SNCI ..... Site of Nature Conservation Interest
SPA ..... Special Protection Area
SPZ..... Source Protection Zone
SSSI ..... Site of Special Scientific Interest
SS ..... Suspended Solids
STW ..... Severn Trent Water
SU ..... Sewerage Undertaker
SuDS ..... Sustainable Drainage Systems
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
WRMP ..... Water Resource Management Plan
WRZ ..... Water Resource Zone
WQA..... Water Quality Assessment
WSZ..... Water Supply Zone
WTW..... Water Treatment Works
WwTW ..... Wastewater Treatment Works

1 Introduction

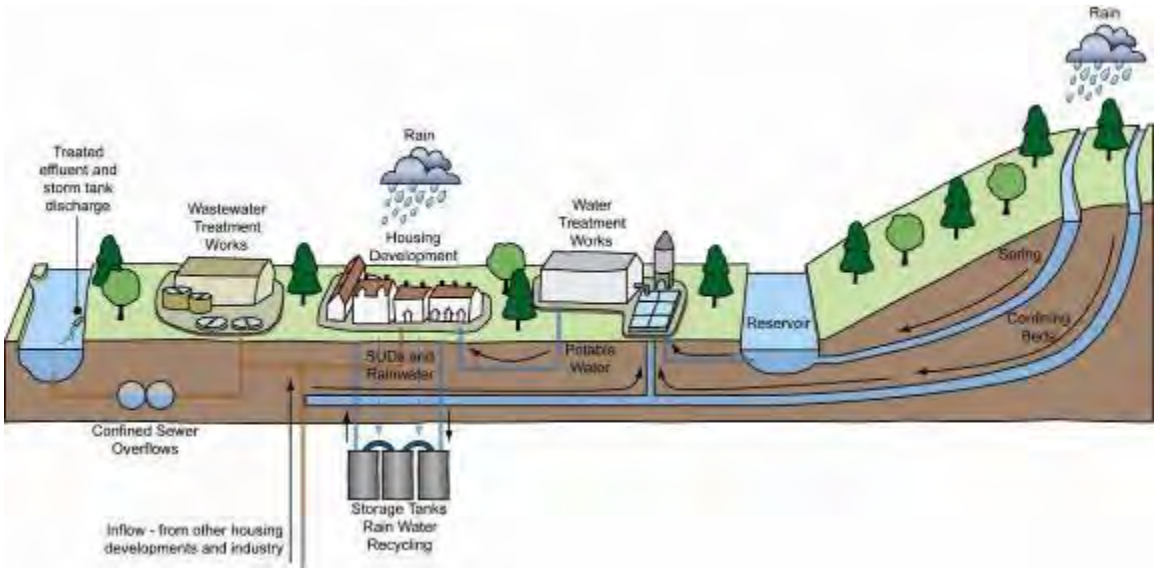
1.1 Background

In September 2016, JBA Consulting was commissioned by Solihull Metropolitan Borough Council (SMBC) to undertake a Phase 1 Water Cycle Study (WCS) which assesses the potential issues relating to future development within the borough and the impacts on water supply, wastewater collection and wastewater treatment.

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. The allocation of large numbers of new homes in certain locations may result in the capacity of existing available infrastructure being exceeded, a situation that could potentially cause service failures to water and wastewater customers, adverse impacts to the environment, or high costs for the upgrade of water and wastewater assets being passed on to bill payers.

In addition to increased housing demand, future climate change presents further challenges to pressures on the existing water infrastructure network including increased intensive rainfall events and a higher frequency of drought events. Sustainable planning for water must now take this into account. The water cycle can be seen in Figure 1-1 below, and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

Figure 1-1: The Water Cycle



This study will assist the council to select and develop sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure, and flood risk. This has been achieved by identifying areas where there may be conflict between any proposed development and the requirements of the environment, and by recommending potential solutions to these conflicts.

The Water Cycle Study (WCS) has been carried out in co-operation with the Environment Agency and Severn Trent Water. This WCS and associated Strategic Flood Risk Assessment inform the Review of the Local Plan in order to provide a better understanding of the impact of the developments on the water supply and wastewater infrastructure and water quality.

1.2 Objectives of the Water Cycle Study

Since the Local Plan was adopted by Solihull Metropolitan Borough Council (SMBC) in 2013, a legal challenge that faced the council, resulted in the overall housing requirement being deleted and remitted back to the council for reconsideration. A 2015 Strategic Housing Needs Study for Greater Birmingham and Solihull Local Enterprise Partnership (GBSLEP) identified that SMBC will have to plan for a significantly higher housing figure, than outlined in the adopted Local Plan. This is being addressed through a review of the Solihull Local Plan which started in April 2016. Initial scoping has

already taken place looking at options for how additional housing could be accommodated in the borough through to 2033.

This Water Cycle Study (WCS) is required in order to assess the constraints and requirements that will arise from potential growth on the water infrastructure.

The overall objective of the WCS study is to understand the environmental and physical demands of future development, to identify opportunities for more sustainable planning and to recognise improvements that may be required so that water cycle capacity is not exceeded. This is assessed by considering the following issues:

- Water Resources;
- Water Supply;
- Wastewater Collection and Treatment;
- Water Quality and the Environment;
- Flood Risk, and
- Climate Change.

This study focuses upon the proposed site allocations provided by Solihull Metropolitan Borough Council. The report outlines the current status of the environment and infrastructure, the possible constraints to the development, the impacts and demands of the development, and gives recommendations as to any improvements or mitigation required including approximate costings.

1.3 Phase 1 Water Cycle Study Scope

The scope of the WCS was defined by SMBC: "the purpose of the Water Cycle Study is to investigate whether the local water environment has the capacity to support planned levels of growth. It should consider issues such as water resources and supply, waste water collection and sewerage infrastructure, waste water treatment infrastructure and water quality. It should take account of the impacts of climate change over the Plan period. The Water Cycle Study update should take account of the work already published in the Water Cycle Study 2012, and revise and update the published output as necessary."

The WCS is required to:

- Review the existing water cycle processes and infrastructure capacity and establish a comprehensive and up to date baseline.
- Undertake detailed assessments of strategic water and waste water treatment options in order to accommodate planned housing and employment growth.
- Make recommendations for future strategic water and waste water treatment provision.

1.4 Structure of this report

Table 1-1: Report Structure

Chapter	Description
1. Introduction	This chapter provides the background, the objective and the scope of the project.
2. Key Developments	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 wastewater treatment works and highlights where upgrades or new infrastructure might be needed. It also looks at the potential impact of

Chapter	Description
	odour from wastewater treatment works on new developments. Finally, it covers the water quality impact assessment of discharges from future wastewater treatment works into the receiving watercourses.
6. Water Quality Assessment	The chapter considers the impact of the increased discharge of effluent due to an increase in the population served by a WwTW may impact on the quality of the receiving water.
7. Flood Risk Management	This chapter considers the flood risk to the potential site allocations as well as the potential risk of increased flood flows in watercourses due to additional flows of sewage effluent.
8. Environmental Constraints and Opportunities	This chapter looks at the environmental risks and opportunities associated with the allocation sites.
9. 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.
10. Summary and Recommendations	This chapter outlines whether the required upgrades and solutions for all the assessments covered by this study can be delivered where a Red status is scored. This chapter also summarises all the recommendations provided in each chapter.

1.5 Stakeholders and Consultation

It is important that a WCS brings together all partners and stakeholders knowledge, understanding and skills to help to understand the environmental and physical constraints to development. The following stakeholders were consulted during this WCS and have provided data for use within the study:

- Solihull Metropolitan Borough Council (SMBC)
- Environment Agency (EA)
- Severn Trent Water (STW)

Further large scale developments within and outside Solihull Metropolitan Borough Council can have the potential to affect water supply demand, existing sewer networks and infrastructure. The WCS takes account of the combined impacts of growth within SMBC and its neighbouring councils:

- Birmingham City Council
- North Warwickshire Borough Council
- Coventry City Council
- Warwick District Council
- Stratford-on-Avon District Council
- Bromsgrove District Council

Furthermore, the Severn Trent Water Strategic Grid Water Resource Zone (WRZ) in which Solihull is located serves a total of 39 local authorities. Parts of this zone located within Wales are regulated by Natural Resources Wales (NRW), which undertakes similar regulatory roles to the Environment Agency in England.

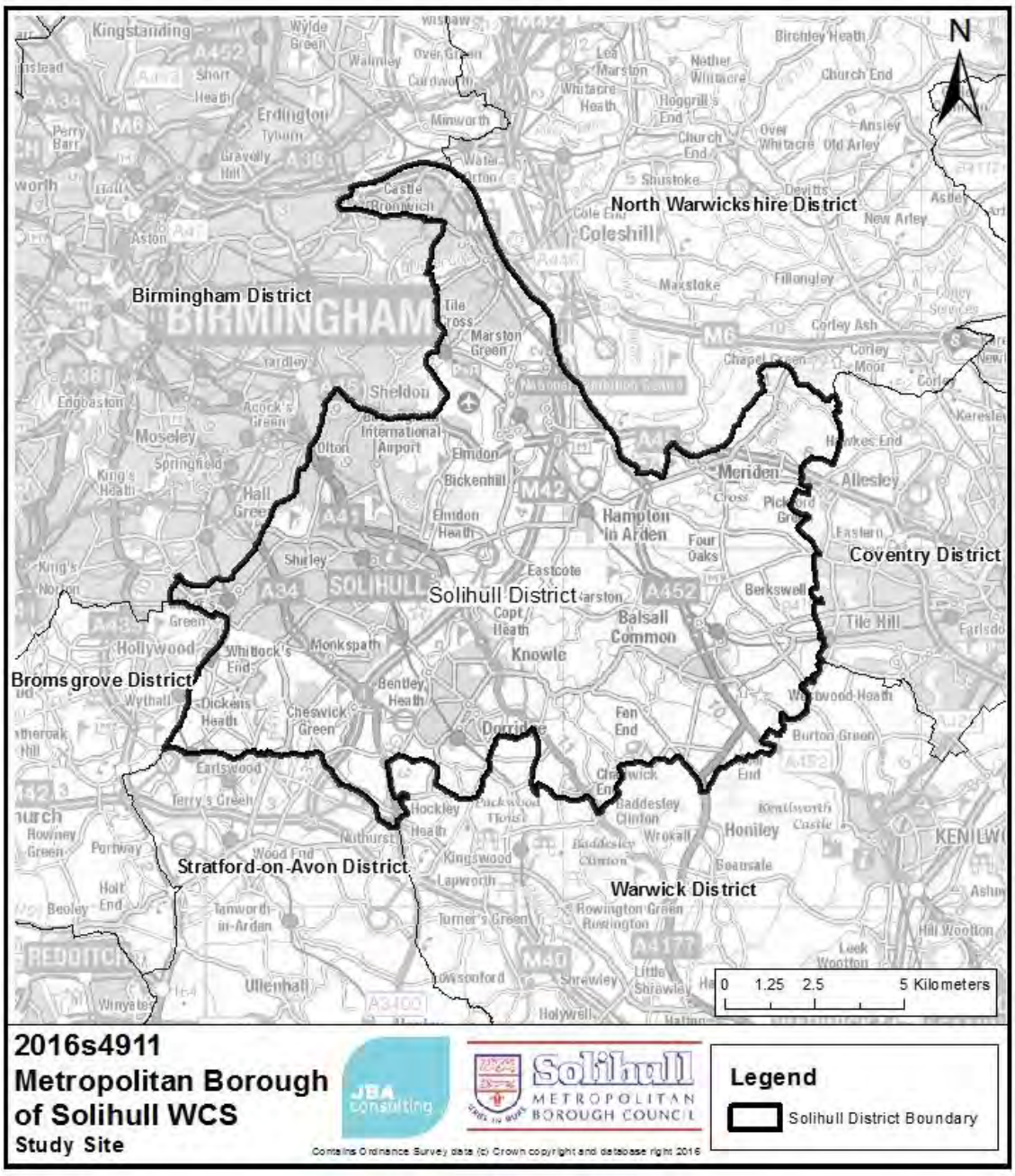
1.6 Study area

Solihull Metropolitan Borough Council is located on the southern edge of the West Midlands Conurbation, between Birmingham and the Black Country in the west and Coventry to the east. It is bound to the north by the rural area of North Warwickshire and to the south, by rural Bromsgrove, Stratford and Warwick. The Metropolitan Borough of Solihull covers an area of 178.28km^2 (Figure 1-2). The towns that form the major population centres of Solihull include Castle Bromwich, Chelmsley Wood, Fordbridge, Kingshurst, Marston Green, Smith's Wood, Solihull and Shirley, which are surrounded by smaller settlements throughout the Borough. Approximately two thirds of

the Borough is countryside and designated Green Belt, which separates the West Midlands conurbation from surrounding settlements. The vital strategic gap between Birmingham/ Solihull and Coventry is known as the Meriden Gap, which is predominantly rural, characterised by a series of settlements, historic villages, hamlets, scattered farmsteads, and dwellings set within attractive countryside. The 2011 Census data estimated the population of Solihull Borough to be around 206,100.

The study area is characterised by heathland, woodland and a variety of grasslands. Significant watercourses within the study area include the River Blythe and the River Cole. Severn Trent Water manages the water supply for the entire Borough.

Figure 1-2: Map of the Study Area



2 Key Developments

2.1 Introduction

Solihull Metropolitan Borough Council (SMBC) is reviewing its Local Plan for a number of factors. This was primarily following a legal challenge to the adopted Local Plan which resulted in the plan being remitted back to the Council for reconsideration[2]. The Council has consulted on a preferred options draft and this study will inform the next iteration of the draft Local Plan.

There are other pressures on development within Solihull, including unmet need within the wider Birmingham Housing Market Area (HMA), and a High Speed 2 (HS2) interchange railway station close to Birmingham Airport and the M42. The arrival of the HS2 brings about a significant shift to the Solihull Local Plan (SLP), to enable the Interchange Area to be allocated for development. An updated Local Plan addressing this matter is vital if the full potential of the HS2 project is to be realised.

To assist SMBC to understand its capacity for growth within the Borough, this WCS assesses the 21 site allocations that are being proposed in the Local Plan Review to understand their likely impact upon water resources, wastewater services and the water environment as a whole. This analysis will inform the decision-making process for the final housing allocations.

2.2 Key Developments and Commitments

A "call-for-sites" collated a total of 245 sites in the Borough, submitted by 13th May 2016 deadline. The legal challenge that was presented resulted in the overall housing requirement being remitted back for re-examination, which required 21 sites to undergo further assessment. Of these 21 sites, SMBC have identified 18 of these to be developed housing purposes, one site for employment purposes where planning permission has been granted, and two sites that have been identified as for housing/mixed purposes (Table 2-1 and Table 2-2).

To help identify if there are any constraints to growth within these site areas in the Metropolitan Borough of Solihull, all 21 sites within the towns and villages where the SMBC plan to focus growth will be assessed to decide the final housing allocations. The geographical locations of the 21 sites across the Metropolitan Borough of Solihull are shown in Figure 2-1. The proposed site allocations are listed in Table 2-1 and the employment site with planning permission is listed in Table 2-2. Of particular importance to the sites listed in Table 2-1, Solihull's Local Area Plan (2014) outlines the global potential that will be provided by the development of the HS2 interchange and adjoining area. It has been estimated that the development will provide the region with around 20,000 new jobs and at least 2,000 new homes. There will be four key zones of development: the station area, a light industrial and research and development zone, a mixed use or innovation and a residential area.[3]

2 SMBC, Solihull Local Plan (2013) Online at: http://www.solihull.gov.uk/Portals/0/Planning/LDF/Local_Plan_Final.pdf accessed 22/11/2016.

3 SMBC Proposed Local Area Plan for the HS2 Interchange and Adjoining Area Initial (Regulation 18) Consultation (2014), Online at: http://www.solihull.gov.uk/Portals/0/Planning/LAP/Local%20_Area_Plan_October_2014.pdf accessed on 22/11/2016.

Figure 2-1: Site Allocations for the Proposed Draft Local Plan for the Borough of Solihull

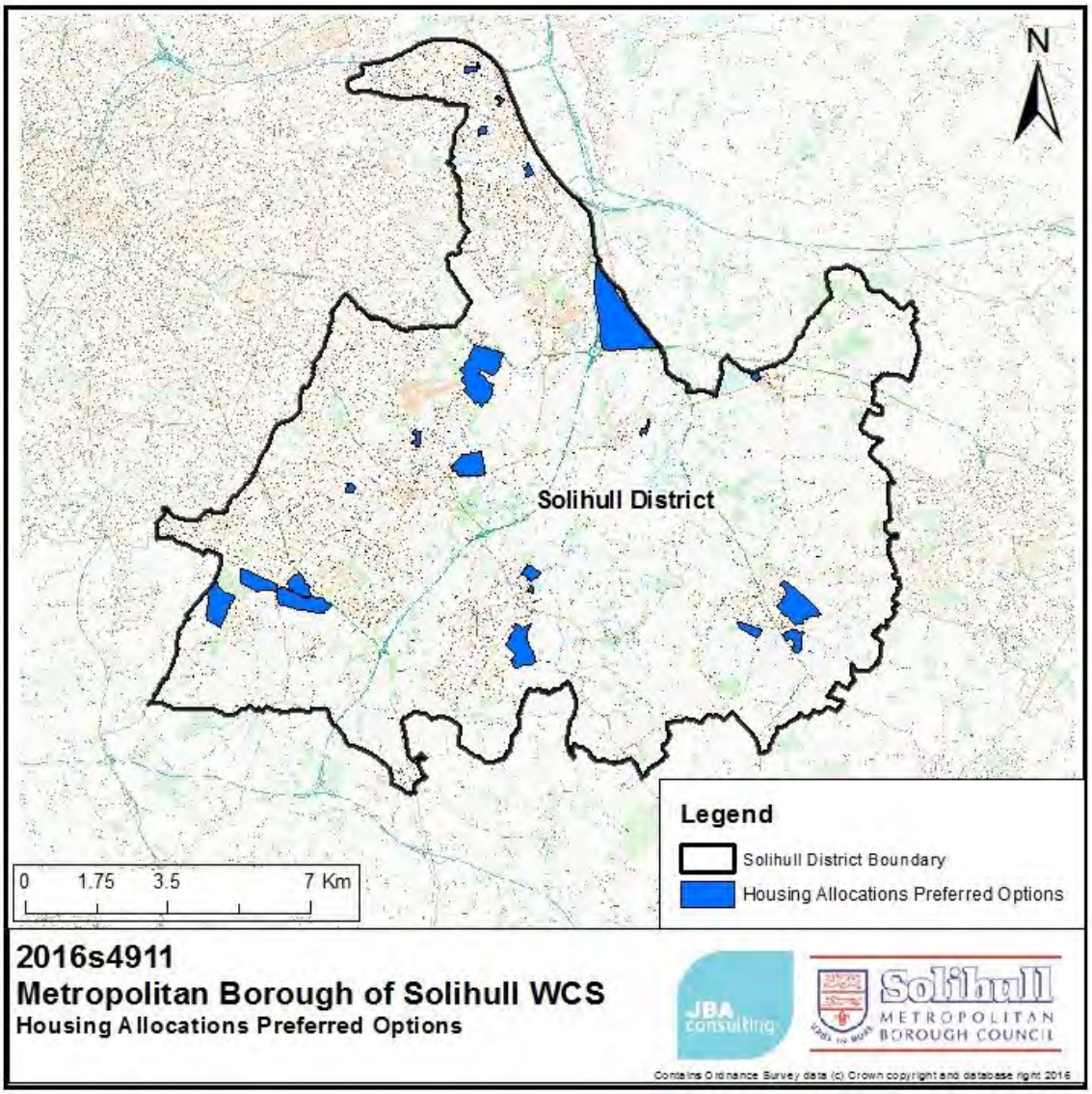


Table 2-1: List of proposed future development sites assessed within this study

Site Reference	Site Name	Potential Housing Numbers	Site Area (Ha)	Preferred use
LPR04	West of Dickens Heath	700	45.17	Housing
LPR13	South of Shirley	600	29.08	Housing
LPR12	South of Dog Kennel Lane	850	45.31	Housing
LPR09	South of Knowle	750	47.74	Housing
LPR08a	Hampton Road A	150	9.80	Housing
LPR08b	Hampton Road B	150	2.50	Housing
LPR16	East of Solihull	600	36.18	Housing
LPR19	UK Central Hub/HS2 interchange	1000	153.17	Mixed
LPR06	Meriden Road	100	3.56	Mixed
LPR01	Barratts Farm	800	55.93	Housing
LPR12	Frog Lane	150	8.43	Housing

Site Reference	Site Name	Potential Housing Numbers	Site Area (Ha)	Preferred use
LPR03	Windmill Lane - Kenilworth Road	200	15.41	Housing
LPR10	West of Meriden	50	3.51	Housing
LPR05	Chester Road/ Moorend Avenue	100	3.76	Housing
LPR07	Kingshurst Village Centre	100	3.42	Housing/Mixed
LPR11	Former TRW site	400	20.44	Housing
LPR18	Sharmans Cross Road	100	4.31	Housing
LPR17	Moat Lane, Vulcan Road	150	5.14	Housing
LPR14	Arran Way	50	2.34	Housing
LPR15	Jensen House, Auckland Drive	100	4.05	Housing
Total local plan review proposed sites:		7,100		

Table 2-2: Employment site with planning permission

Site Reference	Site Name	Site Area (Ha)	Preferred use
LPR20	Land Damson Parkway	93.81	Employment

To deal with the legal challenge presented to the housing requirement in the Solihull Local Plan 2013, the housing shortfall in the wider housing market area and the development of the HS2 Interchange Area, a strategic housing needs study (SHNS) for the whole HMA was undertaken in 2015. It indicated that there was a shortfall across the area over the period 2011-2031, which is to be addressed through Solihull's Local Plan. Under the Duty to Cooperate, SMBC has tried to address this shortfall which includes 2,654 dwellings arising from Solihull as the Borough was not meeting its own needs.[4] The Review of the Solihull Local Plan states that the level of growth in the Borough should be in the region of 608 dwellings per year, which should be considered as a minimum figure. This figure is based on the target set out in the Review of the Local Plan.[5]

SMBCs full Objectively Assessed Need (OAN) is based upon the 2014 household projections published by DCLG in July 2016 and includes a 10% uplift due to market signals. The housing land provision target of 14,905 net additional dwellings (2014-2033) therefore reflects the full objectively assessed housing need (OAN) for Solihull. Table 2-3 provides an overview of housing land supply and how the housing growth can be delivered through sites with planning permission, suitable deliverable sites identified within the Strategic Housing and Economic Land Availability Assessment (SHELAA), unidentified windfall sites, and locations proposed for allocation.

4 SMBC, Reviewing the Plan for Solihull's Future: Solihull Local Plan Review: Draft Local Plan (2016), Online at: http://www.solihull.gov.uk/Portals/0/Planning/LPR/Draft_Local_Plan_05.12.16.pdf accessed on 06/12/2016.

5 SMBC, Reviewing the Plan for Solihull's Future: Scoping, Issues and Options Consultation (2015) online at: http://www.solihull.gov.uk/Portals/0/Planning/LPR/LPR_Scope_Issues_and_Options_Consultation_Full.pdf accessed on 05/12/2016.

Table 2-3: Solihull Housing land supply 2014-2033 (as of 1st April 2016)[6]

Source	Estimated capacity (dwellings)
Housing completions (2014-2016)	1,385
Future housing land supply:	
Sites with planning permission (started)	795
Sites with planning permission (not started)	1,467
Sites identified in land availability assessments	286
Solihull Local Plan allocations without planning permission at 1st April 2016	2,640
Less a 10% to sites with planning permission (not started), sites identified in land availability assessments and SLP sites	-439
Windfall housing land supply (2018-2033)	2,250
Local Plan Review Proposed Sites (approximate new allocations)	6,150
UK Central Hub / HS2 interchange Area	1,000
Total Estimated Capacity	**15,534**

The estimated capacity of 15,534 exceeds the requirement (15,029) by 505 dwellings. This represents a margin of 8% compared with the number of additional dwellings being allocated through the Local Plan Review. This reflects a cautious approach to ensure that the housing requirement figure will be met. The 20 housing sites identified in Table 2-1 have a total capacity of 7,100 dwellings and cover the preferred housing allocations and proposed sites in the UK Central Hub area that have been identified in the Local Plan Review. The WCS therefore assesses sufficient sites to address the current shortfall in identified housing supply, with some additional potential capacity to address the challenges in the wider housing market area and the implications of the HS2 interchange. Table 2-4 presents the progress that has been made with meeting Solihull development needs between 2011 - 2015.

Table 2-4: Status of Solihull's housing completions between 2011- 2015

Source	Capacity
Housing completions (2011-2015)	1,485
Sites with planning permission (started)	866
Sites with planning permission (not started)	1,177
North Solihull Business Plan Sites	174
Sites identified in the Strategic Housing Land Availability Assessment	163
Local Plan proposed sites	2,943
Windfall housing land supply (2015-2033)	2,700
Total Capacity	**9,508**

6 SMBC, Draft Local Plan (2016), Online at: http://www.solihull.gov.uk/Portals/0/Planning/LPR/Draft_Local_Plan_05.12.16.pdf accessed on 05/12/2016.

3 Legislative and Policy Framework

The following sections introduce the framework of national, regional and local policies that must be considered by the Local Planning Authorities (LPAs), Water companies and developers when addressing provision of water and wastewater services to new developments. Key extracts from these policies relating to water consumption targets and mitigating the impacts on the water development from the new development, are summarised below.

3.1 National policy

3.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[7] 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 states:

> "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 states

> "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, the 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[8]
- Water Supply, Wastewater and Water Quality[9]
- Housing - Optional Technical Standards[10]

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

8 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 18/10/2016.

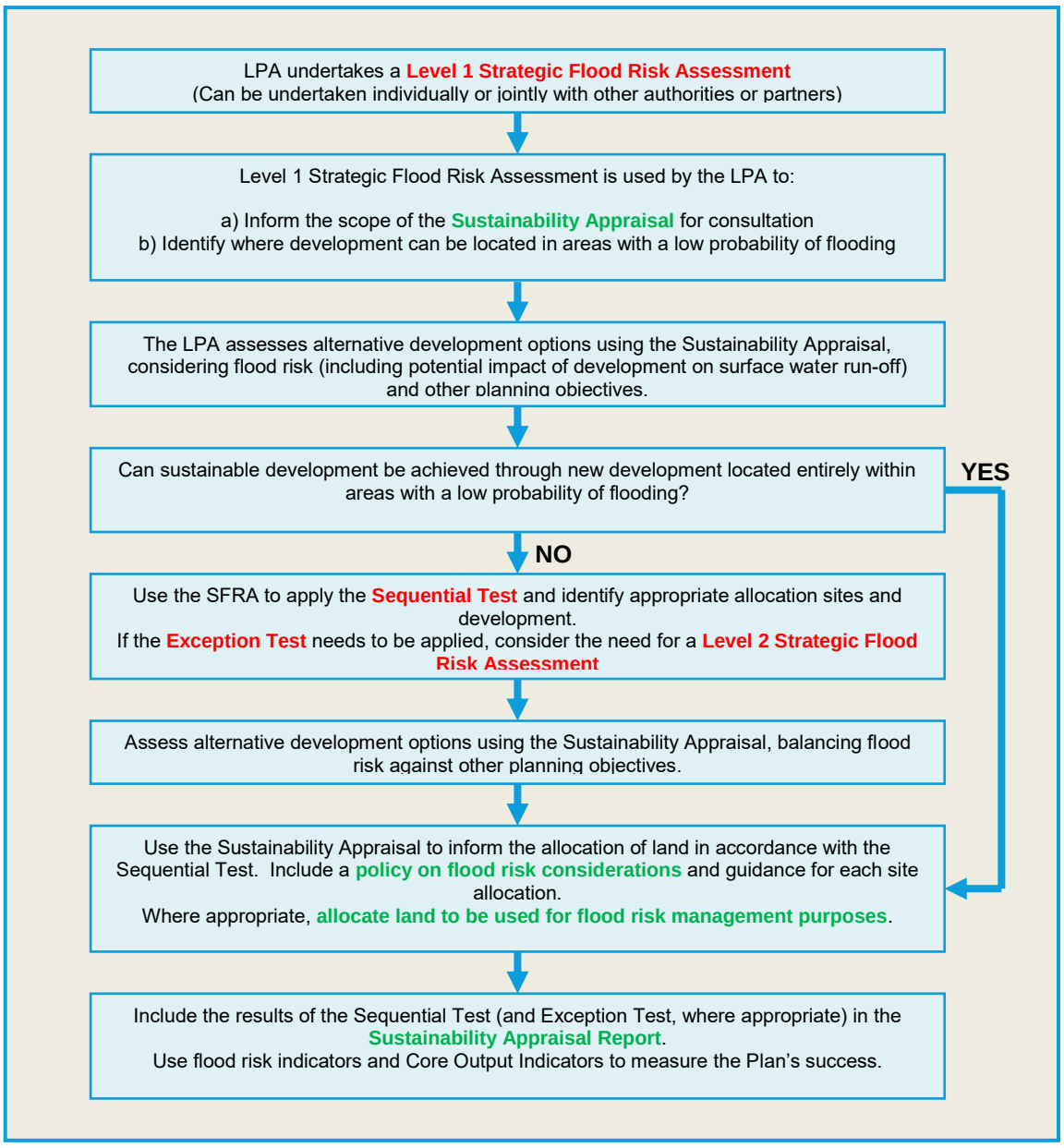
9 Department for Communities and Local Government (2014) Planning Practice Guidance: Water supply, wastewater and water quality. Accessed online at http://planningguidance.planningportal.gov.uk/blog/guidance/ on 18/10/2016.

10 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 18/10/2016.

3.1.2 Planning Practice Guidance: Flood Risk and Coastal Change

Diagram 1 in the Planning Practice Guidance (PPG) sets out how flood risk should be taken into account in the preparation of Local Plans. These requirements are addressed principally in the Council's 2016 Draft Strategic Flood Risk Assessment (SFRA).

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



Based on Diagram 1 of NPPF Planning Practice Guidance: Flood Risk and Coastal Change (paragraph 004, Reference ID: 7-021-20140306) March 2014

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	Not Specified		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 likely to be a significant planning concern when a proposal would: • Involve physical modifications to a water body; • Indirectly affect water bodies, for example as a result of new development such as 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 strategic environmental assessment and sustainability appraisal ... sustainability appraisal objectives could include preventing deterioration of current water body status, 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 on how to gather 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, local planning authorities 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[11] 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, based on use of flow restricting devices to reduce water use by taps and showers.

3.1.5 Building Regulations and Code for Sustainable Homes

The Building Regulations (2010) Part G[12] was amended in early 2015 to require that all new dwellings must ensure that the potential water consumption must not exceed 125l/person/day, or 110 l/person/day 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, Local Planning Authorities (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 which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.

- The House of Commons written statement[13] setting out governments 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." In practice this has been implemented by making Lead Local Flood Authorities (LLFAs) statutory consultees on the drainage arrangements of major developments.
- The Defra Non-statutory technical standards for sustainable drainage systems[14]. These set out the government's high level requirements for managing peak flows and runoff volumes, flood risk from drainage systems and the structural integrity and 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 Lead Local Flood Authority (LLFA) Solihull Metropolitan Borough Council is responsible for advising Local Planning Authorities and play a lead role in ensuring that the

11 Department for Communities and Local Government (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 15/11/2016.

12 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 10/05/2016.

13 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 18/10/2016.

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

proposed drainage schemes for all new developments comply with technical standards and policies in relation to SuDS.

- North of Solihull has a published SuDS Design Guide which requires all new developments in North Solihull to consider how the development will impact on the drainage of the development and the wider catchment area. As a means of meeting the requirements of PPS25 all new development will be expected to consider the use of SuDS as part of the drainage solution[15].
- Solihull's Green Infrastructure Study published in 2012 recommends planning conditions relating to SuDS in terms of green infrastructure that is to be followed throughout the borough[16].
- An updated version of the CIRIA SuDS Manual[17] was published in 2015. The guidance covers the planning, design, construction and maintenance of SuDS for effective implementation within both new and existing developments. The guidance is relevant for a range of roles, with the level of technical detail increasing throughout the manual. The guidance does not include detailed information on planning requirements, SuDS approval and adoption processes and standards, as these vary by region and should be checked early in the planning process.
- SuDS features not adopted by SMBC or Severn Trent Water need to be maintained by householders (in the case of SuDS on private land) and by management companies for other SuDS on public open spaces and highways.

3.1.7 BREEAM

BREEAM (Building Research Establishment Environmental Assessment Methodology) is an internationally recognised method of assessing, rating and certifying the sustainability of buildings. It can be used to assess the environmental performance of any type of building: new and existing. Standard BREEAM schemes exist for assessment of common domestic and non-domestic building types and less common building types can be assessed by developing bespoke criteria.

Using independent, licensed assessors, BREEAM assesses criteria covering a range of issues in categories that evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology and management processes. This promotes both climate change mitigation (energy efficiency) and adaptation (water efficiency). Buildings are rated and certified on a scale of 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'.

BREEAM has expanded from its original focus on individual new buildings at the construction stage to encompass the whole life cycle of buildings from planning to in-use and refurbishment. The standard is regularly revised to improve sustainability, respond to industry feedback and support sustainability strategies and commitments. BREEAM standard can be applied to virtually any building and location, with versions for new buildings, existing buildings, refurbishment projects and large developments.

BREEAM certification may be required by procuring organisations but, following the Government's Housing Standards Review, cannot be made a requirement in Local Plans.

3.2 Local policy

3.2.1 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 15 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].

15 SMBC Placemaking in North Solihull: Primary Design Document online at: http://www.solihull.gov.uk/Portals/0/Planning/LDF/North_Solihull_Design_Code_-__Place_Making_in_North_S.pdf accessed on 23/01/2017.

16 SMBC, 2012 Green Infrastructure Study (2012) online at: http://www.solihull.gov.uk/Portals/0/Planning/LDF/Solihull_Green_Infrastructure_Study.pdf accessed on 23/01/2017 .

17 CIRIA (2015) The SuDS Manual (C753)

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

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. Local Planning Authorities will be required to provide technical advice and support.

3.2.2 Local Plan and Local Strategy

Solihull Metropolitan Council is currently covered by the Solihull Local Plan; this document sets out the amount of development to be delivered in the Borough until 2028 as well as the general locations for growth in terms of housing and other major development needs. The Council has been undertaking a Local Plan Review since April 2016 and it is anticipated that it will be adopted in winter 2017. The Water Cycle Study will inform the Review of Solihull Local Plan and will form an integral part of the Councils evidence base supporting the subsequent location specific development decisions.

3.2.3 Infrastructure Delivery Plan

The purpose of an Infrastructure Development 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 Borough. The IDP presents sources of funding to assist in the delivery of infrastructure to help upgrade facilities and promote economic growth to ultimately increase the quality of life. The plan aims to sustainably develop towns and districts whilst maintaining a high quality environment.

The SMBC Infrastructure Plan[19] is part of the evidence base that has informed the preparation of planning policy and site allocations within the Borough. The IDP examines the physical, social and green infrastructure provision that exists within the Borough and will seek to identify any gaps or capacity issues within this existing provision. The Solihull Sub-Regional Green Infrastructure Strategy[20] expands on research completed in the Green Infrastructure Study[21]. The strategy aims to develop green infrastructure further and sets out detailed guidance on incorporating green infrastructure into new developments within the Borough.

3.3 Environmental Policy

3.3.1 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[22]. 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'.

3.3.2 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 sites include:

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

19 Solihull Local Development Framework Infrastructure Delivery Plan (Sept 2012). Accessed Online at: http://www.solihull.gov.uk/Portals/0/Planning/LDF/Infrastructure_Delivery_Plan_September_2012.pdf on 18/10/2016.

20 Warwickshire Museum and Natural Environment (Feb 2013) Warwickshire, Coventry and Solihull Sub-Regional Green Infrastructure Strategy. Accessed Online at: https://apps.warwickshire.gov.uk/api/documents/WCCC-863-513 on 18/10/2016.

21 Solihull Metropolitan Borough Council (Jan 2012) Green Infrastructure Study. Accessed Online at: http://www.solihull.gov.uk/Portals/0/Planning/LDF/Solihull_Green_Infrastructure_Study.pdf on 18/10/2016.

22 UWWTD. Accessed online at http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31991L0271 on 14/08/2015.

- Special Protection Areas (SPAs) - support significant numbers of wild birds and their 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.

3.3.3 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. The Metropolitan Borough of Solihull predominately lies within the Humber RBD, with a small part of the eastern edge of the council area falling within the Severn River Basin District RMBP[23]. 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 Severn River Basin Management Plans.

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 objectives and does not result in further pressure on the water environment which would 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 and loses of priority hazardous substances into surface waters*
- *Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.*"

Local Planning Authorities (LPAs) must have regard for Water Framework Directive as implemented in the Environment Agency’s River Basin Management Plans[24].

3.3.4 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);

23 Environment Agency (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 29/09/2016

- Areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish);
- Bodies of water designated as recreational waters, including areas designated as 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 in order 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 Community importance, in order to ensure the site contributes to the maintenance of, or restoration to, favourable conservation status.

Groundwater Source Protection Zones

The Environment Agency has a Groundwater Protection Policy to help prevent groundwater pollution. In conjunction with this the Environment Agency have defined groundwater Source Protection Zones (SPZs) to help 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 in which pollution can travel to the borehole within 50 days from any point within the zone and applies at and below the water table. There is also a minimum 50 metre 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 on occasions, usually where local conditions mean that industrial sites and other polluters could affect the groundwater source even though they are outside the normal catchment area.

The Environment Agency's guidance Protect groundwater and prevent groundwater pollution[25] sets out principles for managing activities which may affect the quantity or quality of groundwater. These are relevant both when planning new development and activities as well as managing existing activities, and would apply to new residential, commercial and industrial development, as well as to the provision of infrastructure including water and wastewater services.

3.3.5 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 announced that it would introduce a "Great Repeal Bill" to repeal the European Communities Act 1972 and to transpose European Union law into domestic law "wherever practical". This Bill is likely to be introduced early in the next parliament, but a draft was not available at the time of writing. However, a White Paper published in March 2017[26] states the following objectives for the Bill:

- Repeal of European Communities Act (ECA) 1972
- Conversion of EU law into UK law
- Conversion of directly applicable EU laws into UK law
- Preservation of secondary legislation made under the ECA

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 in the UK decide otherwise.

"The Great Repeal Bill will ensure that the whole body of existing EU environmental law continues to have effect in UK law. This will provide businesses and stakeholders with maximum certainty as we leave the EU. We will then have the opportunity, over time, to ensure our legislative framework is outcome driven and delivers on our overall commitment to improve the environment within a generation. The Government recognizes the need to consult on future changes to the regulatory frameworks, including through parliamentary scrutiny."

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.

25 Environment Agency (2017) Protect Groundwater and Prevent Groundwater Pollution, online at https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution, accessed on 16/05/2017.

26 "Our Approach to the Great Repeal Bill" UK Government 2017 Accessed online at:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/604516/Great_repeal_bill_white_paper_accessible.pdf on: 20-04-17

3.4 Water Industry Policy

3.4.1 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[27]. The companies essentially operate as regulated monopolies within their supply regions, although very large water users and developments are able to 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 could influence the future provision of water and wastewater services include:

- All non-domestic customers will be able to switch their water supplier and/or sewerage undertaker
- 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

3.4.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies;

- The Water Services Regulation Authority (OfWAT) - economic and customer service regulation
- Environment Agency - environmental regulation
- Drinking Water Inspectorate (DWI) - drinking water quality

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 the Asset Management Plan 6 (AMP6) period which runs from 2015 to 2020.

When considering investment requirements to accommodate growing demand, water companies are required to ensure to 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 (SDS) and WRMPs.

3.4.3 Developer Contributions

Developments with planning permission have a right to connect to the public water and sewerage systems, although the Flood and Water Management Act removes the automatic right to connect surface water to sewerage systems.

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, for example the water company upgrading a sewer, is complete.

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.

27 Water Industry Act 1991. Accessed online at http://www.legislation.gov.uk/ukpga/1991/56/contents

Developer contributions will be sought by the Environment Agency and Lead Local Flood Authority for new developments that benefit from existing or future flood risk management schemes. Developer contributions will be required to support the delivery, maintenance and works to upgrade any failing flood risk assets.

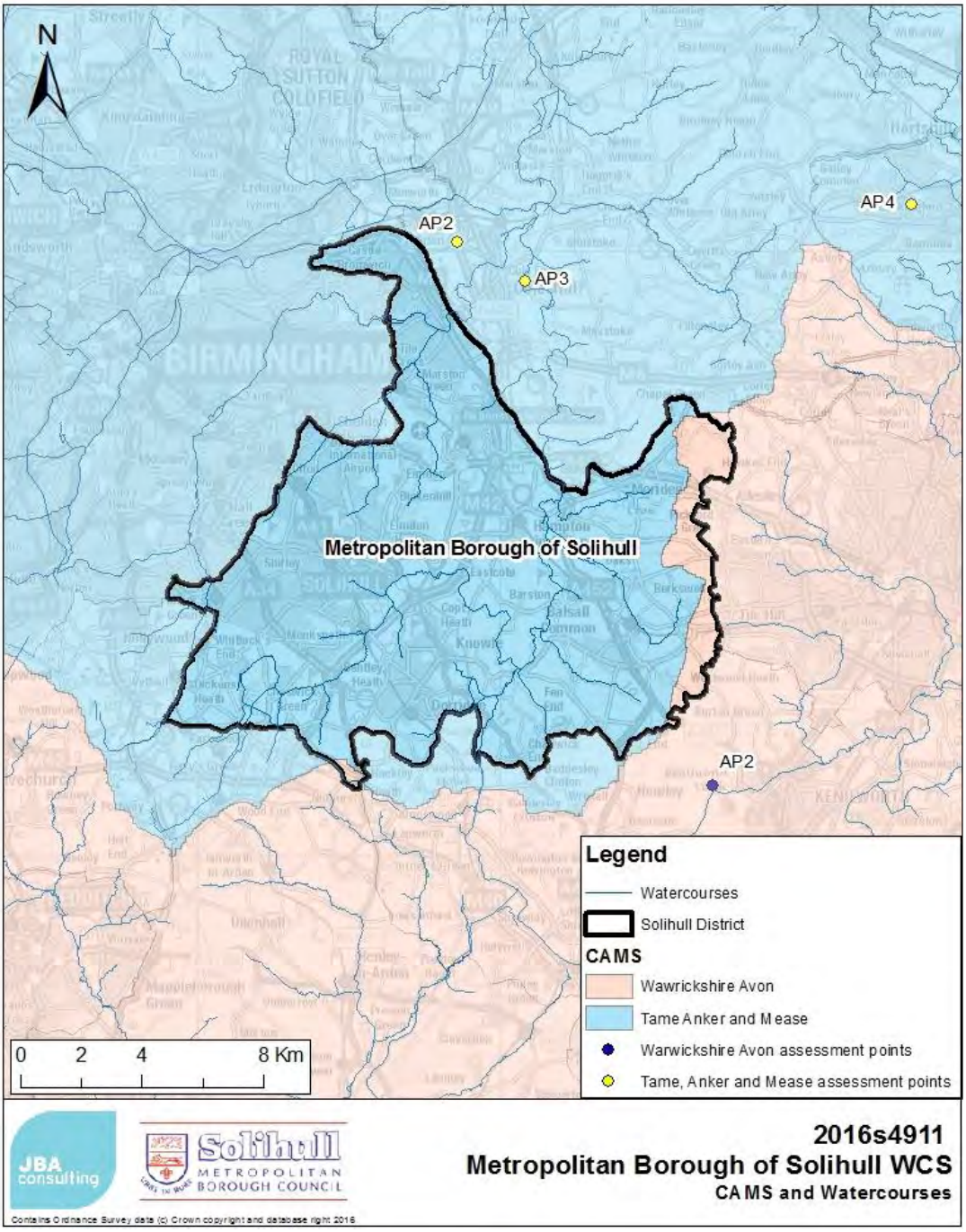
4 Water Resources and Water Supply

4.1 Introduction

4.1.1 Surface Waters

The River Blythe is the main river that runs through the borough of Solihull. The River Blythe runs along the Meriden Gap and is fed by the River Cole and is a tributary of the Tame. It passes through a central band on Solihull around Eastcote, Monkspath and Knowle, areas of the south including Cheswick Green and a small part of the north too. The river is a lowland river on clay and was designated a Site of Special Scientific Interest in 1989. Other watercourses in the Borough include the Grand Union Canal, the Cuttle Brook in the south and Low Brook in the far north.

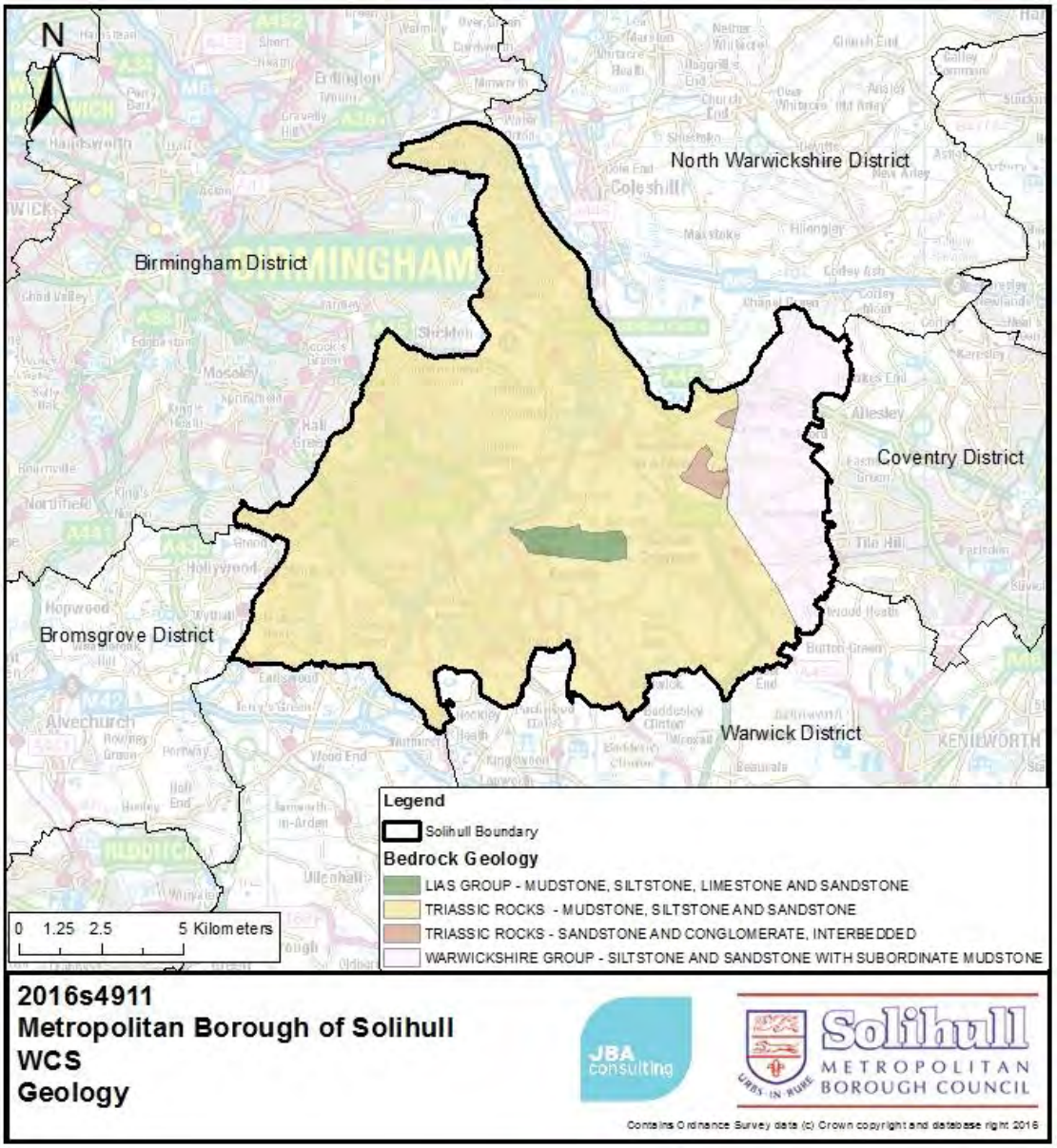
Figure 4-1: Surface Waters and CAMS Assessment Points



4.1.2 Geology

The geology across the majority of Solihull Metropolitan Borough is dominated by Triassic Mercia Mudstone which gives productive, reddish clay soils, but the areas is partially overlaid by glacio-fluvial deposits from the mid pleistocene, consisting of sand and gravel. A range of Triassic mudstone, siltstone and sandstone is found in the east of the catchment. Figure 4-2 shows the geology across the Metropolitan Borough of Solihull.

Figure 4-2: Bedrock Geology of the Metropolitan Borough of Solihull



4.2 Availability of Water Resources

4.2.1 Overview of Water Resource Management

Catchment Abstraction Management Strategies (CAMS) are prepared by the Environment Agency. The Licensing Strategy sets out how water resources are managed in different areas of England and contribute to implementing the Water Framework Directive (WFD). The CAMS provides information on the resources available and what conditions might apply to new licenses. The licences require abstractions to stop or reduce when a flow or water level falls below a specific point as a restriction to protect the environment, and manage the balance between supply and demand for water users. The CAMS is published in a series of documents known as Abstraction License Strategies (ALS's), but for clarity the term CAMS will be used in this report.

Licences are normally time limited, this allows time for a periodic review of the specific area as specific 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, the

availability of resources, and future plans or changes in the area. The licences are then replaced or renewed near to the expiry date.

The CAMS is important in terms of the Water Resource Management Plan (WRMP) as this helps to determine the current and future pressures on water resources and how the supply and demand will be managed by the relevant water companies[28]. The Metropolitan Borough of Solihull is covered by two CAMS, the Warwickshire Avon and the Tame, Anker and Mease CAMS areas, as shown in Figure 4-1. The main river that runs through the borough is the Blythe which runs along the Meriden Gap and is fed by the River Cole and is a tributary of the Tame.

Consequently, the abstraction licenses are slightly different due to the local characteristics of the water bodies. For the whole region, abstraction licences are required if more than 20m³/day of water is withdrawn from a river, lake, reservoir, pond, spring, or an underground source. The licence is granted dependant on the amount of water available.

4.2.2 Resource Availability Assessment

In order to abstract surface water, it is important to understand what water resources are available within a catchment and where abstraction for consumptive purposes is allowed. The Environment Agency has developed a classification system which shows:

- 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 flows (all those abstraction licences that are being used to full capacity) and recent actual flows (referring to the amount of water that has been abstracted in the last 6 years) in relation to the Environmental Flow Indicator (EFI). Results are displayed using different water resource availability colours, further explained in Table 4-1. In some cases, water may be scarce at low flows, but available for abstraction at higher flows. Licences can be granted that protect low flows, this usually takes the form of a "Hands off Flow" (HOF) condition on a licence.

Groundwater availability as a water resource is based on the corresponding surface water availability, unless better information on principle aquifers is available or if there are local issues that need to be taken into account.

29 Tame, Anker and Mease Abstraction Licensing Strategy (2013) Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291402/LIT_3306_bc78df.pdf (04/10/2016)

Table 4-1: Implications of Surface Water Resource Availability Colours

Water Resource Availability Colour	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 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 Tame, Anker and Mease CAMS

The Tame Anker and Mease CAMS[29] encompasses much of the West Midlands conurbation, including Birmingham, parts of the Black Country, Staffordshire to the north and the county of Warwickshire to the east. To the south east the River Cole and River Blythe flow northwards through the urban fringe. The catchment is discharge dominated and impacted greatly by the large number of sewage works, the largest being at Minworth and discharging into the River Tame. The largest abstractions in terms of water quantity in the Tame Anker and Mease CAMS are used for public water supply, energy production and industry. Water resources in this area of the Tame, Anker and Mease CAMS are reliable, as they are available at least 70% of the time. 22% of the licences however, are time-limited. The last common end date (CED) for this CAMS was the 31 March 2014, and the subsequent one is due on 31 March 2026. A time limit of 31 March 2026 will generally be applied to new abstraction licences. However, where it is uncertain about the long term impacts of an abstraction, a short term licence will be granted, during which time, potential impacts are monitored.

Surface water flows have been analysed at assessment points on the river (APs). The three in the area of the Metropolitan Borough of Solihull are at Tame, upstream of the Blythe at Water Orton (AP2), the River Cole at Coleshill (AP3) and the River Blythe at Castle Farm (AP4). A summary of available resources is shown in Table 4-2.

Groundwater abstractions which directly affect surface water flows are assessed in the same way as surface water abstractions. The Tame, Anker and Mease CAMS state the Sherwood Sandstone provides large volumes of potable water. The groundwater management unit for Birmingham however, has restricted water available for licensing. It is closed due to further abstraction because the existing levels of licensed abstraction currently exceed the long term rate of aquifer recharge.

29 Tame, Anker and Mease Abstraction Licensing Strategy (2013) Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291402/LIT_3306_bc78df.pdf (04/10/2016)

Table 4-2: Tame, Anker and Mease CAMS Resource Availability within the Metropolitan Borough of Solihull.

Note that AP 2 lies outside the borough, although parts of its catchment lie in the borough.

AP	Name	CAMS	Local resource availability	HOF Q (1)	Days p.a. (2)	Volume (Ml/d) (3)	Gauging station at AP?
2	Tame, upstream of the Blythe at Water Orton	Tame, Anker and Mease	Water available for licensing	197	328	7.6	Yes
3	River Cole at Coleshill	Tame, Anker and Mease	Water Available for licensing	29.7	270	2.6	Yes
4	River Blythe at Castle Farm	Tame, Anker and Mease	Water available for licensing	100	110	6	Yes

(1) Hands off Flow restriction
(2) Number of days per annum abstraction may be available
(3) Approximate volume available at restriction (Ml/D)

4.2.2.2 Warwickshire Avon CAMS

The Warwickshire Avon CAM[30] covers small parts of the east and south of the Metropolitan Borough of Solihull. The River Avon is a major tributary to the River Seven. The catchment has significant groundwater resources stored in the principal and secondary aquifers around Coventry, Warwick, Kenilworth and Bromsgrove areas. The west of this CAMS region covers the Solihull Borough, and it is estimated that water resources are fairly reliable, as they are available at least 50% of the time. 10.5% of the licences however are time-limited. The last CED for this CAMS was the 31 March 2013, and the subsequent one will be on 31 March 2025.

In the Warwickshire Avon CAMs, one surface water flow assessment point has been identified in the Metropolitan Borough of Solihull. A summary of the available resource for Stoneleigh (River Sowe and Sherbourne) at Stareton gauging station (AP2) is shown in

Table 4-3. Please note that AP2 is outside the borough, although parts of its catchment lie in the borough. AP6 Stratford River Avon is also outside of the borough, however parts of its catchment lie in the borough.

As already mentioned, there are two principal aquifers in this CAM region, those being the Sherwood Sandstone and Jurassic Limestone. The Sherwood Sandstone provide a large volume of potable water, particularly from the Sowe, Leam, mid-Avon and Upper Arrow catchments, and sustains industrial and agricultural abstractions. There are only very few licences abstracting from the Jurassic Limestone aquifer, which is situated in the south of the catchment; those that do are for purposes associated with agriculture.

30 Warwickshire Avon (2013) Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291400/LIT_2604_7a244e.pdf (04/10/2016)

Table 4-3: Warwickshire Avon CAMS Resource Availability within the Metropolitan Borough of Solihull

AP	Name	CAMS	Local resource availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)	Gauging station at AP?
2	Stoneleigh (River Sowe and Sherbourne	Warwick shire Avon	Water available for licensing	143	153	5.6	Yes

4.2.3 Recommendations for Better Management Practices

Due to abstraction, several water bodies in the borough have fallen below the Ecological Flow Indicator (EFI) which may lead the EA to change or revoke some abstraction licenses. This underlines the need to reduce abstraction by using more efficient management practices. This would increase the sustainability of abstraction and reduce the impacts to the environment.

The main options for this identified in the CAMS are to adopt water efficiency and demand management techniques. Methods 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; and
- 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.

4.2.4 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 surface or groundwater. Water stress causes deterioration of the water environment in both the quality and quantity of water, and consequently restricts the ability of a waterbody from achieving a "Good Status" under the 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[31] the Severn Trent supply region is classed as an area of "moderate" water stress.

4.3 Water Resource Assessment: Water Resource Management Plans

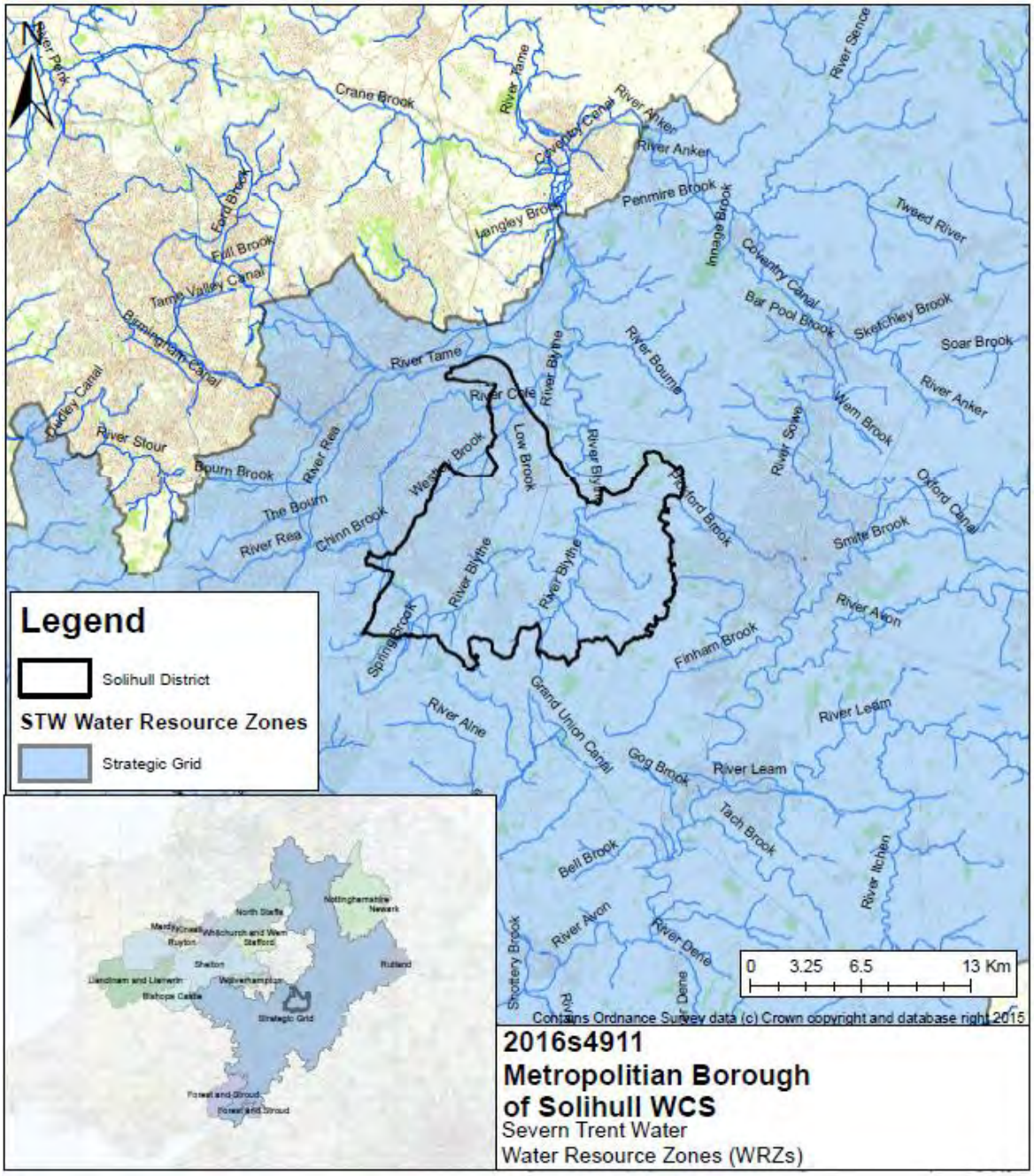
When new development within a borough is planned, it is important to ensure that there are sufficient water resources in the area to cover the increase in demand without risk of shortages in the future or during periods of high demand.

31 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 03/10/2016

The aim of this assessment is to flag up the housing numbers proposed by SMBC that exceed the number that Severn Trent have considered, whilst planning for future demand so actions can be implemented and resources can be planned to overcome future shortages.

The water resources assessment has been carried out utilising two approaches; initially by reviewing the Water Resource Management Plans (WRMPs) of Severn Trent Water, and secondly by providing the water companies with growth scenarios for each settlement allowing them to assess each settlement and the housing yields proposed.

Figure 4-3: Water Supply Company Boundaries Across the Metropolitan Borough of Solihull



4.3.1 Methodology

Severn Trent Water's Water Resource Management Plan (WRMP)[32] was reviewed and attention was mainly focussed upon:

32 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 18/10/2016

- 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

The results were assessed using a red / amber / green traffic light definition to score the water resource zone:

Adopted WRMP has planned for the increase in demand, or sufficient time to address supply demand issues in the next WRMP.	Insufficient evidence in adopted WRMP to confirm that the planned increase in demand can be met.	Adopted WRMP does not take into consideration the planned increase in demand. Additional water resources may be required.

4.3.2 Data Collection

The datasets used to assess the water resource capacity were:

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

4.3.3 Results

Severn Trent Water is responsible for supplying the Metropolitan Borough of Solihull with water. For the purposes of water resource planning, the Severn Trent supply area is divided into 15 Water Resource Zones (WRZ) which vary greatly in scale and have unique water resource concerns. The entire Metropolitan Borough of Solihull and the proposed development sites are located within the Strategic Grid WRZ, the largest resource zone which supplies the majority of Severn Trent Water's customers. Figure 4-3 shows the location and size of the Strategic Grid WRZ in relation to the other resource zones within STW and the positioning of Solihull Borough within the strategic grid.

Severn Trent Water's Final Water Resources Management Plan 2014[33] was reviewed. The overview of the proposed strategy showed that STW aims to reduce the overall demand for water across all 15 of its WRZs and make the best use of the existing water resources through a more flexible and sustainable supply system. To achieve that, the water company aims to:

- Reduce waste by reducing leakage by around 6% by 2020,
- Reduce the demand for water by working with customers to improve their water efficiency,
- Increase the efficiency, flexibility, and resilience of existing water resources by utilising water trading,
- Expand existing water resources and develop new water resources when required,
- Utilise proactive catchment management measures to protect sustainable sources of drinking water supply from pollution risks.

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

The Strategic Grid WRZ is likely to require significant investment in order 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 5Ml/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 4-4.

Table 4-4: 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

Supply-demand balance:

The WRZ is predicted to enter supply-demand deficit under dry-year annual average conditions by 2020, under the scenario that Severn Trent do nothing. This is a result of pressures from an imbalance in growth, a result of pressures from climate change and sustainability constraints, such as from the need to reduce abstraction from unsustainable sources[34]. Therefore this strategic zone will require new sources of water supply. The future deployable output losses are largely the result of changes to the operation of the River Wye and Elan Valley reservoirs, as required to meet the objectives of the Habitats Directive. These changes could result in a loss of up to 40Ml/d of deployable output in the Strategic Grid Zone. There are also further abstraction licence reductions needed across the zone due to environmental concerns which will amount to a further 5Ml/d loss of deployable output. However, this is dependent on the delivery of wider water quality and capital maintenance investment programmes that will ensure our existing sources of supply are reliably available.

Population and household growth:

For the base year 2012/13, the number of properties within the supply area were based on STWs 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 were based on the 2011 population projections from the Office

34 Severn Trent Water, Water Resource Management Plan (2014) Online at: http://www.water.org.uk/policy/water-resources/water-company-plans accessed on 18/10/2016.

for National Statistics (ONS). The household growth estimates used in the 2014 WRMP35 for the strategic grid area shown in Table 4-5.

Table 4-5: Severn Trent Water WRMP Household Growth Estimates for the Strategic Grid WRZ

Component	2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
Strategic Grid New Build Properties	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. The WRMP does not include a break-down of household growth by local authority. 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[36]. For those districts partially covered, the percentage of the current population of each local authority within the WRZ was applied. Table 4-6shows the 2015 DCLG housing projections for the local authorities within the Strategic Grid.

Table 4-6: DCLG 2015 Household Projections in the STW Strategic Grid WRZ

Local Planning Authority	Est. % pop. within WRZ	2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
Wyre Forest	100%	1,070	1,399	1,315	1,178	815	5,777
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
Hinckley and Bosworth	100%	1,465	1,857	1,762	1,597	1,024	7,705
Melton	100%	749	901	809	713	506	3,678
Harborough	100%	1,701	1,994	1,839	1,662	1,149	8,345
Blaby	100%	1,048	1,327	1,215	1,134	758	5,482
Charnwood	100%	3349	3770	3877	3780	2638	17,414
Oadby and Wigston	100%	36	227	442	466	338	1,509
Rugby	100%	1868	2425	2247	2189	1700	10,429
Warwick	100%	2186	3013	2946	2879	2123	13,147

35 Severn Trent Water Limited (2013) Strategic Grid fWRMP Data Tables. Accessed via https://www.severntrent.com/content/ConMediaFile/1718 on 18/10/2016.

36 Household Projections (2015) online at https://www.gov.uk/government/collections/household-projections#history accessed on 23/01/2017.

Local Planning Authority	Est. % pop. within WRZ		2015-2019	2020-2024	2025-2029	2030-2034	2035-2039	Total
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
Leicester	100%		4693	5709	5879	6052	4411	26,744
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
North West Leicestershire	90%	Total	1,057	1,353	1,309	1,193	824	5,736
		WRZ	951	1,218	1,178	1,074	742	5,162
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
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	30.00%	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**

The comparison shows that Severn Trent Water forecast a housing yield of **359,450** between 2015 and 2039 in the strategic grid. The latest DCLG household growth estimates forecast a value of 403,700. This is an 11% increase on the 25-year housing yield used in the 2014 WRMP and may require some further investigation. Notably, the difference in growth projections is greatest in the

period 2020 to 2024, indicating that STW may need to amend their strategy for AMP7. It is anticipated that Severn Trent Water will have commenced a review as part of their preparations for the next WRMP, which commences in 2019.

Per-capita consumption:

A downwards trend in demand is often displayed where a water company is in an area designated as water stressed, or where it has demand above the national average (147 litres per head per day). The general trends in water demand from household and non-household customers over the last 15 years has experienced a 5% decline since 1997-1998, while commercial demand has shown a decline of around 25% over the same period. Despite a growing population and household customer base, the total demand for water has declined over the past 15 years. Household demand has decreased marginally despite population and household number growth, and reflects the success of water efficiency efforts by Severn Trent household customers and the impact of metering on consumption. In addition, a series of relatively cool and wet summers that have been observed recently, has marked a steep decline in household consumption.

Within the Strategic Grid WRZ, Severn Trent Water have predicted a future reduction in household per capita consumption (PCC), with the greatest net reductions in the early part of the plan period from AMP 6 - AMP 10. Cumulative Net Demand reductions are predicted to be 15.29Ml/d in AMP 6 (2015-2020), 24.82Ml/d in AMP 7 (2020-2025), 30.69Ml/d in AMP 8 (2025-2030), 34.19Ml/d in AMP 9 (2030-2035) and 35.41Ml/d in AMP 10 (2035-2040). These demand forecasts have assumed a decline in water savings from product installation at 10% per annum and a decline in water savings from education at 5% per annum[37]. The non-household water demand for the Strategic Grid WRZ for 2011 is 217Ml/d, which is expected to decrease to 196.2Ml/d and then to 188.1Ml/d by 2030, with a slight increase in demand to 188.9Ml/d in 2040.

The preferred plan:

Severn Trent Water have presented the following preferred plan for maintaining the supply-demand balance in Strategic Grid WRZ. The 2014/15 leakage target is to be maintained with no deterioration to 2039/40. Maintaining the level of leakage overtime will require Severn Trent to implement significant investment to offset the underlying natural rate of rise (NRR) in leakage which results from mains deterioration over time. The 2014 Water Resource Management Plan for Severn Trent Water stated a plan to achieve over the next 25 years which includes both overall plan objectives and Strategic Grid Schemes, as described below:

- Continuing to reduce leakage, with an expected leakage target around 407Ml/d by 2040. This would represent a leakage fall of around 89Ml/d from 2010 levels, a reduction of around 18%. The AMP6 (2015-2020) leakage reduction will be double the amount that was included in the draft WRMP, and is in response to the challenge from stakeholders that the leakage reduction plans should be more ambitious. The plan will mean that government aspirations are exceeded and at least a 3% reduction in leakage will be achieved by 2020.
- AMP7 (2020-2025) - Reduce leakage by 3Ml/d, Trimpley- Worcestershire groundwater conjunctive use, expansion of Draycote reservoir by 6%, Bromsgrove groundwater licence transfer.
- AMP8 (92025 - 2030) - Reduce leakage by 1.9Ml/d
- AMP9 (2030-2035) - Reduce leakage by 3.7Ml/d
- AMP10 (2035 - 2040) - reduce leakage by 0.3Ml.d
- Helping customers reduce their demand for water by continuing and accelerating our current water efficiency activities, with expected savings of around 40Ml/d by 2040.
- Continuing with household metering at a pace led by our customers through the update of the free meter option.
- Reducing abstractions from sources where it is certain or likely that activities are causing environmental damage or are continuing to fail Water Framework Directive objectives. This would mean giving up around 85Ml/d of the currently held water abstraction licences.

37 Severn Trent Water, Water Resource Management Plan (2014) Online at: http://www.water.org.uk/policy/water-resources/water-company-plans accessed on 18/10/2016.

- Make new strategic links to neighbouring water supply companies and beyond making better use of existing resources and improving supply resilience.

These proposals are integrated with the wider capital maintenance and water quality investment plans to ensure reliable and sustainable output from our existing sources. The WRMP states that the preferred plan is sensitive to transfer requirements from other resource zones, including from other water companies. This could therefore be sensitive to sudden changes in household projections or to sustainability reductions in abstraction licenses. This will be addressed through the five-yearly WRMP process, and the annual update reports.

4.3.4 Conclusions

All settlements and sites within the Metropolitan Borough of Solihull are supplied by Severn Trent Water and are located within the Strategic Grid WRZ. Severn Trent Waters WRMP demonstrates the pressures on water resources across the water companies supply area due to the impacts of population increases, resource uncertainty, climate change and the need to reduce abstractions to reduce the impacts of the natural environment.

There is an 11% disparity between the predicted housing yield of Severn Trent Water and the latest DCLG household growth estimates across the Strategic Grid WRZ. Housing growth figures for Solihull and individual local authorities, that are not however published in the WRMP, and the zone is the appropriate geographic scale for this assessment. The difference between these figures will require some review as the STW WRMP is planning for a growth rate below what is predicted by the DCLG. There is no evidence that the increase in forecast housing growth and therefore in water demand will lead to an imminent supply-demand imbalance, and it is expected that STW's next WRMP, to be published in 2019, will account for the rise in planned housing growth. Therefore, the overall RAG assessment for water resources is considered to be green.

Although Severn Trent Water 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 water usage, at nominal additional cost to the developer, would be in line with general principals of sustainable development, and reducing energy consumed in the treatment and supply of water.

4.3.5 Recommendations

Action	Responsibility	Timescale
Review population and housing growth forecasts within Severn Trent Water Strategic Grid WRZ	Severn Trent Water, SMBC	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.	SMBC and other LPAs in STW's Strategic Grid WRZ	Ongoing
Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas.	SMBC	In draft Local Plan
Water companies should advise SMBC of any strategic water resource infrastructure developments within the Borough, where these may require safeguarding of land to prevent other type of development occurring. However, at present, no major potential schemes have been identified within the SMBC boundary.	STW, SMBC	In draft Local Plan

4.4 Water supply infrastructure assessment

Increase in water demand adds pressure to the existing supply infrastructure. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrading will be required. The time required to plan, obtain funding and construct major pipeline works can be considerable and therefore water companies and planners need to work closely together to ensure that the infrastructure is able to meet growing demand.

Water supply companies make a distinction between supply infrastructure, the major pipelines, reservoirs and pumps that transfer water around a WRZ, and distribution infrastructure, smaller scale assets which convey water around settlements to customers. This assessment is focussed on the supply infrastructure. It is expected that developers should fund assessments and the modelling of the distribution systems to assess requirements for local capacity upgrades.

4.4.1 Methodology

Severn Trent Water were provided with a complete list of sites and the potential/equivalent housing numbers for each. Using this information, STW were asked to comment on the impact of the proposed growth on water supply infrastructure in SMBC.

4.4.2 Data collection

The datasets used to assess the water supply and distribution capacity are the following:

- Site locations in GIS format (provided by SMDC)
- Potential housing numbers for each site (provided by SMDC)
- Population equivalent using an occupancy rate of 2.35p/h (calculated by STW)
- Water demand by multiplying the population equivalent by 136l/p/d (calculated by STW)

4.4.3 Results

The following response was received from Severn Trent Water:

"Severn Trent Water's Water Resource Management Plan already considers the supply and demand issues for the next 25 years. However, the water supply network is a highly pressurised system and detailed modelling is required to determine whether additional demand will require capacity upgrades. As development occurs within Solihull Metropolitan Borough, Severn Trent Water modelling teams can then undertake detailed modelling but because infrastructural improvements and local reinforcements can usually be undertaken within 18 months to 2 years, water capacity is not expected to be a constraint to development."

4.4.4 Conclusions

Severn Trent Water responded to the request to assess the impacts of development on water supply infrastructure. STW confirmed that water supply is not expected to be a constraint to development. Early developer engagement is required to ensure that, as development occurs within the Borough, detailed modelling of water supply infrastructure will allow any upgrades to be completed without restricting the timing, location or scale of the planned development.

4.4.5 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	STW	Ongoing
Undertake technical studies to understand options to provide sufficient bulk and local transfer capacity and communicate results with WFDC.	STW	Ongoing
Developers seek early consultation with Severn Trent Water in order to ensure adequate time is available to provide local distribution main upgrades to meet additional demand.	Developers, STW	Ongoing

5 Wastewater Collection and Treatment

Severn Trent Water (STW) is the Sewerage Undertaker (SU) for the entire Borough. The role of sewerage undertaker includes the collection and treatment of wastewater from domestic and commercial premises, and in some cases areas it also includes the drainage of surface water from building curtilages to combined or surface water sewers. It excludes, unless adopted by STW, systems that do not connect directly to the wastewater network, e.g. SuDS or highway drainage.

Increased wastewater flows into collection systems due to growth in populations or per-capita consumption can lead to an overloading of the infrastructure, increasing the risk of sewer flooding and, where present, increasing the frequency of discharges from Combined Sewer Overflows (CSOs).

Likewise, headroom at Wastewater Treatment Works (WwTW) can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity. As the volumes of treated effluent rises, even if the effluent quality is maintained, the pollutant load discharged to the receiving watercourse will increase. In such circumstances the Environment Agency (EA), as the environmental regulator, may tighten consented effluent consents in order to achieve a "load standstill", i.e. ensuring that as effluent volume increases the pollutant discharged does not increase. Again, this would require investment by the water company to improve the quality of the treated effluent.

In combined sewerage systems, or foul systems with surface water misconnections, there is potential to create headroom in the system, thus enabling additional growth by the removal of surface water connections. This can most readily be achieved during the redevelopment of brownfield sites which currently have combined sewerage systems, where there is potential to discharge surface waters via sustainable drainage systems (SuDS) to groundwater, watercourses or surface water sewer.

5.1 Sewerage System Capacity Assessment

New residential developments add pressure to the existing sewerage system. An assessment is required to identify the available capacity within the existing systems, and the potential to upgrade overloaded systems to accommodate future growth. T he scale and cost of upgrading works may vary significantly depending upon the location of the development in relation to the network itself and the receiving WwTW.

It may be the case that an existing sewerage system is already working at its full capacity and further investigations have to be carried out to define which solution is necessary to implement to increase its capacity. New infrastructure may be required if, for example, a site is not served by an existing system.

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.

5.1.1 Methodology

Severn Trent Water were provided with the list of sites and the potential housing numbers. Using this information STW assessed each site using the range of datasets they hold.

STW used the following red / amber / green traffic light definition to score each site:

Capacity available to serve the proposed growth	Infrastructure and/or treatment upgrades required to serve proposed growth or diversion of assets may be required	Major constraints to provision of infrastructure and/or treatment to serve proposed growth

5.1.2 Data Collection

The datasets used to assess the sewerage system capacity are the following:

- Site locations in GIS format (provided by SMBC)
- Potential housing numbers for each site (provided by SMBC)
- Populations equivalent using an occupancy rate of 2.3p/h (calculated by STW)
- Water demand by multiplying the population equivalent by 136l/p/d (calculated by STW)

5.1.3 Results

STW provided a spreadsheet containing sewerage comments in terms of known network constraints, assumed connectivity and surface water disposal. STW also provided an overall RAG score for the potential impact of the developments on sewerage infrastructure. A summary of the results of the sewerage system capacity assessment is presented below and the full version of the results detailing more information is shown in Appendix B.

The following information was received alongside the assessment provided by STW:

- The purpose of these desktop based assessments are to indicate where proposed development **may** have a detrimental impact on the performance of the existing public sewerage network, taking into account the size of the development proposals.
- These are desktop assessments using readily available information and have not been subjected to detailed hydraulic modelling.
- For most new development the surface water should be managed sustainably through use of a SuDS, the additional foul only flows will have a negligible impact on existing sewer performance but where there are pre-existing capacity constraints additional capacity improvements may be required.
- Where subsequent detailed modelling indicates capacity improvements are required, such work will be phased to align with development occupancy with capacity improvement works funded by Severn Trent Water.
- "However, whilst Severn Trent have a duty to provide additional capacity to accommodate planned development, we also have a requirement to manage our assets efficiently to minimise our customers' bills. Consequently, to avoid potential inefficient investment we generally do not provided additional capacity until there is certainty that the development is due to commence. Where development proposals are likely to require additional capacity upgrades to accommodate new development flows it is highly recommended that potential developers contact Severn Trent as early as possible to confirm flow rates and intended connection points. This will ensure provision of additional capacity can be planned into our investment programme to ensure development is not delayed".

Balsall Common STW

Two of the three sites identified in this catchment (Barratts Farm and Windmill Lane near Kenilworth Road) have been identified as having a high potential impact on sewerage infrastructure. Both sites are subject to sizeable development with no suitably sized foul sewers in the immediate vicinity of Barratts Farm and the size of the site given the units that will be added to Windmill Lane. The third site, Frog Lane, has been identified as posing a medium potential impact as a result of a hydraulic flooding event downstream of the site. All three sites will therefore require hydraulic modelling by STW.

Barston STW

Four sites within the preferred local plan would go to Barston STW, three of which have been given a low scoring of potential impact on sewerage infrastructure, subject to hydraulic modelling (Hampton Road, Knowle (site A and B) and Sharmans Cross Road, Solihull). Meriden Road in Hampton-in-Arden has been identified as posing a medium potential impact on sewerage infrastructure under the preferred option of development, as a result of known capacity issues and interaction of the flow with a SSSI, which is the River Blythe that runs through the centre of the borough.

Coleshill STW

Ten sites within the preferred local plan have been identified as draining to the Coleshill STW. Of these ten, six of the sites have shown to pose a high potential impact on sewerage infrastructure and therefore require further modelling. Namely these are East of Solihull at Lugtrout and Lane Hampton Lane; The Green, Shirley; Land Damson Parkway at Bickenhill; South of Dog Kennel Lane, Shirley; South of Shirley, Whitlocks End Farm and Dickens Heath Road; and, the UK Central Hub/HS2 Interchange, Bickenhill. The high impact on sewerage infrastructure is attributed to either incapacity of the STW, potential for further flooding incidents and the size of the development. The largest impact in terms of units has been identified to be from the UK Central Hub/HS2 interchange, Bickenhill.

Three sites have been identified as having a low potential impact on sewerage infrastructure, Chester Road/ Moorend Avenue at Fordbridge, Jenson House and Auckland Drive in Smiths Wood and Kinghurst Village Centre These have been identified as at lower risk due to the smaller size of the area draining to Coleshill STW. Arran Way at Smiths Wood, located in the lower reaches of the Coleshill and Barston Catchment is the only site that has been identified as having a medium potential impact on sewerage infrastructure, as a result of the unknown surface water asset availability.

Meriden STW

West of Meriden on Birmingham Road is the only site in the proposal that would drain to Meriden STW, and it has been identified as having a low potential impact on sewerage treatment infrastructure. The site is adequately served by a surface water sewer on its east boundary and an unnamed watercourse across its northern boundary. However, given the small size of this WwTW, a capacity assessment at the works may be required, in addition to the low score being subject to hydraulic modelling.

Minworth STW

West of Dickens Heath at Tythe Barn Lane has been identified as a site as having high potential impact on the sewerage infrastructure given the size of the development, the distance from Coleshill treatment works, flows crossing a large portion of the catchment and potential pumping station issues.

Norton Green STW

South of Knowle Station Road and Warwick Road in Knowle has been identified as the only site in the preferred local plan that would go to Norton Green STW. A high rating score has been given to this site, meaning there is a great chance of potential impact on sewerage infrastructure as a result of the plan composing of an additional 500 or more properties, which has the potential to create capacity issues.

5.1.4 Conclusions

The STW assessment of sewerage system capacity in the Metropolitan Borough of Solihull has brought the following conclusions:

- 7 of the 21 sites (including Hampton Road site A and B) within the preferred draft local plan for the Metropolitan Borough of Solihull have been identified as having sufficient capacity available to serve the proposed growth.
- 4 of the 21 different sites would require infrastructure and/ or treatment upgrades in order to serve the proposed growth, a diversion of assets may also be required to provide adequate sewerage capacity for the development of these sites.
- 10 of the sites that have been assessed in this report would face major constraints to the provision of infrastructure and/or treatment to serve the level of growth proposed at the development sites
- Severn Trent Waters preferred method of surface water disposal is using a sustainable drainage system (SuDS) with connection to the sewer system seen as the last option.
- Sewerage Undertakers have a duty under Section 94 of the Water Industry Act 1991 to provide sewerage and treat wastewater arising from new domestic development. Except where strategic upgrades are required to serve very large or multiple developments, infrastructure upgrades are usually only implemented following an application for a connection, adoption, or requisition from a developer. Early developer engagement with

water companies is therefore essential to ensure that sewerage capacity can be provided without delaying development.

5.1.5 Recommendations

Table 5-1: Sewerage infrastructure assessment actions

Action	Responsibility	Timescale
Take into account sewerage infrastructure constraints in phasing development in partnership with Severn Trent Water.	SMBC	Ongoing
Severn Trent Water to continue to assess growth demands as part of their wastewater asset planning activities and feedback to SMBC where concerns arise.	STW	Ongoing
Severn Trent Water and developers will be expected to work closely and early on in the planning promotion process to develop an outline Drainage Strategy for the site. The Outline Drainage strategy should set out sufficient detail to determine the likely timescales for the delivery of the infrastructure and the likely costs of the infrastructure. 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.	STW and Developers	Ongoing
Developers will be expected to show 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	Ongoing

5.2 Wastewater Treatment Works Flow Consent Assessment

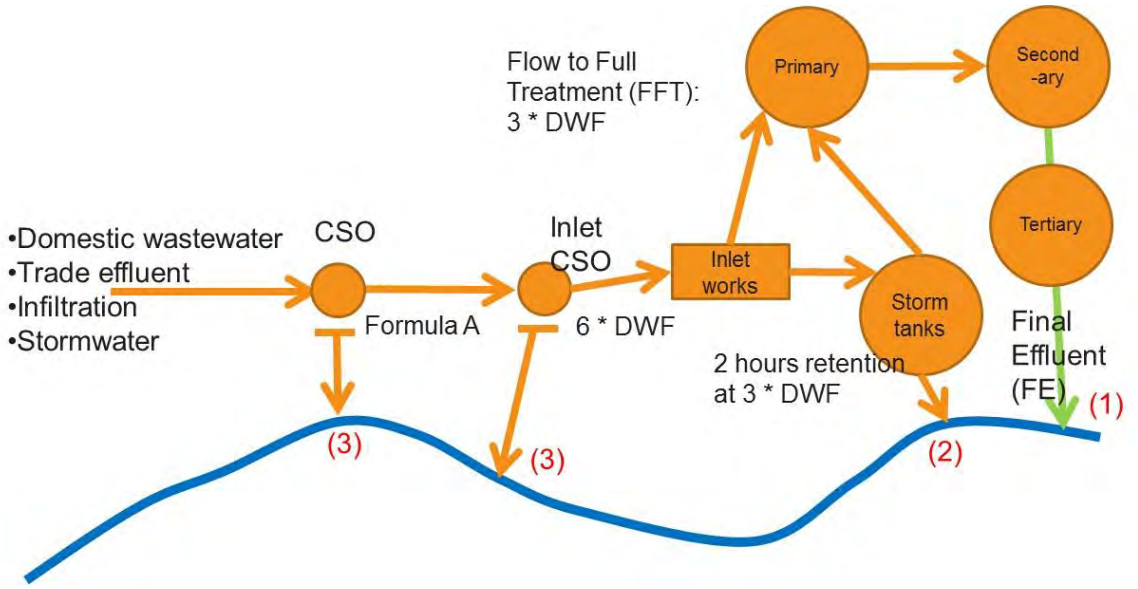
5.2.1 Introduction

The EA is responsible for regulating sewage discharge releases via a system of Environmental Permits (EPs). Monitoring for compliance with these permits is the responsibility of both the EA and the plant operators.

Figure 5-1 summarises the different types of wastewater releases that might take place, although precise details vary from works to works depending on the design.

During dry weather, the final effluent from the Wastewater Treatment Works (WwTW) should be the only discharge (1). With rainfall, the storm tanks fill and eventually start discharging to the watercourse (2) and Combined Sewer Overflows (CSOs) upstream of the storm tanks 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.

Figure 5-1: Overview of typical combined sewerage system and wastewater treatment works discharges



Environmental permits are used alongside water quality limits as a means of controlling the pollutant load discharged from a wastewater treatment works to 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 a statistic known as the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for wastewater treatment works 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).

WwTW Environmental Permits 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, in particular that the Chemical Status element of the Water Framework Directive (WFD) classification.

The impact of the potential proposed development on wastewater treatment is assessed as follows:

- Assessment of headroom capacity in the flow consent for each WwTW (this section)
- Impact of the additional future effluent on the water quality of the receiving waterbody (section 6).
- Impact of additional future effluent flows on downstream flood risk (section 7.2).
- A screening assessments to identify sites which may be impacted by odour nuisance from WwTWs (section 5.3).

5.2.2 Methodology

An assessment of the WwTW capacity was carried out by assessing the available headroom within the current Dry Weather Flow (DWF) permit at each WwTW, and converting this to an equivalent number of new homes. Headroom was calculated following the Environment Agency's preferred method of defining actual DWF as the 90 percentile flow recorded at the treatment works (i.e. the

flow which is exceeded for 90% of the time). This was subtracted from the consented DWF to determine the available headroom.

Headroom was converted to an equivalent number of new homes using the following assumptions:

- Per-capita water consumption at 136l/person/day (from STW WRMP)
- Population equivalent using an occupancy rate of 2.35p/h (calculated by STW)
- DWF assumed to be 110% of per water consumption (recommended by Severn Trent, this includes an allowance for infiltration)

In addition to the assessment prepared by JBA, STW were provided with the list of settlements and the potential/equivalent numbers for each treatment works. They were invited to provide an assessment of the receiving WwTW and any additional comments.

Each treatment works was given a red / amber / green traffic light score using the following definitions:

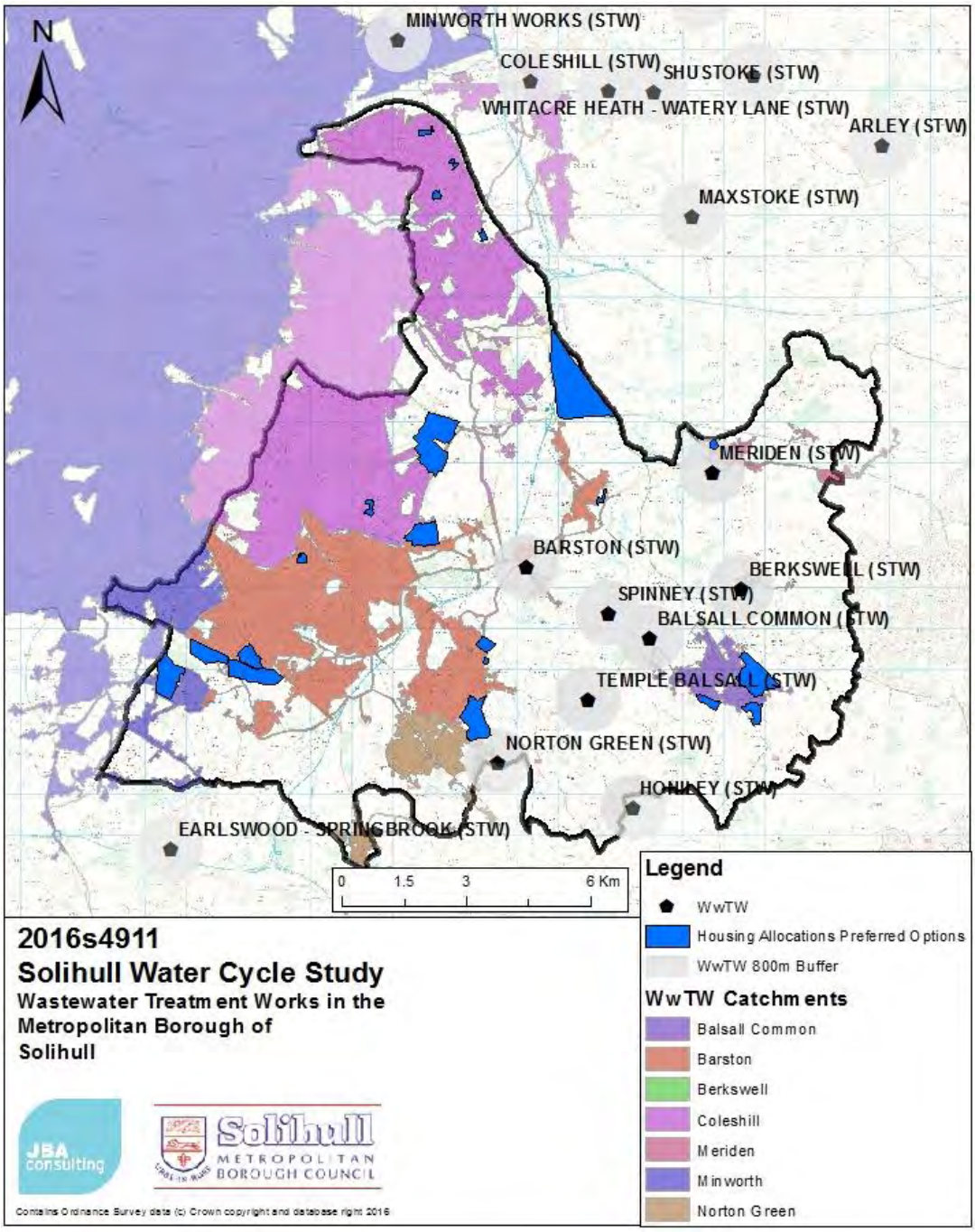
Capacity available to serve the proposed growth	Infrastructure and/or treatment upgrades required to serve proposed growth or diversion of assets may be required	Major constraints to provision of infrastructure and/or treatment to serve proposed growth

5.2.3 Data Collection

The datasets used to assess the WwTW capacity are the following:

- List of settlements (provided by SMBC)
- Planned housing numbers for each proposed site (provided by SMBC)
- WwTW locations and sewerage drainage area boundaries (used by STW)
- Occupancy rate, water demand and % of water that reach the WwTW (used by STW)

Figure 5-2: Sewerage drainage boundaries and proposed sites within Solihull



5.2.4 Results

This analysis identified six WwTWs serving the SMBC area, however Minworth WwTW, which serves 1.7M people in Birmingham and the Black Country was excluded from this assessment, as previously mentioned, on the basis that the additional flow from SMBC will form only a tiny proportion of the total flow treated. This approach was communicated to Severn Trent Water and the Environment Agency, and it is recommended that a strategic scale water quality assessment be undertaken for Minworth. This should address planned growth in all of the local authorities served. The results of this assessment show that Coleshill and Meriden WwTW have capacity for growth, however the headroom at Meriden WwTW is very small. The other three WwTW have a shortfall from full growth number in DWF and will therefore require infrastructure or treatment upgrades in order to serve proposed growth, or additionally, a diversion of assets may be required. Results for this assessment are shown in Table 5-2.

It is worth noting that the observed flows for the year 2014 was a year of exceptionally high rainfall. Across the Severn Trent region, the Centre for Ecology and Hydrology (CEH)[38] estimate that the annual rainfall was 120% of the long-term average, and had a 1 in 10-20 year return period. In these conditions, many wastewater collection systems would be expected to exhibit higher than average infiltration flows. The EA has commissioned research (currently unpublished) into identifying periods of "unusual" rainfall which should be excluded from the calculation of actual DWF. This method has not been applied to the calculation of actual DWF in this assessment. It is therefore possible that the flows were atypical during 2014 and if so would lead to an underestimation of headroom at these WwTWs. Rainfall in the Severn Trent Region for 2015 and 2016 was 100% and 105% of the long-term average.

No comments were provided by Severn Trent Water on the WwTW within the Borough of Solihull where there is proposed growth.

Table 5-2: Wastewater treatment works flow headroom assessment results

WwTW Name	DWF Consented Volume (m3/d)	Current DWF 2016 (m3/d)	Current Surplus (m3/d)	Proposed New Housing	Additional Demand (m3/d)	Total Future DWF (m3/d)	Future DWF Headroom (m3/d)
Balsal Common	1780	1513	267	1150	3514	5027	-3246
Barston	11200	8380	2820	2350	7180	15560	-4360
Coleshill	65000	46870	18130	3322	6535	53405	11595
Meriden	752	568	184	50	153	721	31
Norton Green	3180	2038.4	1141.6	750	2291	4330	-1150

5.2.5 Conclusions

This assessment looked at the available headroom in the flow consents at each of the WwTW that serve the Metropolitan Borough of Solihull and their likely ability to accommodate additional wastewater flows from the proposed development sites. It has been identified that Balsal Common, Barston and Norton Green will require additional investment and treatment capacity upgrades.

5.2.6 Recommendations

Table 5-3: Wastewater treatment works capacity actions

Action	Responsibility	Timescale
Take into account the available WwTW capacity in phasing of development going to the same WwTW.	SMBC	Ongoing
Provide annual updates to STW of projected housing growth.	SMBC	Annually
STW to assess growth demands as part of their wastewater asset planning activities and feedback to SMBC where concerns arise.	STW	Ongoing
STW, SMBC, neighbouring council and the EA will work closely to ensure the timely delivery of any necessary WwTW upgrades.	STW, EA and SMBC	Ongoing

38 Centre for Ecology and Hydrology (2015) Hydrological Summary for December 2014. Accessed online at http://nora.nerc.ac.uk/509404/1/HS_201412.pdf on 15/01/2017

5.3 Wastewater Treatment Works Odour Assessment

5.3.1 Introduction

In locations where proposed new development encroaches upon an existing Wastewater Treatment Works (WwTW), odour from the WwTW may become a cause of nuisance and complaints for future residents. Managing odour at WwTW can add considerate capital and operational costs, particularly when retro-fit to existing WwTW .

National Planning Policy Guidance recommends that plan-makers considering whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, in particular, due to the risk of odour impacting on residents and requiring additional investment to address.

5.3.2 Methodology

It is generally the case for water companies that a new development may need an odour assessment if the site is close to a WwTW and is encroaching closer to the WwTW than existing urbanised areas.

A GIS assessment was carried out by JBA Consulting to identify sites that are less than 800m from a WwTW and sites that are encroaching closer to the WwTW than the existing urbanised areas. If there are no existing houses it is more likely that an odour assessment is needed. Another important consideration is the location of the site in respect to the WwTW because the predominant winds blow from the south west.

A red / amber / green assessment was applied:

Site is unlikely to be impacted by odour from the STW	Site location is such that an odour impact assessment is recommended	Site is an area with confirmed STW odour issues

5.3.3 Data Collection

The datasets used to assess the impact of odour from each WwTW were:

- Sites location in GIS format (provided by the SMBC)
- WwTW locations (provided by STW)
- OS mapping

5.3.4 Results

Table 5-4 lists those sites where it is recommended that an odour assessment is undertaken.

Table 5-4: Sites where an odour assessment is recommended

Site Ref	WwTW	Encroachment?	Direction of the WwTW from the development site	Site boundary distance from WwTW (m)
LPR10	Meriden	Yes	South	760m
LPR09	Norton Green	Yes	South	650m

5.3.5 Conclusions

The odour screening assessment concluded that two sites may be at risk of experiencing odour due to their proximity to the existing WwTW. It is recommended that the odour impact assessments are undertaken as part of the planning application process for these sites. All other sites are unlikely to be impacted by odour from WwTWs.

Table 5-5: Wastewater treatment odour summary

Site Ref	Location	Assessment
LPR09	South of Knowle (impacted by Norton Green WwTW)	Site location is such that an odour impact assessment is recommended as part of the planning application process
LPR10	West of Meriden (Impacted by Meriden WwTW)	
All other sites		Site is unlikely to be impacted by odour from WRC

5.3.6 Recommendations

Table 5-6: Wastewater treatment odour actions

Action	Responsibility	Timescale
Consider odour risk in selection of site allocations.	SMBC	Ongoing
Carry out an odour assessment for 'amber' assessed sites (for LPR09 and LPR10)	Developers	Ongoing

6 Water Quality Assessment

6.1.1 Introduction

The increased discharge of effluent due to a growth in population served by a Waste Water Treatment Works (WwTWs) may impact on the quality of the receiving waterbody. The Water Framework Directive (WFD) does not allow a watercourse to deteriorate from its current class (either water body or element class).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourse. Where the scale of development is such that a deterioration is predicted, a new Environmental Permit (EP) may be required for the WwTW to improve the quality of the final effluent, so that the extra pollution load will not result in a deterioration in the water quality of the watercourse. This is known as a "no deterioration" or "load standstill".

It is the objective of the WFD that all waterbodies should meet Good Ecological Status (GES), or where they have been highly modified meet Good Ecological Potential (GEP). It is therefore also necessary to assess whether the proposed increase in effluent due to growth could prevent a watercourse from meeting GES or GEP.

If a watercourse fails the GES target, further investigations are needed to define the 'reasons for fail' and which actions could be implemented to reach such status.

For each development site, the receiving WwTW was identified. This has allowed for the total future DWF to be calculated for each WwTW. This analysis identified six WwTWs serving the SMBC area, however Minworth WwTW, which serves 1.7M people in Birmingham and the Black Country, was excluded on the basis that the additional flow from SMBC will form only a tiny proportion of the total flow served. This approach was communicated to Severn Trent Water and the Environment Agency, and it is recommended that a strategic scale water quality assessment be undertaken for Minworth. This should address planned growth in all of the local authorities served.

Therefore the water quality assessment investigated environmental capacity at the following WwTWs:

- Balsall Common
- Barston
- Coleshill
- Meriden
- Norton Green

The aims of this assessment was to:

- Identify whether the increases in wastewater effluent discharged as a result of the proposed growth would lead to deterioration in water quality in the receiving watercourse.
- Where deterioration is predicted, test whether this could be prevented, using a tighter permit condition.
- Where the watercourse is not meeting the physio-chemical requirements of the Water Framework Directive Good Ecological Status or Potential, test whether the proposed growth would prevent that from being achieved.

Full details of the water quality assessment methodology and results are included in Appendix A. This section provides a summary of the methodology, results and conclusions.

6.1.2 Methodology

To complete the assessment, future effluent flows were calculated to represent the future growth at proposed developments provided by Solihull Metropolitan Borough Council and neighbouring local authorities. Coleshill WwTW will take an extra 1351 proposed homes from Birmingham City and 602 from the North Warwickshire District, whilst Norton Green WwTW will take an extra 20 proposed homes from the Warwick District. These extra housing numbers were included in the future effluent flows.

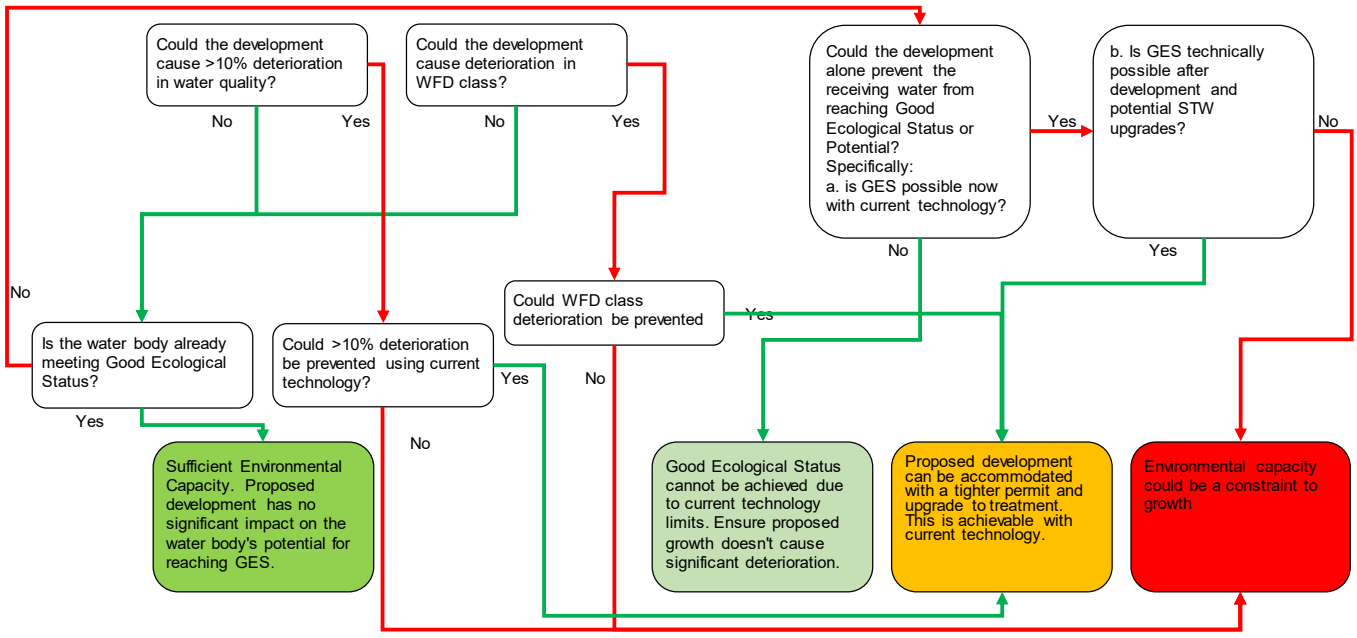
The Environment Agency's RQP tool was used to assess how the volumetric flows impacted upon the water quality at the five WwTWs and identify whether this causes a deterioration in the receiving watercourse. Deterioration is defined by the EA where any of the following conditions apply:

- A class deterioration: For example, if an increased load of ammonia from a WwTW led to a water body currently defined as "Fair" ecological status dropping down to "Poor" status.
- A deterioration of more than 10%. For example, if the present-day 95 percentile BOD downstream of a WwTW is 2.0mg/l, but as a result of an increased WwTW discharge this rose to 2.3mg/l, this would be a deterioration of 15%.
- Any deterioration of a water body classed as "Bad". Where the water body is currently of "Bad" ecological status (the lowest WFD status), then no further deterioration is permitted.

Where deterioration was predicted, the model was rerun to test whether upgrading the treatment works to use Best Available Technology (BAT) could prevent deterioration.

Where the receiving watercourse downstream of the treatment works was predicted to not meet Good status for one or more determinants, the models were rerun to test whether the application of Best Available Technology (BAT) treatment processes could enable the receiving watercourse to meet the physico-chemical requirements to achieve good Ecological Status or Potential. Where they could, this was then retested with the additional effluent flows due to growth. In cases where GES could be achieved at present, but would be prevented from being achieved in the future due to the growth alone, it is considered that environmental capacity may be a constraint on growth. This assessment process has recently been set out in a guidance document by the Environment Agency's West Thames Area[39]. Whilst this document has no national status it provides a useful summary of how to interpret the results of the water quality assessment. This guidance is summarised in the flow chart below:

Figure 6-1: Water Quality Assessment flow chart



The EA advised the following permit values are achievable using Best Available Technology (BAT) and that these values should be used for modelling all WwTW potential capacity irrespective of the existing treatment technology and size of works:

- BOD (95%ile) = 5mg/l
- Ammonia (95%ile) = 1mg/l
- Phosphorus (mean) = 0.5mg/l

Note that phosphorus removal is the subject of ongoing national trials investigating novel techniques and optimisation of existing methods. This major study, which involves all UK water companies, is not due to report until 2017, therefore this assessment is based on the current assumption of BAT for phosphorus. STW are assuming a 0.5mg/l as BAT until the study's results will be available.

The assessment did not consider the feasibility of upgrading each existing WwTW due to constraints of cost, timing, space, carbon cost etc.

39 Environment Agency West Thames Area (2015) Water Cycle Study Guidance and Requirements - West Thames Area.

6.1.3 Results

Table 6-1: Summary of Results when BAT is applied

Watercourse (WwTW)	Could the development cause a greater than 10% deterioration in WQ?	Could the development cause a deterioration in WFD class of any element?	Could the development prevent the water body from reaching GES?
Key	See Figure 6-1		
River Blythe (Balsall Common WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for NH_4 and P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.	Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Blythe (Barston WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	No class deterioration predicted. No WwTW upgrade is required.	Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Tame (Coleshill WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.	Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Blythe (Meriden WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.	Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Blythe (Norton Green WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.	Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.

6.1.4 Conclusions

The following conclusions are drawn from this water quality impact assessment:

- Balsall Common, Barston, Meriden and Norton Green are all operating above the Phosphorous permit conditions. Any growth would therefore further increase discharges of P beyond what the EA has permitted.
- There is no deterioration greater than 10% or class deterioration predicted at any of the WwTWs. There is, however, deterioration within the 'Bad' class at Balsall Common, Coleshill, Meriden and Norton Green, which is not permitted. However, in all cases this deterioration could be prevented by tightening permits and upgrading the WwTWs.
- At all works, modelling predicts that Good status cannot be achieved due to current technology limits for treatment of Phosphorus and Ammonia, even if the upstream water quality was meeting Good status. In these cases, the technology is considered to be the reason for not achieving GES, not the proposed growth.

- Consequently, environmental capacity is not considered to be a constraint to growth at any of the WwTWs assessed. However, it would be anticipated that Balsall Common, Barston, Meriden and Norton Green WwTWs will need to be brought into compliance with their Phosphorous permits before any significant growth is connected to these treatment works.

6.1.5 Recommendations

Table 6-2: Water Quality Assessment Recommendations

Action	Responsibility	Timescale
Where possible consider the water quality constraints when allocating and phasing development sites	SMBC	Ongoing
Bring Balsall Common, Barston, Meriden and Norton Green WwTWs into compliance with their Phosphorous permits before allowing any significant growth to connected to these treatment works.	STW	Ongoing
Where the water quality assessment indicates that permits may require a higher standard of treatment than currently achievable using Best Available Technology, provide clear advice to sewerage undertakers on: • The approach to permitting • Requirements for any additional studies (for example additional water quality sampling for the sites missed, modelling, macro-invertebrate surveys etc.), • Advise SMDC where water quality constraints may limit the potential for growth.	EA	Ongoing
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.	STW	Annually
A strategic scale water quality assessment should be undertaken for Minworth WwTW. This should address planned growth in all of the local authorities served.	STW, EA, other local authorities served by Minworth	To be confirmed

7 Flood Risk Management

7.1 Flood Risk Assessment

Please refer to the SFRA for an assessment of flood risk to proposed site allocations.

7.2 Assessment of Additional Flood Risk from Increased WwTW Discharges

7.2.1 Introduction

In catchments with a large planned growth in population and with discharge effluent to a small watercourse, the increase in the discharged effluent might have a negative effect on the risk of flooding. An assessment has been carried out in order to quantify such effect.

7.2.2 Methodology

The following process has been used to assess the potential increased risk of flooding due to extra flow reaching a specific WwTW:

- Identify which WwTWs will be receiving additional flows;
- Calculate the increase in DWF as a result of planned growth;
- Identify the point of discharge of these WwTWs;
- At each outfall point, use the FEH CD-ROM v3.0 to extract the catchment descriptors;
- Use ReFH[40] method to calculate peak 1 in 30 (Q30) and 1 in 100 (Q100) year fluvial flows;
- Calculate the additional foul flow as a percentage of the Q30 and Q100 flow.
-

A red / amber / green score was applied to score the associated risk as follows:

Additional flow ≤5% of Q30. Low risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q30. Moderate risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q100. High risk that increased discharges will increase fluvial flood risk

7.2.3 Data Collection

The datasets used to assess the risk of flooding are the following:

- Current and predicted future DWF for each WwTW
- Location of WwTW outfalls
- Catchment descriptors from FEH CD-ROM v3.0[41]

7.2.4 Results

Table 7-1 shows the results of the additional flood risk assessment for the WwTWs. This shows that in terms of additional flood risk at the WwTWs, the proposed development would have a negligible effect on the predicted peak flow events with return periods of 30 and 100 years. The WwTW with the highest flow increase is Coleshill WwTW with a predicted 1.07% increased risk during the 30 year return period event.

40 Note: ReFH2 was released in February 2015. This implements improvements which are mainly relevant to permeable and urbanised catchments. As the study catchments are not permeable or highly urbanised, and that the ReFH method is not being used to generate hydrographs in this case, ReFH1 has been used.

41 FEH CD-ROM v3.0 © NERC (CEH). © Crown copyright. © AA. 2009. All rights reserved.

Table 7-1: Summary of the predicted DWF increase

WwTW	Receiving watercourse	ReFH Q30 (m3/s)	ReFH Q100 (m3/s)	Additional Average DWF (m3/s)	Additional Daily Flow m3/s)	Flow increase % Q30	Flow increase %Q100
Balsall Common	Unnamed	1.47	1.93	0	<0.1	0.00%	0.00%
Barston	River Blythe	22.46	28.66	0	<0.1	0.00%	0.00%
Coleshill	River Cole, Kingshurst Brook, Westley Brook, Low Brook	1.07	1.41	0	<0.1	0.00%	0.00%
Meriden	Rive Blythe	1.88	2.48	0	<0.1	0.00%	0.00%
Minworth	Stratford-Upon-Avon Canal	0.79	1.05	0	<0.1	0.00%	0.00%
Norton Green	Stratford-Upon-Avon Canal	7.18	9.34	0	<0.1	0.00%	0.00%

7.2.5 Conclusions

The impact of increased effluent flows is unlikely to have a significant impact upon flood risk in the receiving watercourses, however the River Blythe is a SSSI, and water quality at this location must not be allowed to deteriorate. The Environment Agency may refuse an Environmental Permit that would support effluent discharges that would adversely affect water quality of a SSSI.

7.2.6 Recommendations

Action	Responsibility	Timescale
Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	STW	During design of WwTW upgrades

8 Environmental Constraints and Opportunities

8.1 Introduction

A series of maps have been produced using data from OS OpenData for the sites where development is proposed within the Metropolitan Borough of Solihull, in order to identify environmental risks and opportunities associated with the proposed development sites. This allowed for a series of notable environmental designations and features to be displayed in order to identify the presence of environmental features within or close to the proposed sites. The maps should be used in conjunction with Sustainability Appraisals (SA) and/or Strategic Environmental Assessments (SEAs) when these are available.

The maps can be used to identify environmental features in close proximity to a site of proposed development and the distance between the two features. The distance at which the feature becomes significant to the development of the site depends on the type, nature and potential sensitivity of the different environmental features. Table 8-2 shows the approximate distances at which a feature may become significant to a development site. The potential adverse impacts associated with development of the sites were then considered in relation to these features, and potential environmental opportunities, such as habitat creation or recreational opportunities were also 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 a significant adverse effect on the environment.

8.2 Data Collection

Information for the Metropolitan Borough of Solihull was collected on a range of key environmental designations and features. This information was provided by the Environment Agency, Solihull Metropolitan Borough Council or sourced from OS OpenData. These features were grouped into six topic areas:

- Water
- Biodiversity
- Historic Environment
- Landscape
- Air Quality and Waste
- Geology and Soils.
- These topics are further discussed below.

Table 8-1: Environmental Features and Designations

Feature	Description	Comment for SMBC
Water		
Watercourses	A river, stream or other riparian feature i.e., ditch, as shown on OS mapping.	SMBC has several main rivers and associated watercourses, the River Blythe and the River Cole.
Water Framework Directive (WFD) classification	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.	The majority of watercourses are designated as poor with some being designated as moderate.

Feature	Description	Comment for SMBC
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. For example, sands and gravels. Bedrock - solid permeable formations e.g. sandstone, chalk and limestone. 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.	There are both principal bedrock and superficial aquifers in the Metropolitan Borough of Solihull.
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.	SPZs only affect a small area of the north east of the catchment, with a small area covering Zone 2 and an even smaller area covering Zone 1.
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.	There are 76 ancient woodlands in the Metropolitan Borough of Solihull.
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 by reason 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.	There are 10 SSSIs that are located within or partially within the Borough.
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.	There are 23 Local Nature Reserves situated across the Borough of Solihull.
Historic Environment		
Listed Building	Listed buildings are buildings or structures of exceptional architectural or historic special interest. Listed building have three grades: Grade I buildings are of exceptional interest, sometimes considered to be internationally important; Grade II* buildings are particularly important buildings of more than special interest; and Grade II buildings are nationally important and of special interest.	There are around 369 listed buildings in the Metropolitan Borough of Solihull.
Scheduled Monuments	Scheduled Monuments are historic sites of national importance and are protected under the Ancient Monuments and Archaeological Areas Act, as amended by the National Heritage Act 1983.	There are 16 scheduled monuments in the Borough.
Conservation Area	Conservation Areas are designated for their special architectural and historic interest. Most are designated by the local planning authority and place restrictions on a range of development including property alterations, tree works, advertisements and	The Borough of Solihull has 20 conservation areas.

Feature	Description	Comment for SMBC
	demolition.	
Landscape and Waste		
Green Belt	A designation for land around certain cities and large built-up areas. The fundamental aim of Green Belt policy is to prevent urban sprawl by keeping land permanently open. Inappropriate development that is harmful to the Green Belt should not be approved except in very special circumstances.	The Metropolitan Borough of Solihull is largely covered by Green belt land, and the majority of the proposed development sites fall within its boundary.
Landfill/ Historic Landfill	Landfill sites and Historic landfill sites are places where records indicate waste materials have been buried. Some sites remain open to further waste deposits (landfill), whilst others are now closed or covered (historic landfill).	Historic Landfill sites: around 76 sites Landfill sites: around 5 sites
Geology and Soils		
Agricultural Land Classification	Agricultural Land Classification (ALC) is a method for assessing the quality of farmland. The ALC system classifies land into five grades: Grade 1: Excellent Grade 2: Very Good Grade 3: 3a – Good / 3b – Moderate Grade 4: Poor Grade 5: Very Poor The highest quality and most versatile land is defined as Grades 1, 2 and 3a.	The majority of the Metropolitan Borough of Solihull has largely Grade 3 soils. There are also several bands of Grade 4 and isolated areas of Grade 2. There are no Grade 1 soils.

Table 8-2: Environmental Designations and Features

Topic	Environmental feature	Buffer (m)
Biodiversity	Site of Special Scientific Interest (SSSI)	1000m
	Local Nature Reserves	100m
	Ancient or Semi-Natural Woodland	100m
Historic environment	Scheduled Monument	500m
	Listed Building	100m
	Conservation Area	No Buffer applicable
Landscape and Waste	Green Belt	100m
	Historic Landfill	100m
	Landfill	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
Geology and soils	Agricultural Land Classification (ALC)	100m

8.3 Results

8.3.1 Water Designations and Features

8.3.1.1 Surface Waters

The Metropolitan Borough of Solihull has two significant watercourses and associated catchments and tributaries, the River Blythe in the west of the catchment and the River Cole in the north. The Grand Union Canal is also located in the south of the borough and the Stratford-Upon-Avon Canal is located in the south west of the borough. Figure 8-1 shows the Water Framework Directive (WFD) overall classifications for the main watercourses. The majority of the watercourses in the Metropolitan Borough of Solihull are classified as poor, with only a few being classified as moderate, such as the River Blythe from Temple Balsall Brook to Patrick Bridge. The watercourse furthest south, Temple Balsall Brook from the source to the River Blythe is the only watercourse in the catchment that is classified as bad. Pressures on water quality in the Borough are as a result of changes to the natural flow and levels of water from abstraction, physical modifications, pollution from rural areas from arable land and livestock, pollution from towns, cities, and transport such as phosphate contamination. A full table of reasons why each watercourse has not achieved a good status is displayed in Table 8-3.

Figure 8-1: Solihull Surface Water Designations

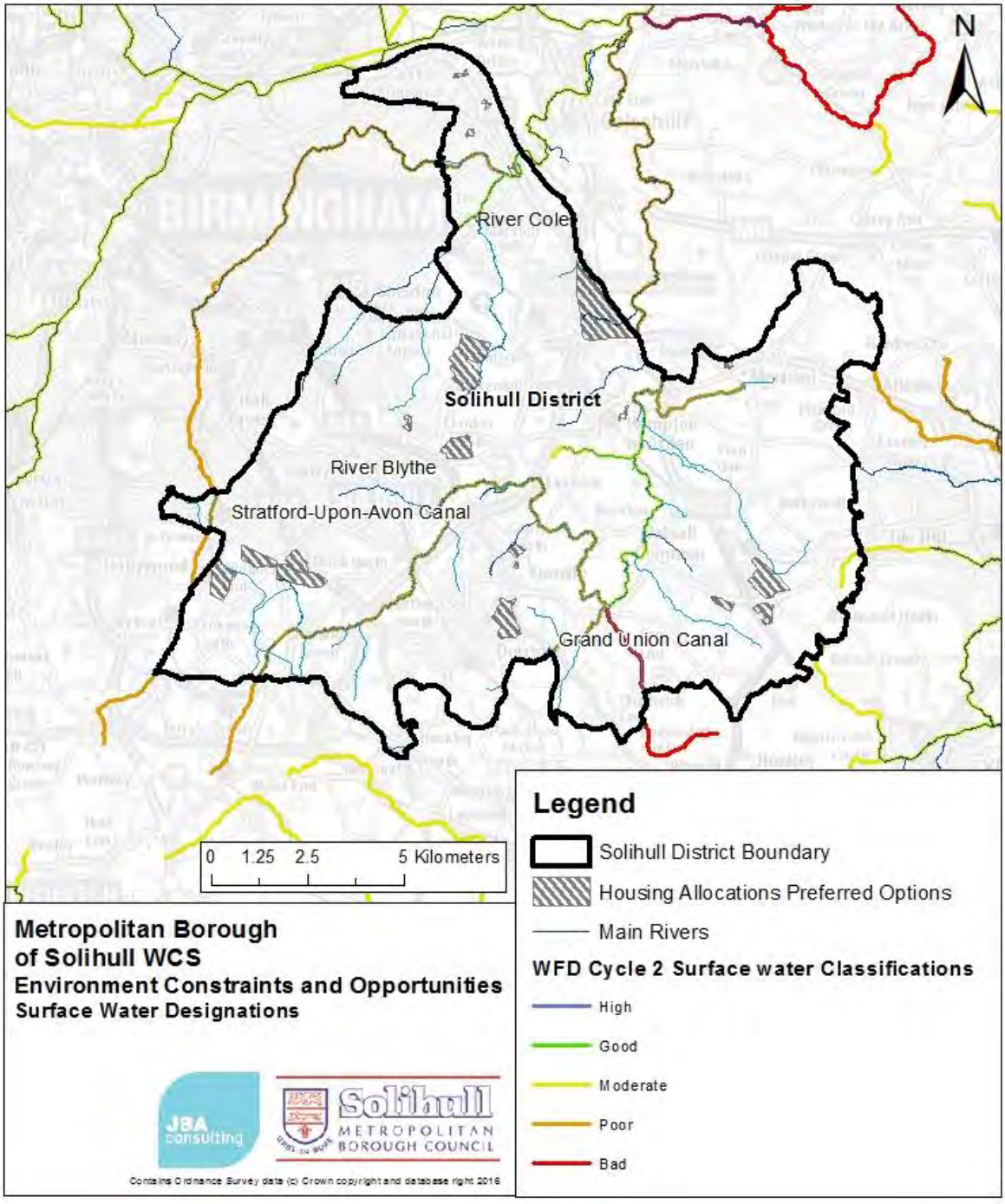


Table 8-3: Reason for Not Achieving Good Status (RNAGs) - Cycle 2 WFD for Surface Water

Water Body Name	Overall Pressure Causing RNAG	Significant Water Management Issue	2015 Classification Status (Cycle 2) for Surface Water
Blythe from Patrick Bridge to R Tame	Phosphate and abstraction from flow	Flow, diffuse source and point source pollution	Poor
Blythe from Source to Cuttle Brook	Phosphate	Diffuse and point source pollution	Poor
Blythe from Temple Balsall Brook to Patrick Bridge	Phosphate and chemicals	Diffuse and point source pollution	Moderate
Canley Bk - source to conf with Finham Bk	Phosphate and abstraction from flow	Flow and diffuse source pollution	Moderate
Cole from Hatchford-Kingshurst Brook to R Blythe	Physical modification, phosphate, organic pollution and fine sediment	Physical modification and diffuse source pollution	Moderate - Moderate or less
Cole from Source to Springfield	Phosphate and Ammonia	Diffuse and point source pollution	Moderate
Cole from Springfield to Hatchford-Kingshurst Brook	Ammonia, dissolved oxygen, phosphate, ammonia and fine sediment	Diffuse source pollution	Moderate - poor
Cuttle Brook from Source to River Blythe	Phosphate and fine sediment	Diffuse and point source pollution	Moderate - poor
Hatchford-Kingshurst Brook from Source to R Cole	Physical modification and phosphate	Physical modification and diffuse source pollution	Moderate - Moderate or less
Temple Balsall Brook from Source to R Blythe	Phosphate and fine sediment	Diffuse and point source pollution	Poor - bad

Potential adverse impacts on the water environment from the development of sites and the associated water supply/sewerage infrastructure improvements include:

- Increased surface runoff and sediment loading leading to increased turbidity in receiving watercourses;
- Pollutants in chemicals and sewage effluent affecting water quality in surface waters and groundwaters; and

- Increased pressure on water resources due to over-abstraction.

A number of sites have a watercourse or drainage ditch running through them or along their boundaries. River corridors form natural wildlife corridors and are an important feature of the landscape in the Borough, requiring adequate buffer zones free of development. An assessment should be made of the impact of site development on the WFD status of each waterbody that site water will drain into. The assessment should consider both water quality and quantity. Measures may need to be provided to avoid any impact on water quality or channel morphology in these waterbodies.

Developers must provide a minimum of 8 metre easement from the top bank of a main River or toe of flood risk management asset (in line with Midlands Byelaw 21). The LLFA will require a minimum of 6m from 'ordinary' watercourses.

These easements are essential to ensuring that flood risk management activities can be delivered during the lifetime of the development, and support the natural and ecological functioning of the watercourse.

Rivers should be considered as the centrepiece of new developments, and development should take every opportunity to be orientated to encourage access and enjoyment of the environmental infrastructure it provides, and be regarded as an important asset within the development layout.

Riparian developments must consider the potential to deliver river restoration, de-culverting and river enhancement as part of the development. Such measures will provide an important contribution to Flood Risk Management, and WFD objectives for each watercourse. Natural flood risk management proposals to 'slow the flow' should be included wherever they will provide flood risk reduction measures that benefit the wider catchment.

The following management options outline how the proposed 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;

- 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 local residents; and
- Enhance the local landscape character.

HR Wallingford's study, ‘Maximising the Ecological Benefits of Sustainable Drainage Schemes’ (2003), advises that the maximum ecological benefits derived from SuDS may come from improvements to the still water aquatic environment and that the best that can often be achieved for the receiving waters is to prevent further deterioration. However, research indicates that whilst ponds and ditches may support quite rich wildlife communities, most SuDS schemes do not fulfil their ecological potential. This is due to inappropriate design features or a lack of maintenance of the structures leading to poor water quality and domination by common plant species. The design of a SuDS scheme would need to be specific to the development site and would need to meet the topographic and hydrological characteristics present there.

Riparian buffer strips can also be provided adjacent to watercourses within the development site or along its periphery. Buffer strips provide an intermediate protection zone between developed land and areas of conservation value, restricting the flow of pollutants and preventing them from being washed from the site into the watercourse. The width of the buffer strips will depend on the size of the water body. Natural England guidance in relation to buffer strips adjacent to agricultural land states that ‘Generally speaking, the wider the buffer the better the protection for the water body.

8.3.1.2 Groundwater

The north of the Borough overlies mainly secondary A superficial aquifers, whilst the south of the Borough has a mix of secondary A aquifers and secondary undifferentiated superficial aquifers. There are a few sporadic areas in the Borough that also have unproductive superficial aquifers. Secondary aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases, they form an important source of base flow to rivers.

Source Protection Zones (SPZs) are only found in the north east of the borough, covering the area from Four Oaks to the southern extent of Chapel Green, which is the boundary of the Borough. The majority of this area is covered by a Zone 3 SPZ, a significantly smaller part of this area is covered by Zone 2 SPZ outer protection zone and there is an inner circular area that covers Zone 1 SPZ. Figure 8-2 located the SPZs across the Borough of Solihull.

The Metropolitan Borough of Solihull consists mainly of principal bedrock aquifers in the east, and secondary B aquifers in the north, south, and west of the Borough. There are a few areas of secondary A bedrock aquifers located sporadically across the Borough, but particularly in the southern areas.

Principal aquifers exhibit high irregular and/or fracture permeability, usually providing high level of water storage. These aquifers may also support water supply and/or river base flow on a strategic scale. Sites that are located on secondary bedrock aquifers, capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

All of the local plan proposed sites for the Metropolitan Borough of Solihull fall on both superficial and bedrock aquifers and therefore, many, if not all sites, may require measures to avoid the risk of groundwater contamination.

Figure 8-2: Solihull Superficial Groundwater Designations

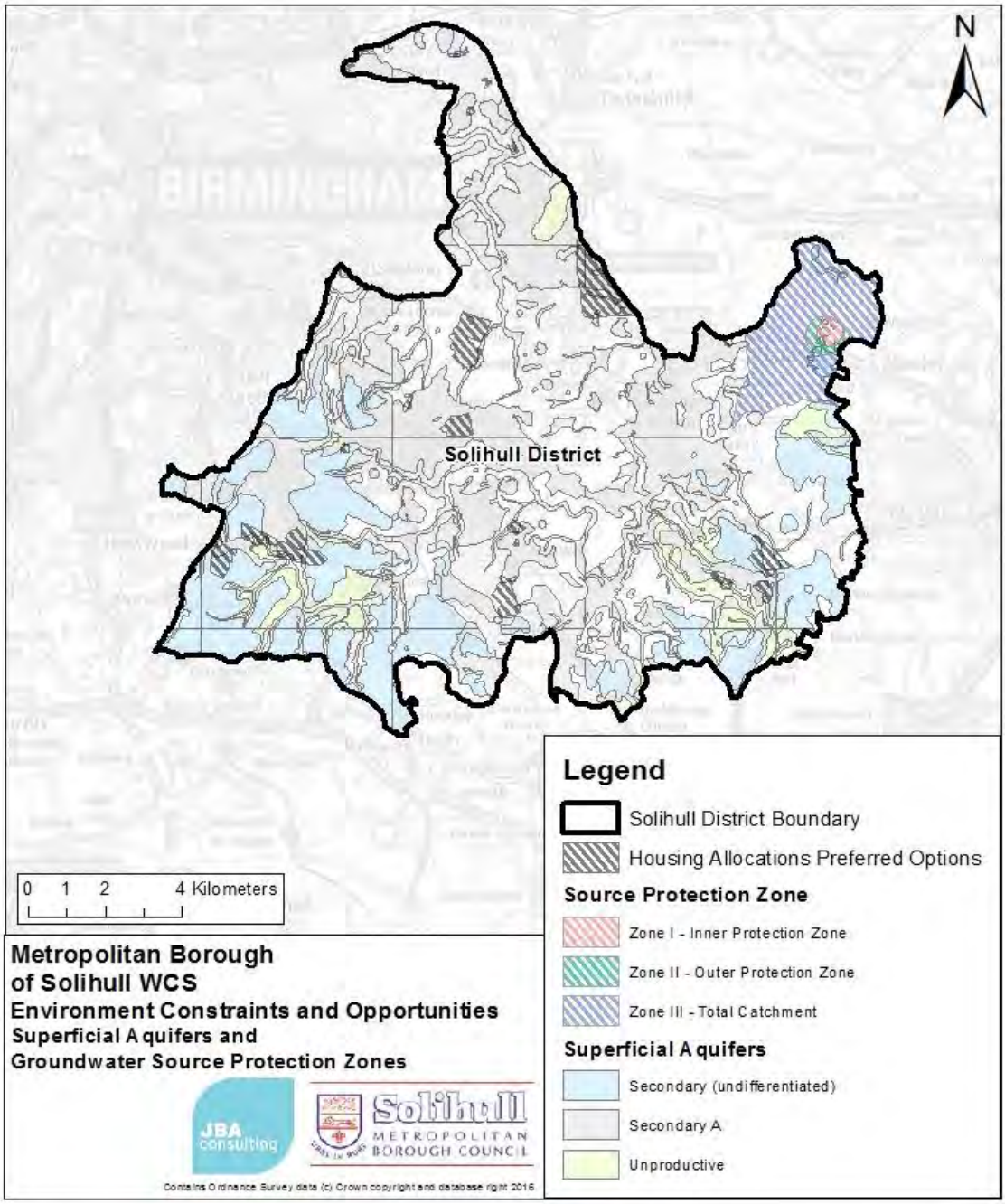
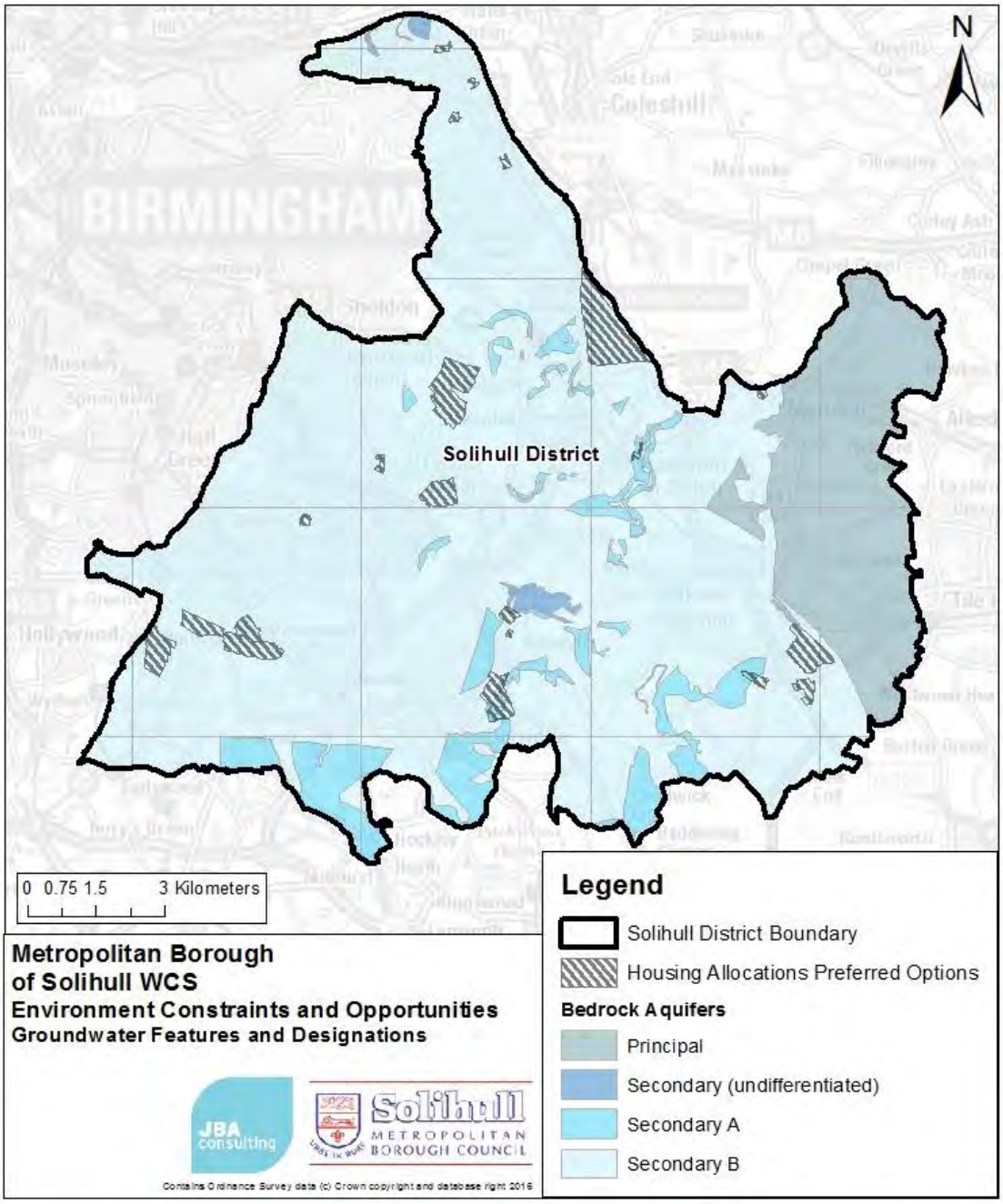


Figure 8-3: Solihull Bedrock Groundwater Designations



8.3.2 Biodiversity

The Metropolitan Borough of Solihull is predominantly rural in character and biodiversity designations are well distributed across the Borough. Several of the proposed sites have been located within close proximity to these areas of high importance in terms of biodiversity.

There are 76 ancient or semi natural woodlands in the Borough, these are widely distributed in each region of the borough, with the largest cluster in the north east. Some of the proposed development sites, principally in the south west of the Borough are located in close proximity to ancient or semi natural woodlands. West of Dickens Heath is the main site of concern as the proposed development area covers some of the area that has been designated as ancient woodland. Developers would have to ensure that there would be no adverse impacts on the old and sensitive woodland environments.

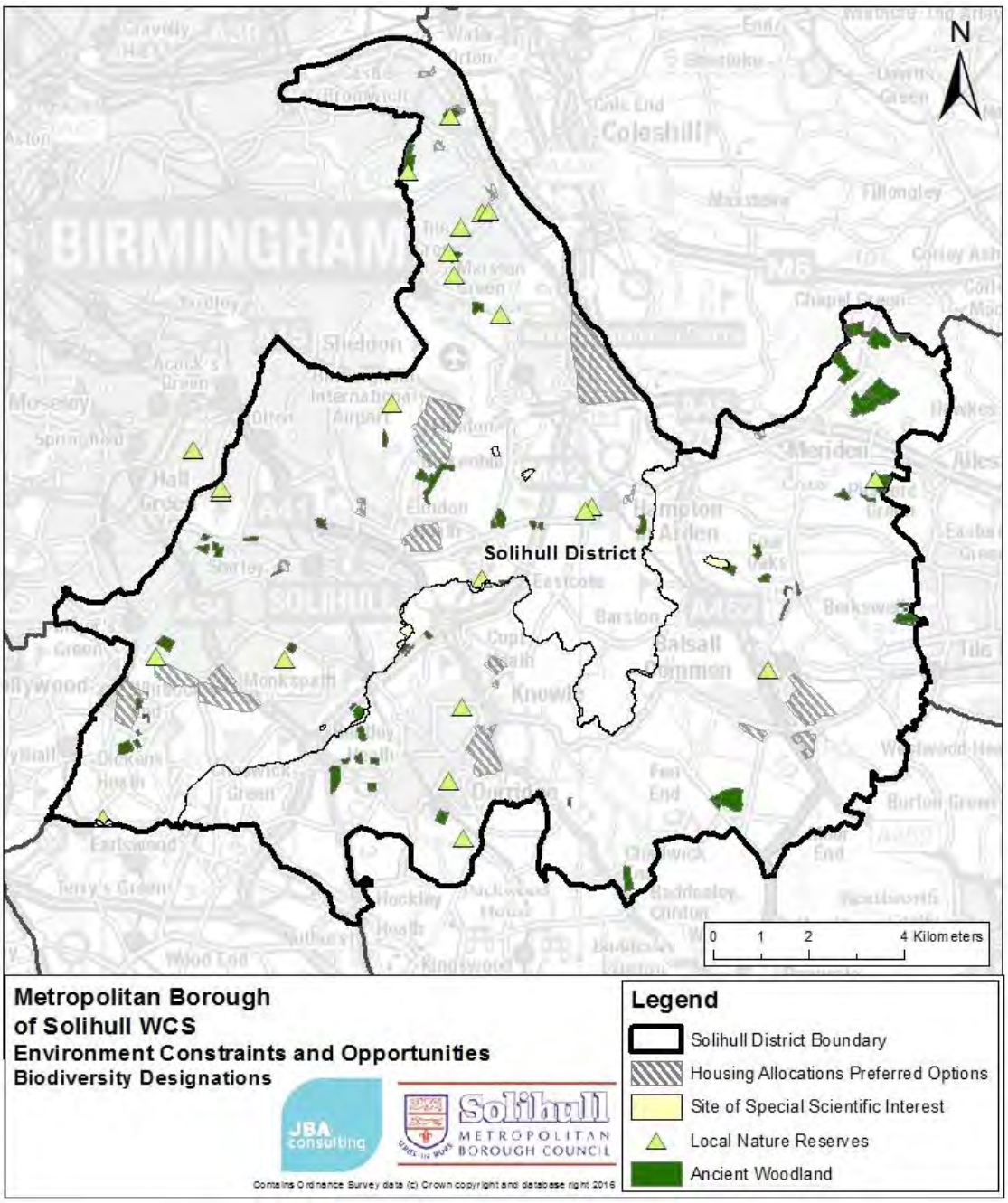
There are 10 Sites of Special Scientific Interest (SSSI) that are located within or partially within the Metropolitan Borough of Solihull. The entire stretch of the River Blythe that runs through the Borough of Solihull, from Hampton Arden to south west of Cheswick Green, has been identified as an SSSI. Several WwTWs have been identified as discharging to the River Blythe, namely Barston, Meriden, Spinney, and Temple Balsall. Additionally, the Environment Agency have raised concerns about a number of small private package treatment works which discharge to the Blythe, which are considered to contribute to the decline in water quality in recent years. Allocations connecting to Barston and Meriden WwTWs are considered in this WCS, specifically in Section 6. The following risks and opportunities arise in this catchment:

- The water quality analysis indicated that the proposed developments draining to Barston WwTW would not lead to deterioration. However, the works is not currently meeting its Phosphorous permit condition, and it is anticipated that this should be brought into compliance before any significant growth is connected to this treatment works.
- An upgrade the Meriden WwTW would be required to prevent deterioration. This could present an opportunity to achieve improvements to this reach of the Blythe (subject to meeting WFD cost-benefit criteria). Meriden WwTW is also not currently meeting its Phosphorous permit.
- Where new sewerage is required to serve developments in the River Blythe catchment, there may be opportunities to connect-in locations currently served by private package treatment works, thereby reducing discharges from these to the River Blythe.

There are also 23 Local Nature Reserves (LNR). There are development sites located close to some LNRs such as Bills Wood and Smiths Wood and therefore these could be potentially affected by pollution, disturbance, or a reduction in water resources, as a result of their development.

Adverse impacts on biodiversity as a result of development within or near the areas that have been identified as significant importance, as either an SSSI, LNR and ancient or semi-natural woodlands, includes habitat loss and species disturbance in areas associated with new infrastructure and residential/economic developments and along pipeline routes. Planners and developers must consider how development proposals could affect any nearby protected site. Natural England may be consulted if a development site may affect a protected area.

Figure 8-4: Metropolitan Borough of Solihull Biodiversity Designations



8.3.3 Landscape and Waste

The Metropolitan Borough of Solihull has a rich diversity of landscapes. It is primarily composed of arable land and improved grassland, followed by woodland and then neutral grassland. The Borough of Solihull also has a relatively large area of broad-leaved woodland for its size.

A significant area of the Borough is designated as Green Belt land. The majority of proposed building allocations are therefore situated within or in close proximity to this area. The Local Development Plan, Policy P17 sets out local provisions for development in the Green Belt, to be used alongside national policy. Some of the proposed development areas however, are inset to the Green Belt areas, such as Hampton in Arden and Meriden and are not therefore subject to Green Belt Policy.[42] The Draft Local Plan (DLP) (2016) states that two of the preferred site allocations necessitate land to be removed from the Green Belt, Land at HS2 Interchange and Land at Damson Parkway[43]. The justification for Policy P1 provides the exceptional circumstances for this approach to be accepted. The DLP states that an overall indicative capacity of 900 sites equating to a total of 37 hectares of land would occupy non green belt areas over the plan period, whilst a total indicative capacity of 5,250 sites covering an area of 299 hectares could be constructed on green belt land. The Borough of Solihull does not have any Areas of Outstanding Natural Beauty, Local Landscape Areas or any other landscape features that may pose planning restrictions on the proposed development sites.

There are 5 landfill sites and 76 historic landfill sites that are distributed across the Borough of Solihull, some of which are located in close proximity to proposed development sites. There is one historic landfill site that is situated within the proposed development site, UK Central Hub/ HS2 Interchange.

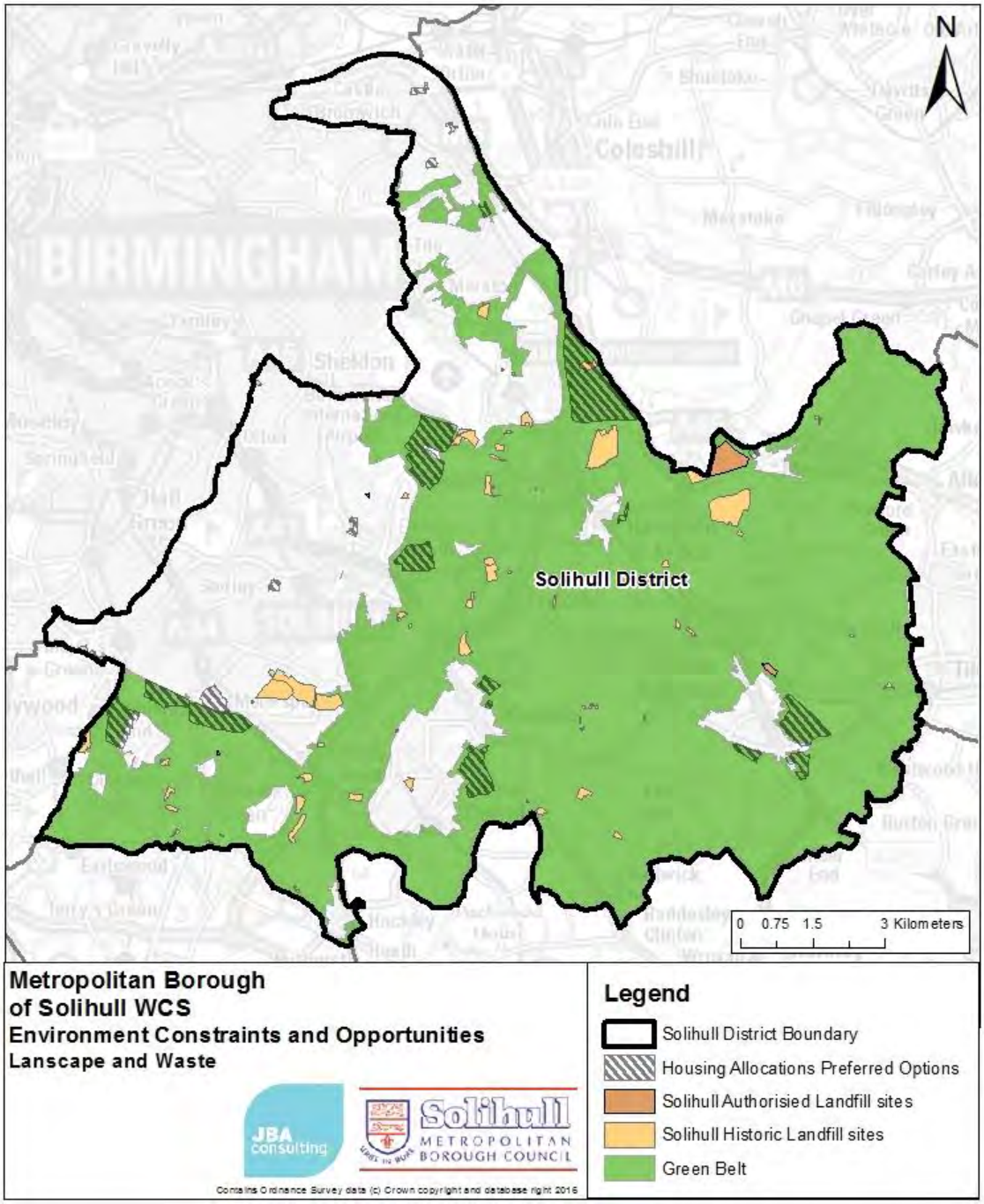
Potential adverse impacts on the landscape from the proposed developments and the associated water supply/sewerage infrastructure improvements include:

- Temporary and/or permanent landscape and visual impacts associated with ground disturbance, construction activities and the presence of new residential development/water treatment works; and
- Increased energy consumption and carbon emissions associated with construction and operation of developments, and the piping and treatment of increased volumes of water.

42 Solihull Local Plan: Shaping a Sustainable Future, 2013. Online at: http://www.solihull.gov.uk/Portals/0/Planning/LDF/Local_Plan_Final.pdf accessed on 29/11/2016.

43 SMBC, Reviewing the Plan for SolihullsFuture: Solihull Local Plan Review, Draft Local Plan (2016),Online at: http://www.solihull.gov.uk/Portals/0/Planning/LPR/Draft_Local_Plan_05.12.16.pdf , accessed on 06/12/2016.

Figure 8-5: Metropolitan Borough of Solihull Landscape and Waste Designations



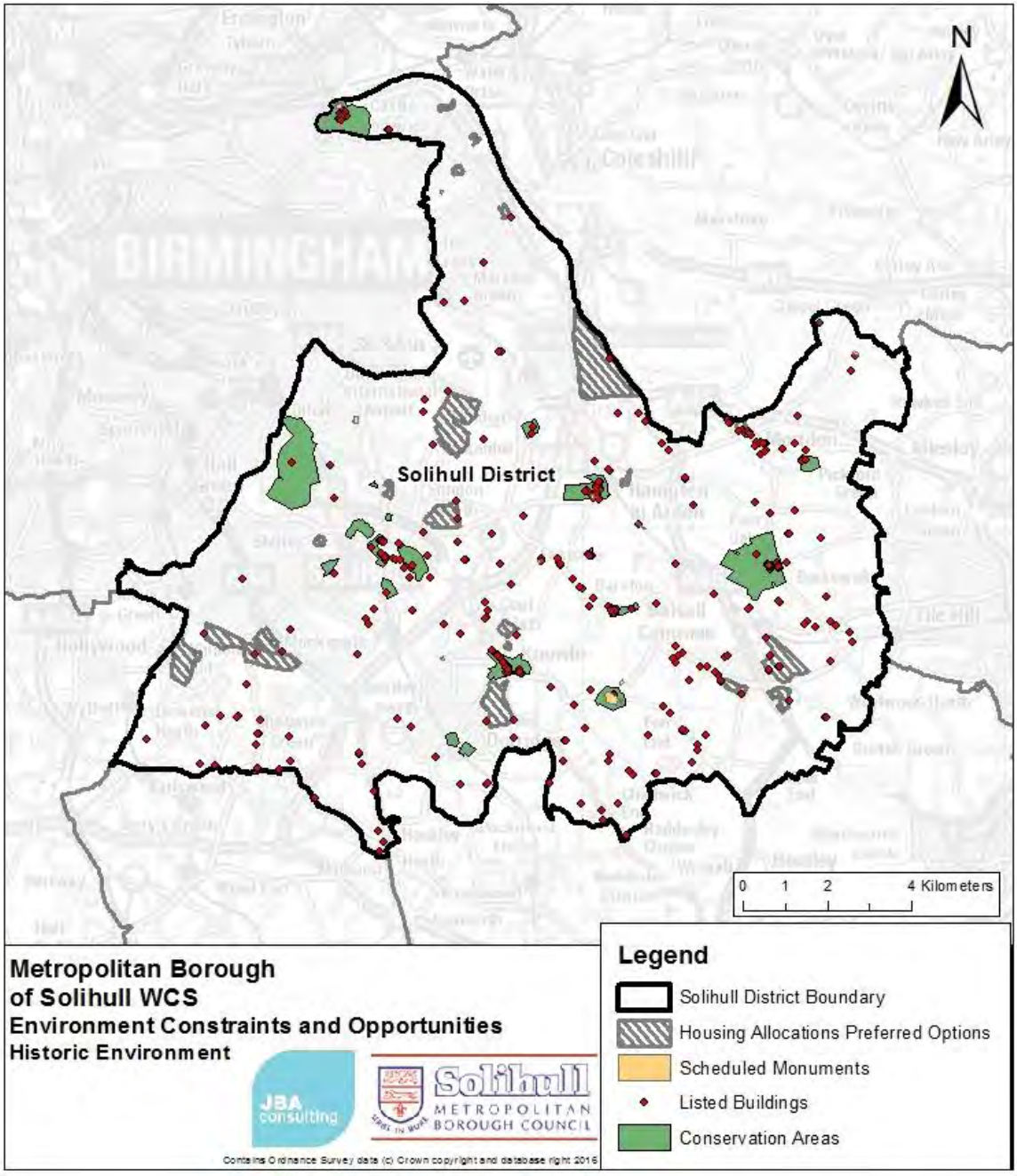
8.3.4 Historic Environment

There are 369 listed buildings, 16 scheduled monuments and 20 conservation areas that are well distributed across the towns and villages of the Metropolitan Borough of Solihull.

Potential adverse impacts on the landscape from the proposed developments and the associated water supply/sewerage infrastructure improvements include:

- Loss or disturbance of historic features in areas associated with new infrastructure and residential developments and along pipeline routes; and
- Increased waterlogging or drying out of buried archaeological features due to changes in groundwater levels and surface water runoff.

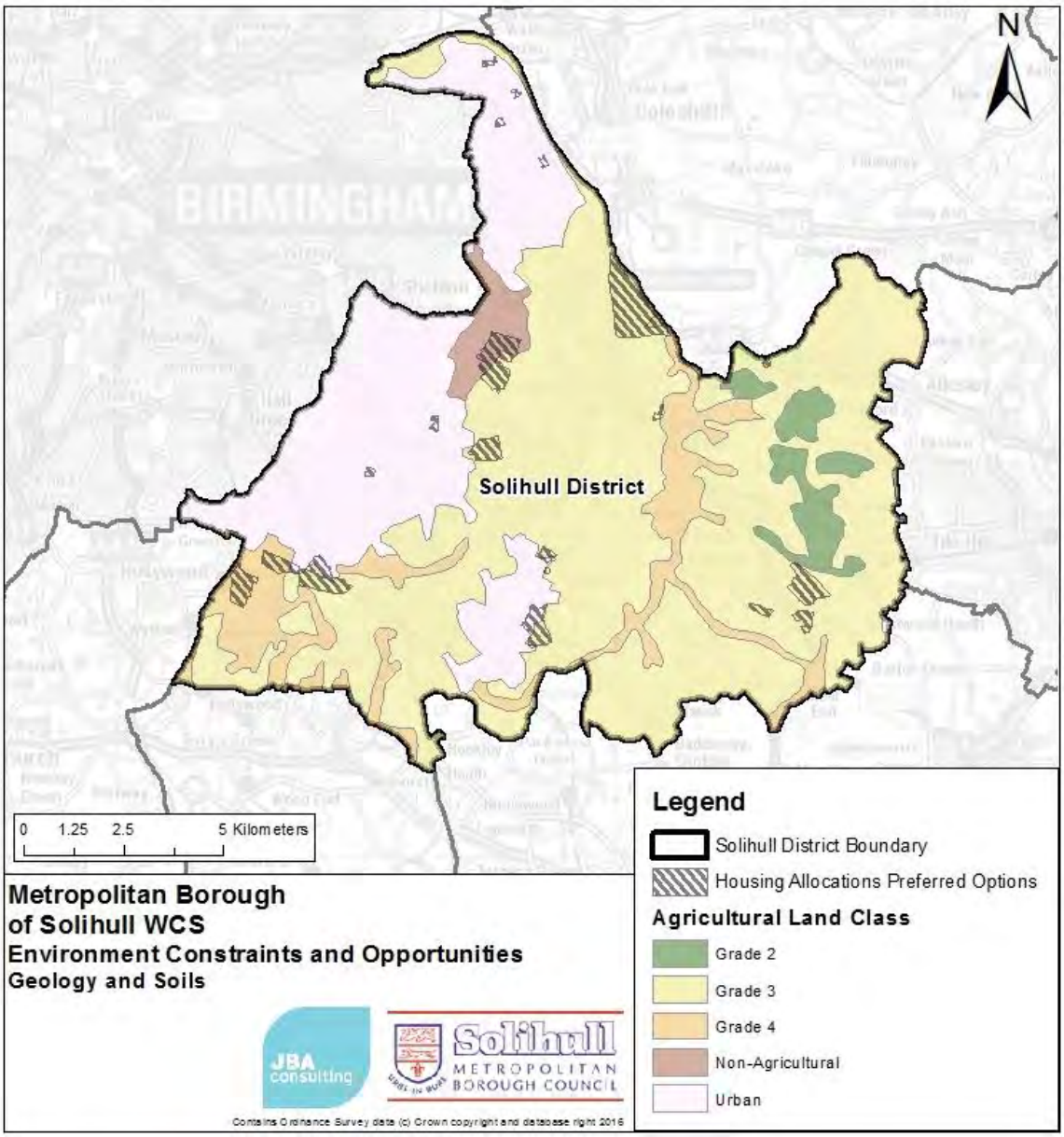
Figure 8-6: Metropolitan Borough of Solihull Historic Designations



8.3.5 Geology and Soils

There is a varied distribution of agricultural land across the Metropolitan Borough of Solihull but generally agricultural land classification is considered to be of good to moderate quality agricultural land (Grade 3). There is only one area in the catchment that has been identified as non-agricultural, and a large proportion of the north and north west have been classified as urban. Sever bands of poor quality agricultural land (Grade 4) has been identified in the west of the Borough and down a stretch of land in the east. Proposed development sites exist mainly in these areas. Several areas of very good quality agricultural land (Grade 2) have also been identified in the east of the Borough, with proposed development areas being outside of this extent.

Figure 8-7: Metropolitan Borough of Solihull Geology and Soil Designations



8.4 Opportunities

There are a number of 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 possible environmental impacts that could occur as a result of 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 8-4.

Table 8-4: Environmental Opportunities and Benefits

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 receiving 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.

8.5 Conclusions

Development of the proposed site allocations have the potential to cause a range of adverse impacts. Further environmental surveys and more detailed assessments are required for each of the sites to determine the acceptability of their development and to inform the requirement for mitigation measures. Sites shown to have few environmental features in close proximity should not necessarily be assumed to be suitable for development. Likewise, sites with a greater amount of environmental features in close proximity should be assumed to be unsuitable for development, as constraints could be appropriately addressed.

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

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.

8.6 Recommendations

This study has provided a high-level appraisal of the potential environmental risks and opportunities associated with each of the proposed development sites. This should be used in conjunction with Sustainability Appraisals (SA) and/or Strategic Environmental Assessments (SEAs) when these are available. More detailed assessment of the environmental issues associated with the development of each 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.

The following recommendations are proposed in relation to the proposed development sites:

Table 8-5: Environmental Constraints and Opportunities Actions

Action	Responsibility	Timescale
Consultation with SMBC ecologists and heritage officers should be undertaken in relation to the development of each site to further identify potential environmental risks and opportunities, and to determine specific requirements for mitigation measures. In particular, attention should be given to the River Blythe, a designated SSSI, which runs through Solihull as development could potentially affect this protected area.	Developers and SMBC	Ongoing
Developers should seek to maximise the water quality and amenity/ecological benefits when installing SuDS for surface water flood management. The design of SuDS schemes should be specific to each allocation site to maximise the environmental benefits. Careful planning of SuDS schemes in areas identified as groundwater aquifers or sensitive to groundwater contamination would be required to ensure no adverse impact on groundwater quality. However, provision of SuDS has the potential to maintain or improve groundwater recharge.	Developers and SMBC	Ongoing

Action	Responsibility	Timescale
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
Existing water features i.e., ponds, ditches and streams should be retained as a high priority and incorporated into SuDS schemes where appropriate to maintain the aquatic biodiversity value of the sites and to provide a local source of flora and fauna that may naturally colonise new habitats.	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 hydro-morphological process, and also benefit a range of aquatic wildlife through new habitat creation or improving access to valuable habitat. Implementation of these measures could contribute towards delivery of the requirements of the Water Framework Directive.	SMBC, Developers and EA	Ongoing
Good design principles should be applied to all developments, particularly those located in sensitive or protected landscapes so as to minimise the impact on landscape character and visual amenity. Design advice provided by SMBC should be applied and consultation with the Council's landscape officer should be undertaken to inform the design of the development of a site.	SMBC, Natural England and Developers	Ongoing

9 Climate Change Impact Assessment

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made in this water cycle study. This has been done using a matrix which considers both the potential impact of climate change on the assessment in question, and also the degree to which climate change has been considered in the information used to make the assessments contained within the WCS (see Table 9-1).

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

Table 9-1: 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			

9.1.1 Results

Table 9-2: 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?	Climate Change Score
Water resources	High (1 and 2)	Yes - qualitative within WRMP and RMBP	
Water supply infrastructure	Medium - some increased demand in hot weather	Yes - qualitative consideration within WRMP	
Wastewater Collection	High - Intense summer rainfall and higher winter rainfall increases flood risk	No - not considered in STW assessment	
Wastewater treatment	Medium - Increased winter flows and more extreme weather events reduces flow headroom	No - not considered in STW assessment	
STW odour	Low	No - not considered	
Water quality	Nutrients: High (1) Sanitary determinands: Medium (1)	No - not considered	
Flood Risk	High - See SFRA for additional detail	No - not considered	
Flooding from increased STW discharge	Low	No - not considered	

Sources:

(1) River Basin Management Plan Severn River Basin District

(2) Severn Trent Water's Final Water Resource Management Plan 2014

(3) WFDC Draft Strategic Flood Risk Assessment

9.1.2 Recommendations

Table 9-3: Climate Change Actions

Action	Responsibility	Timescale
When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, STW, SMBC	As required
Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	SMBC, Developers	As required

10 Summary and Recommendations

10.1 Water Cycle Study Summary

This Water Cycle Study (WCS) was carried out in cooperation with the Environment Agency, Solihull Metropolitan Borough Council and Severn Trent Water. Overall there are no major issues which indicate that the planned scale, location and timing of planned development within the Borough of Solihull is achievable from the perspective of supplying water and wastewater services and preventing the deterioration of water quality in the receiving watercourses.

The WCS has identified that infrastructure upgrades are expected to be required to accommodate the planned growth. Timely planning and provision of infrastructure upgrades will be undertaken through regular engagement between WFDC, STW, the EA and developers. Table 10-1 provides a summary of the Red / Amber / Green analysis results for each site respectively.

Table 10-1: Summary of results for each site

Site Ref.	Site Name	Preferred Site Use	Water Resources Assessment	Water Supply Infrastructure Assessment	WwTW Capacity Assessment	Wastewater Treatment Works Flow Consent Assessment	STW Odour Assessment	Additional Flood Risk from Increased WwTW Discharges
LPR04	West of Dickens Heath	Housing						
LPR13	South of Shirley	Housing						
LPR02	South of Dog Kennel Lane	Housing						
LPR09	South of Knowle	Housing						
LPR08a	Hampton Road A	Housing						
LPR08b	Hampton Road B	Housing						
LPR16	East of Solihull	Housing						
LPR19	UK Central Hub/HS2 interchange	Mixed						
LPR06	Meriden Road	Mixed						
LPR01	Barratts Farm	Housing						
LPR12	Frog Lane	Housing						
LPR03	Windmill Lane - Kenilworth Road	Housing						
LPR10	West of Meriden	Housing						
LPR05	Chester Road/ Moorend Avenue	Housing						
LPR07	Kingshurst Village Centre	Housing/Mixed						
LPR11	Former TRW site	Housing						
LPR18	Sharmans Cross Road	Housing						
LPR17	Moat Lane, Vulcan Road	Housing						
LPR14	Arran Way	Housing						
LPR15	Jensen House, Auckland Drive	Housing						
LPR20	Land Damson Parkway	Employment						

10.1.1 Development scenarios and policy issues

This Water Cycle Study is based on an assessment of the impact of planned development within the Metropolitan Borough of Solihull. SMBC identified 20 sites for preferred development in total. This consisted of 17 sites for residential housing, 1 employment site where planning permission has been granted, and 2 sites to be allocated for housing/mixed purposes. These sites make up those

that were remitted from the Local Plan (2013) for reconsideration, as a result of a legal challenge, the development of the HS2 Interchange Area and the knowledge of unmet housing needs within the wider housing market area.

Legal agreements under the Town and Country Planning Act Section 106 agreement, and Community Infrastructure Levy agreements are not intended to be used to obtain funding for water or wastewater infrastructure. It is not therefore necessary for Metropolitan Borough of Solihull to identify requirements for developers to contribute towards the cost of upgrades in its Local Plan.

The Water Industry Act sets out arrangements for connections to public sewers and water supply networks, and developers should ensure that they engage at an early stage with Severn Trent Water to ensure that site specific capacity checks can be undertaken and where necessary additional infrastructure constructed to accommodate the development. Where permitted Severn Trent Water may seek developer contributions towards infrastructure upgrades. Upgrades to water resources and wastewater treatment works are funded through Severn Trent Water's company business plans.

10.1.2 Water Resources

All proposed development sites are located within the Environment Agency Catchment Management Abstraction Strategies (CAMS) of Warwickshire Avon and the Tame, Anker and Mease. Both CAMS have restricted water available for licensing and all sites have been considered to be under moderate water stress by the EA.

The Planning Practice Guidance advises planning authorities on how to gather evidence to set optional requirements, including those for water efficiency. It states that all new homes already have to meet the mandatory national standard set out in Building Regulations (of 125l/ppd). This guidance recommends that where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110l/ppd.

All proposed development sites within the Metropolitan Borough of Solihull would be supplied by Severn Trent Water and are located within the large Strategic Grid Water Resource Zone (WRZ). The Water Resource Management Plan (WRMP) demonstrates the pressures on water resources throughout the STW supply area but makes adequate provision for the proposed growth in housing within the Solihull Borough and other LPAs within the WRZ. Therefore, water resources would not be considered a barrier to planned growth in the Borough.

10.1.3 Water Supply Infrastructure

Severn Trent Water responded to the request for an assessment of water supply infrastructure within the Metropolitan Borough of Solihull. STW stated that the WRMP consider supply and demand issues for the next 25 years. As development within the Borough of Solihull occurs, it will be necessary to undertake detailed modelling of the water supply infrastructure to allow for appropriate infrastructure upgrades and local reinforcements. STW does not expect water supply to be a constraint to development within the Borough of Solihull.

10.1.4 Wastewater Collection and Treatment

Severn Trent Water completed a Sewage System Capacity Assessment for all the development sites. Overall 35% (7 sites) of the sites have capacity available to serve the proposed growth. 20% (4 sites) would require infrastructure and/or treatment updates and 50% (10 sites) have major constraints to growth.

Sewerage Undertakers have a duty under Section 94 of the Water Industry Act 1991 to provide sewerage and treat wastewater arising from new domestic development. Except where strategic upgrades are required to serve very large or multiple developments, infrastructure upgrades are usually only implemented following an application for a connection, adoption or requisition from a developer. Early developer engagement with water companies is therefore essential to ensure that sewerage capacity can be provided without delaying development.

Severn Trent Water's preferred method of surface water disposal is using a sustainable drainage system (SuDS) discharging to ground or open watercourses, with connection to the sewerage system seen as the last option.

10.1.5 Wastewater Treatment Works and Quality Consent Assessment

An assessment of the WwTW capacity was carried out by assessing the available headroom within the current DWF permit at each WwTW and converting it to an equivalent number of new homes, using the 90 percentile flow recorded at the treatment works. The results showed that Coleshill and Meriden WwTW have capacity for growth, however it is only Meriden that would have surplus upon meeting the proposed new housing numbers. Balsall Common, Barston and Norton Green WwTW have a shortfall from full growth number in DWF and will therefore require infrastructure or treatment upgrades in order to serve proposed growth.

10.1.6 Wastewater Treatment Centre Odour Assessment

An odour screening assessment was completed to identify sites that in close proximity to existing WwTWs where odour may be a cause of nuisance and complaints. Results concluded that two sites may be at risk of experiencing odour due to their proximity to the existing WwTW, thee being LPR09 South of Knowle and LPR10 West of Meriden. All other sites are unlikely to be impacted by odour from WwTW.

10.1.7 Water Quality Impact Assessment

Six WwTW for the Borough of Solihull were identified, however, water quality assessments were only carried out for five of the WwTWs because Minworth WwTW serves 1.7M people in Birmingham and only a tiny proportion of future flows treated will be as a result of growth in Solihull. This approach was communicated to STW and the Environment Agency and it was recommended that a strategic scale water quality assessment should be undertaken. The five WwTW that were used in this assessment were Balsall Common, Barston, Coleshill, Meriden and Norton Green.

The results found that:

- Balsall Common, Barston, Meriden and Norton Green are all operating above the Phosphorous permit conditions. Any growth would therefore further increase discharges of P beyond what the EA has permitted.
- There is no deterioration greater than 10% or class deterioration predicted at any of the WwTWs. There is, however, deterioration within the 'Bad' class at Balsall Common, Coleshill, Meriden and Norton Green, which is not permitted. However, in all cases this deterioration could be prevented by tightening permits and upgrading the WwTWs.
- At all works, modelling predicts that Good status cannot be achieved due to current technology limits for treatment of Phosphorus and Ammonia, even if the upstream water quality was meeting Good status. In these cases, the technology is considered to be the reason for not achieving GES, not the proposed growth.
- Consequently, environmental capacity is not considered to be a constraint to growth at any of the WwTWs assessed. However, it would be anticipated that Balsall Common, Barston, Meriden and Norton Green WwTWs will need to be brought into compliance with their Phosphorous permits before any significant growth is connected to these treatment works.

10.1.8 Flood Risk Assessment

A detailed assessment of flood risk can be found within the Solihull Strategic Flood Risk Assessment.

An assessment was carried out to determine whether increased discharges of treated effluent from each WwTW due to the increased development within the Metropolitan Borough of Solihull could lead to an increase in fluvial flood risk from the receiving watercourse. This assessment was carried out at all 6 WwTW that will receive additional flows from the preferred draft local plan development site options, and results showed that the impact of increased effluent flows is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

10.1.9 Environmental Constraints and Opportunities

Data from the Environment Open data from the EA were used to create maps to allow for a range of notable environmental designations and features to be displayed that are within or close to the proposed sites. The maps should be used in conjunction with Sustainability Appraisals (SA) and/or Strategic Environmental Assessments (SEAs) when these are available.

The environmental assessment provides an overview of the wider environment within the Borough and the potential risks and opportunities associated with the development of the proposed sites.

The entire stretch of the River Blythe that runs through the Borough of Solihull, from Hampton Arden to south west of Cheswick Green, has been identified as an SSSI. Several WwTWs have been identified as discharging to the River Blythe, namely Barston, Meriden, Spinney, and Temple Balsall. Additionally, the Environment Agency have raised concerns about a number of small private package treatment works which discharge to the Blythe, which are considered to contribute to the decline in water quality in recent years. The following risks and opportunities arise in this catchment:

- The water quality analysis indicated that the proposed developments draining to Barston WwTW would not lead to deterioration. However, the works is not currently meeting its Phosphorous permit condition, and it is anticipated that this should be brought into compliance before any significant growth is connected to this treatment works.
- An upgrade the Meriden WwTW would be required to prevent deterioration. This could present an opportunity to achieve improvements to this reach of the Blythe (subject to meeting WFD cost-benefit criteria). Meriden WwTW is also not currently meeting its Phosphorous permit.
- Where new sewerage is required to serve developments in the River Blythe catchment, there may be opportunities to connect-in locations currently served by private package treatment works, thereby reducing discharges from these to the River Blythe.

10.1.10 Climate Change

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made within this water cycle study. The assessment used a matrix which considers both the potential impact of climate change on the assessment in question, and also 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. This is a matter to be addressed at detailed assessment stage.

10.1.11 Recommendations

A table of recommendations outlined the actions that are advised for each of the different sections, the stakeholder responsible for carrying out the recommendation and the timescale at which it is advised that the action is implemented.

10.1.12 Timescales for implementing infrastructure upgrades

This WCS has identified where additional water and wastewater infrastructure may be required to enable planned growth, but the details of designing asset upgrades will be the responsibility of Severn Trent Water. 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 10-2, developed with advice from water companies (including Severn Trent Water), provides indicative timescales for different types and sizes of upgrade:

Table 10-2: 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	Strategic
Water resources	Publication of LPA Local Plans and associated updates		Demand management measures, minor new resource e.g. borehole: 3-5 years	New reservoir: 10 to 20 years.
Water supply	Pre-development enquiries Planning applications	Localised supply pipe upgrades: 18 month to 3 years	New supply mains, boosters, service reservoirs: 3-5 years	Implementation of new technologies or a new treatment works: 5 to 10 years
Wastewater treatment	Pre-development enquiries Planning applications	Minor upgrade of existing treatment works: 2-4 years	Treatment works upgrade 18 months to 3 years	Implementation of new technologies or a new treatment works: 5 to 10 years.
Sewerage	Pre-development enquiries Planning applications	Localised sewerage upgrades: 18 month to 3 years	New collector sewers or other strategic assets: 3-5 years	Strategic tunnel: 10 to 20 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.

10.2 Recommendations

Table 10-3: Summary of recommendations

Aspect	Action	Responsibility	Timescale
Water Resources: Water Resource Management Plans	Review population and housing growth forecasts within Severn Trent Water Strategic Grid WRZ	Severn Trent Water, SMBC	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.	SMBC and other LPAs in STW's Strategic Grid WRZ	Ongoing
	Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas.	SMBC	In draft Local Plan
	Water companies should advise SMBC of any strategic water resource infrastructure developments within the Borough, where these may require safeguarding of land to prevent other type of development occurring. However, at present, no major potential schemes have been identified within the SMBC boundary.	STW, SMBC	In draft Local Plan
Water Resources: Water Supply Infrastructure Assessment	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	STW	Ongoing
	Undertake technical studies to understand options to provide sufficient bulk and local transfer capacity and communicate results with WFDC.	STW	Ongoing
	Developers seek early consultation with Severn Trent Water in order to ensure adequate time is available to provide local distribution main upgrades to meet additional demand.	Developers, STW	Ongoing
Wastewater Collection and Treatment: Sewerage System Capacity	Take into account sewerage infrastructure constraints in phasing development in partnership with Severn Trent Water.	SMBC	Ongoing

Aspect	Action	Responsibility	Timescale
Assessment	Severn Trent Water to continue to assess growth demands as part of their wastewater asset planning activities and feedback to SMBC where concerns arise.	STW	Ongoing
	Severn Trent Water and developers will be expected to work closely and early on in the planning promotion process to develop an outline Drainage Strategy for the site. The Outline Drainage strategy should set out sufficient detail to determine the likely timescales for the delivery of the infrastructure and the likely costs of the infrastructure. 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.	STW and Developers	Ongoing
	Developers will be expected to show 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	Ongoing
Wastewater Treatment Works Flow and Quality Consent Assessment	Take into account the available WwTW capacity in phasing of development going to the same WwTW.	SMBC	Ongoing
	Provide annual updates to STW of projected housing growth.	SMBC	Annually
	STW to assess growth demands as part of their wastewater asset planning activities and feedback to SMBC where concerns arise.	STW	Ongoing
	STW, SMBC and the EA will work closely to ensure the timely delivery of any necessary WwTW upgrades.	STW, EA and SMBC	Ongoing
Wastewater Treatment Works Odour Assessment	Consider odour risk in selection of site allocations.	SMBC	Ongoing
	Carry out an odour assessment for 'amber' assessed sites	Developers	Ongoing
Water Quality Assessment	Where possible consider the water quality constraints when allocating and phasing development sites	SMDC	Ongoing

Aspect	Action	Responsibility	Timescale
	Bring Balsall Common, Barston, Meriden and Norton Green WwTWs into compliance with their Phosphorous permits before allowing any significant growth to connected to these treatment works.	STW	Ongoing
	Where the water quality assessment indicates that permits may require a higher standard of treatment than currently achievable using Best Available Technology, provide clear advice to sewerage undertakers on: The approach to permitting Requirements for any additional studies (for example additional water quality sampling for the sites missed, modelling, macro-invertebrate surveys etc.), Advise SMDC where water quality constraints may limit the potential for growth.	EA	Ongoing
	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	STW	Annually
	A strategic scale water quality assessment should be undertaken for Minworth WwTW. This should address planned growth in all of the local authorities served.	STW, EA, other local authorities served by Minworth	To be confirmed
Flood Risk Management	Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	STW	During design of WwTW upgrades
Environmental Constraints and Opportunities	Consultation with SMBC ecologists and heritage officers should be undertaken in relation to the development of each site to further identify potential environmental risks and opportunities, and to determine specific requirements for mitigation measures. In particular, attention should be given to the River Blythe, a designated SSSI, which runs through Solihull as development could potentially affect this protected area.	Developers and SMBC	Ongoing

Aspect	Action	Responsibility	Timescale
	Developers should seek to maximise the water quality and amenity/ecological benefits when installing SuDS for surface water flood management. The design of SuDS schemes should be specific to each allocation site to maximise the environmental benefits. Careful planning of SuDS schemes in areas identified as groundwater aquifers or sensitive to groundwater contamination would be required to ensure no adverse impact on groundwater quality. However, provision of SuDS has the potential to maintain or improve groundwater recharge.	Developers and SMBC	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
	Existing water features i.e., ponds, ditches and streams should be retained as a high priority and incorporated into SuDS schemes where appropriate to maintain the aquatic biodiversity value of the sites and to provide a local source of flora and fauna that may naturally colonise new habitats.	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 a range of aquatic wildlife through new habitat creation or improving access to valuable habitat. Implementation of these measures could contribute towards delivery of the requirements of the Water Framework Directive.	SMBC, Developers and EA	Ongoing
	Good design principles should be applied to all developments, particularly those located in sensitive or protected landscapes so as to minimise the impact on landscape character and visual amenity. Design advice provided by SMBC should be applied and consultation with the Council's landscape officer should be undertaken to inform the design of the development of a site.	SMBC, Natural England and Developers	Ongoing

Aspect	Action	Responsibility	Timescale
Climate Change Recommendations	When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, STW, SMBC	As required
	Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	SMBC, Developers	As required

Appendices

A Water Quality Assessment

A.1 Introduction

The increased discharge of effluent due to a growth in population served by a Waste Water Treatment Works (WwTW) may impact on the quality of the receiving water. The Water Framework Directive (WFD) does not allow a watercourse to deteriorate from its current class (either water body or element class).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourse. Where the scale of development is such that a deterioration is predicted, a new Environmental Permit (EP) may be required for the WwTW to improve the quality of the final effluent, so that the extra pollution load will not result in a deterioration in the water quality of the watercourse. This is known as a "no deterioration" or "load standstill".

It is the objective of the WFD that all water bodies should meet Good Ecological Status (GES), or where they have been highly modified meet Good Ecological Potential (GEP). It is therefore also necessary to assess whether the proposed increase in effluent could prevent a watercourse from meeting GES or GEP.

If a watercourse fails the GES target, further investigations are needed to define the 'reasons for fail' and which actions could be implemented to reach such status.

For each development site, the receiving WwTW was identified. This has allowed for the total future DWF to be calculated for each WwTW. This analysis identified six WwTWs to assess, however Minworth WwTW, which serves 1.7M people in Birmingham and the Black Country, was excluded on the basis that the additional flow from SMBC will form only a tiny proportion of the total flow served. This approach was communicated to Severn Trent Water and the Environment Agency, and it is recommended that a strategic scale water quality assessment be undertaken for Minworth. This should address planned growth in all of the local authorities served.

- Balsall Common
- Barston
- Coleshill
- Meriden
- Norton Green

A.1.1 Study Objectives

This report assesses the potential water quality impacts on the receiving watercourses due to future growth in effluent flows. The aims of this assessment are to:

- Identify whether the increases in wastewater effluent discharged as a result of the proposed growth would lead to deterioration in water quality in the receiving watercourse.
- Where deterioration is predicted, test whether this could be prevented, using a tighter permit condition.
- Where the watercourse is not meeting the physico-chemical requirements of the Water Framework Direct Good Ecological Status or Potential, test whether the proposed growth would prevent that from being achieved.

A.2 Methodology

A.2.2 Growth scenarios

In order to undertake this assessment, the flows at each WwTW have been calculated from the proposed developments provided by the Solihull District Council. The Dry Weather Flow (DWF) was calculated for each WwTW by using an occupancy rate of 2.4 persons per dwelling, a consumption of 134 l/p/d as outlined in the Water Resource Management Plan (WRMP) with 95% of flows reaching the WwTW (it is assumed that this is intended to represent an allowance for base infiltration in the sewer flows).

Table 4 shows the present day DWF, the future growth DWF calculated from the method above, and the sum of these to make the future growth total.

Table 4: present-day and future scenario to model.

WwTW	Mean DWF (Ml/d)			
	Present day	Future growth	Future Total	Percentage Change
Balsall Common	2.45	3.51	5.96	143%
Barston	11.55	7.17	18.72	62%
Coleshill	68.45	6.53	77.76	13%
Meriden	0.894	0.512	1.046	31%
Norton Green	3.32	2.29	5.67	70%

A.2.3 Assessment of Deterioration

The study was required to assess changes to effluent flows as a result of the proposed development from each settlement to assess the impact of the increase contaminant load on the receiving watercourses. Any increase in a pollutant load being discharged from a WwTW could cause a deterioration and the EA set the following criteria to define significant deterioration, at which point a review of the Environmental Permit may be triggered:

- A class deterioration. For example, if an increased load of ammonia from a WwTW led to a water body currently defined as "Moderate" ecological status dropping down to "Poor" status.
- A deterioration of more than 10%. For example, if the present-day 95 percentile BOD downstream of a WwTW is 2.0mg/l, but as a result of an increased WwTW discharge this rose to 2.3mg/l, this would be a deterioration of 15%.
- Any deterioration of a water body classed as "Bad". Where the water body is currently of "Bad" ecological status (the lowest WFD status), then no further deterioration is permitted.

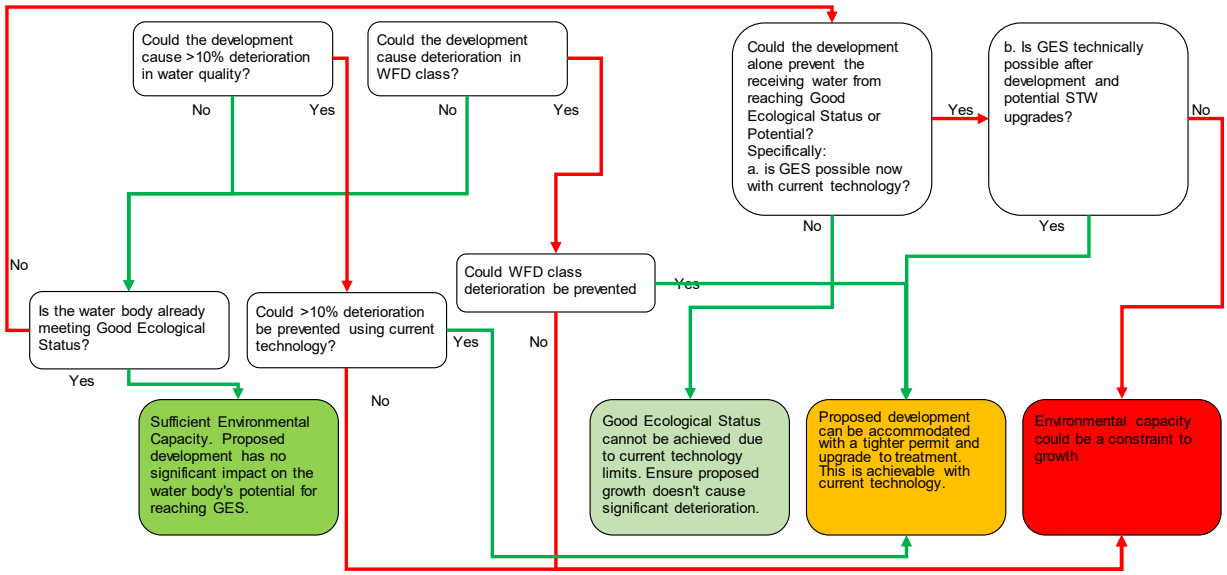
Where a WwTW is predicted to lead to a failure in one or more of these targets, it is necessary to determine a possible future permit value which would prevent this from occurring. The RQP tool can be used to do this by calculating the required discharge needed to achieve a downstream river target.

A.2.4 Best Available Technology (BAT) Assessment

Where river targets failures were predicted, the models were rerun to test whether application of Best Available Technology (BAT) treatment processes could prevent deterioration and enable the receiving watercourse to meet the physico-chemical requirements to achieve Good Ecological Status or Potential. This assessment process has recently been set out in a guidance document by the Environment Agency's West Thames Area44. Whilst this document has no national status, it provides a useful summary of how to interpret the results of the water quality assessment. This guidance is summarised in the flow chart below:

44 Environment Agency West Thames Area (2015) Water Cycle Study Guidance and Requirements - West Thames Area.

Figure 8: Water quality assessment flow chart



The EA advised that the following permit values are achievable using Best Available Technology, and that these values should be used for modelling all WwTW potential capacity irrespective of the existing treatment technology and size of the works:

- BOD (95%ile) = 5mg/l
- Ammonia (95%ile) = 1mg/l
- Phosphorus (mean) = 0.5mg/l

Note that phosphorus removal is the subject of ongoing national trials investigating novel techniques and optimisation of existing methods. This major study, which involves all UK water companies, is not due to report until 2017, therefore this assessment is based on the current assumption of BAT for phosphorus. STW are assuming a 0.5mg/l as BAT until the study's results will be available.

This assessment did not take into consideration if it is feasible to upgrade each existing WwTW to such technology due to constraints of costs, timing, space, carbon costs etc.

A.2.5 River Quality Planning Tool

The Environment Agency RQP tool was the selected approach for this assessment in conjunction with the recommended guidance document; "Water Quality Planning: no deterioration and the Water Framework Directive[45]". The tool uses a state Monte Carlo Mass Balance approach which allows the user to calculate discharge standards needed to achieve a particular river quality standard. The tool can also predict the discharge quality required to achieve a downstream water quality target.

RQP models were set up and run for each WwTW to determine the current impact of the treatment works as well as the future impact.

Where failure was predicted in any of the scenarios, and the upstream river quality did not achieve 'good status' the model was re-run assuming that the upstream river had 'good status'. This allows the actual impact of the future effluent discharge to be assessed if upstream point and/or diffuse sources were to be resolved.

The data required to run the RQP software were:

Upstream river data (received from the EA):

- Mean flow
- 95% exceedance flow

45 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 02/11/2016

- Mean for each contaminants
- Standard deviation for each contaminant

Discharge data (received from the EA):

- Mean flow
- Standard deviation for the flow
- Mean for each contaminants
- Standard deviation for each contaminant

River quality target data (received from the EA):

- No deterioration target
- 'Good status' target

The above data inputs should be based on observations where available. In the absence of observed data EA guidance require that the following values were used:

- Flow mean: 1.25*DWF
- Flow SD: 1/3*mean
- Quality data: permit values or assumed values
- If observed river flows were not available these were obtained from an existing model or a low-flows estimation software.
- If observed water quality data were not available these were obtained from an existing model or a neighbouring catchment with similar characteristics, or the mid-point of the WFD class.
- Dry Weather Flow (DWF) permits and the measured Q90 flows were also provided by the EA

A.2.6 Determinants

The determinants assessed at each WwTW were Biological Oxygen Demand (BOD), Ammonia (NH_4) and Phosphorus (P). No dilution data has been provided from STW for the future dilution of the pollutants, therefore it is assumed the dilution will be the same as the present day dilution.

A.2.7 Good Ecological Status

The WFD targets for Good Ecological Status (GES) for Biological Oxygen Demand (BOD), Ammonia (NH_4) and Phosphorus (P) set by the EA for lowland and high alkalinity water bodies are shown in Table 5 below.

Table 5: WFD 'Good Status' Targets for lowland and high alkalinity water bodies

Determinand	Statistic	Target
BOD	90 percentile	5mg/l
NH4	90 percentile	0.6mg/l
P	Mean	Site Specific

The EA has provided 2015 WFD catchment/reach specific 'Good Status' targets for phosphorus. The following targets have been used in this assessment at each WwTW:

Table 6: Phosphorus targets for 'Good Status' by WwTW

WwTW	P mean mg/l	Receiving Watercourse
Balsall Common	0.064	River Blythe at Ryton End
Barston	0.056	River Blythe at Sandalls Bridge
Coleshill	0.066	River Tame
Meriden	0.063	River Blythe at Patrick Bridge
Norton Green	0.065	Cuttle Brook

A.2.8 Assessing Compliance

Compliance against WFD targets for the scenarios modelled was calculated using the Present Day situation as the baseline. Compliance / or non-compliance is indicated on the results tables as follows:

Modelled water quality is within the WFD target for the determinand in question.	Modelled water quality does not meet the WFD target for the determinand in question.

The status of the receiving watercourse is reported using the same traffic-colour used by the EA “Method statement for the classification of surface water bodies v3[46]” as shown in

46 Environment Agency (2012) Method statement for the classification of surface water bodies v3 Accessed online at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/485389/LIT_5769_ed4e2b.pdf 02/11/2016

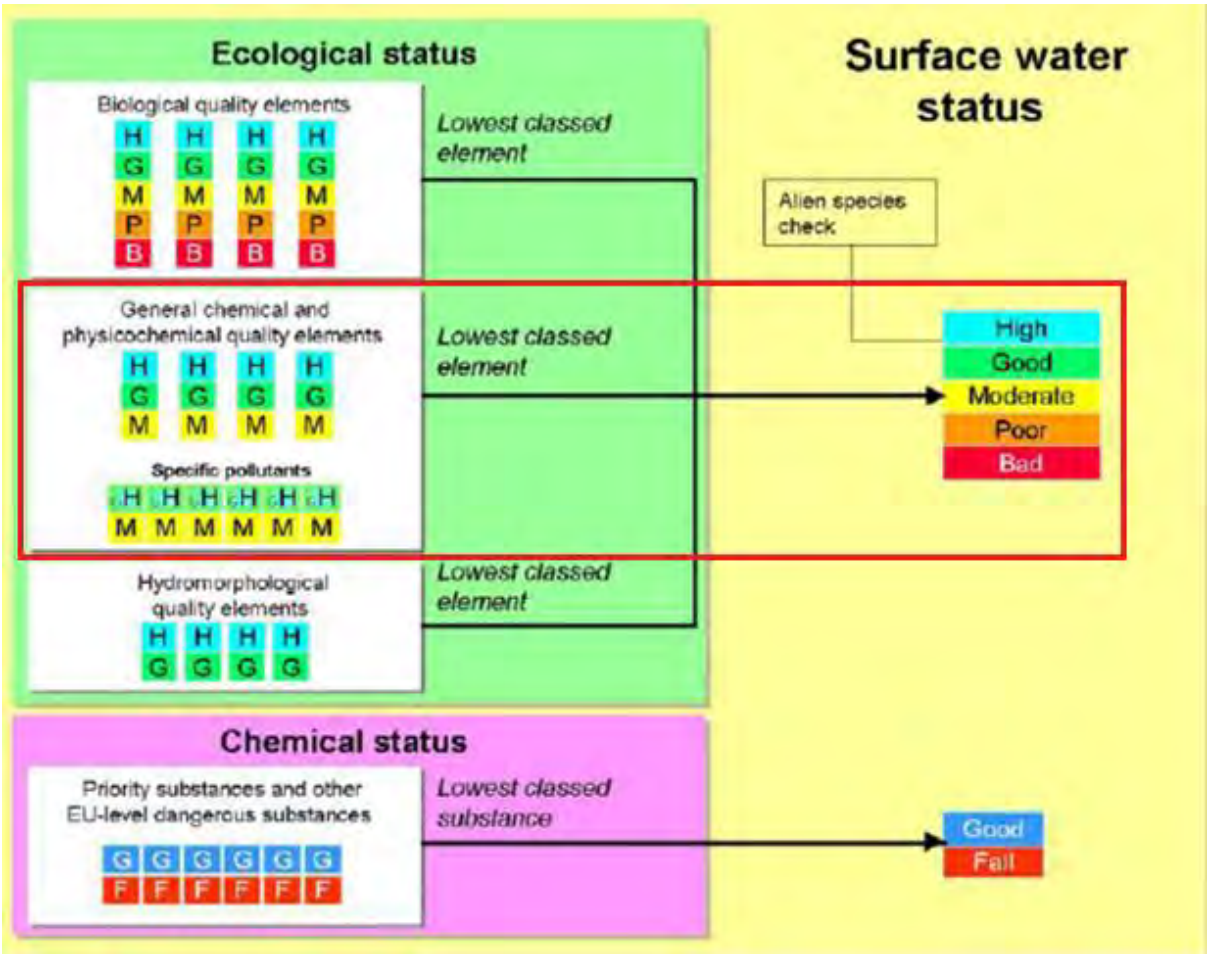
Figure 9. The WCS requires an assessment only based on the physico-chemical quality elements where each element is classified as bad, poor, moderate, good or high.

For each WwTW a summary table is provided (based on Table 7) for the receiving watercourse, reporting the 2015 WFD status for BOD, NH_4 and P, the overall status for the watercourse and future objectives.

Table 7: Summary table representing 2015 WFD status, watercourse status and its objectives

	Overall	BOD	Ammonia	Phosphorus
2015 WFD status	Overall watercourse's status	Watercourse's status for BOD	Watercourse's status for NH4	Watercourse's status for P
Objective	Overall watercourse's objective	Watercourse's objective for BOD	Watercourse's objective for NH4	Watercourse's objective for P

Figure 9: Classification of Surface Water from "Method statement for the classification of surface water bodies v3"



A.3 Results

A.3.9 Balsall Common WwTW

Balsall Common WwTW discharges into the River Blythe as shown in Figure 10. There are 1150 proposed residential developments that have been designated to connect to Balsall Common WwTW.

Figure 10: Balsall Common WwTW discharge Location

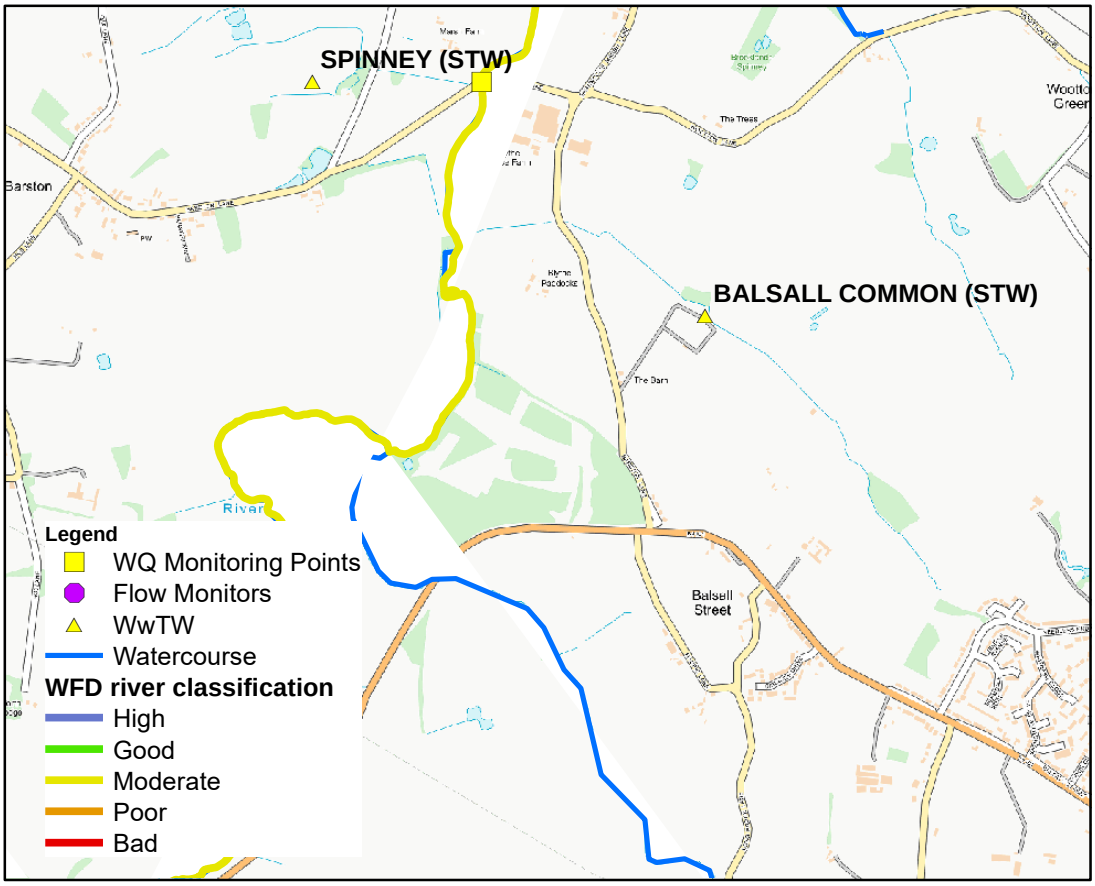


Table 8: River Blythe at Ryton End 2015 WFD status and objectives

	Overall	BOD	Ammonia	Phosphorus
2015 status	Moderate	High	High	Moderate
Objective	Good	High	High	Good

Table 8 shows the current status of the receiving watercourse including the overall status as well as the individual statuses for BOD, NH_4 and P. The River Blythe has a moderate overall status but both BOD and NH_4 have a high WFD status.

Table 9: Consent Values for DWF, BOD, NH_4 and P at Balsall Common WwTW

DWF (m3/d)		BOD (mg/l)		NH4 (mg/l)		P (mg/l)	
Permitted DWF	Measured Q90	95%ile consent value	Modelled 95%ile	95%ile consent value	Modelled 95%ile	Mean consent value	Modelled mean
1780	1513	15	8.47	10	6.01	1	2.31

Table 9 shows the consented values for Balsall Common WwTW. The works has permitted values for 2015 DWF BOD and NH_4 and is currently working within these limits. However, the works is currently working above the P consent. As no data has been given for the future dilution of the

pollutants, it is assumed they will remain the same. In this case, the works will still be operating in the future within the consented values, except for P.

Table 10: Input data and RQP results for Balsall Common WwTW

Parameter	Statistic	River	Source	Present Day			Future growth		
				WRC	Source	RQP Result	WRC	Source	RQP Result
Flow (Ml/d)	Mean	0.074	Low Flow Softw are	2.45	Observed Data		5.96	Calculated using STW parameters	
	SD			1.51			3.675		
	5%ile	0.010							
BOD (mg/l)	Mean	1.83	Observed Data	3.66	Observed Data	6.76	3.66	Observed Data	6.87
	SD	0.885		2.50			2.50		
	Target 90%ile	4.00	2015 WFD						
NH4 (mg/l)	Mean	0.094	Observed Data	1.98	Observed Data	4.31	1.98	Observed Data	4.42
	SD	0.136		2..29			2.29		
	Target 90%ile	0.30	2015 WFD						
P (mg/l)	Mean	0.306	Observed Data	2.25	Observed Data	2.26	2.25	Observed Data	2.29
	SD	0.259		2.78			2.78		
	Target Mean	0.164	2015 WFD						
P (mg/l)	Mean	0.0485	Assumed Mid Class Good	2.25	Observed Data	2.25	2.25	Observed Data	2.29
	SD	0.0162		2.78			2.78		
	Target Mean	0.064	2015 WFD						

Table 10 shows the input data and RQP results for Balsall Common. The model results indicate that all pollutants fail their 2015 WFD targets. There is no deterioration greater than 10% for any of the pollutants and there is no class deterioration. However, for both NH_4 and P there is a deterioration within the 'Bad' ecological class which is not permitted, thus a revision of the permit is likely to be required.

The RQP function was used to calculate the required discharge quality for BOD to meet the river targets, assuming a good status upstream. The model results in Table 11 indicate that the good target can only be achieved for the present day scenario using BAT. However, for NH_4 and P GES is not achievable for the present day flows even when assuming 'Good status' upstream and BAT at the WwTW. Therefore, the watercourse is unable to meet GES as a consequence of current technological limits, not as a result of the proposed development.

Table 11: Discharge quality required to meet good WFD targets for all pollutants

WwTW	Pollutant	Target	Upstream river quality	Scenario	Mean	SD	95%ile
Balsall Common	BOD	4	High	Future Grow th	2.18	1.4	**4.92**
Balsall Common	BOD	4	High	Present Day	2.22	1.44	**5.00**
Balsall Common	NH4	0.3	High	Future Grow th	0.14	0.15	**0.41**
Balsall Common	NH4	0.3	High	Present Day	0.14	0.15	**0.42**
Balsall Common	P	0.164	Moderate	Future Grow th	**0.16**	0.18	0.49
Balsall Common	P	0.164	Moderate	Present Day	**0.16**	0.18	0.49
Balsall Common	P	0.064	Assumed Mid Class Good	Future Grow th	**0.03**	0.03	0.09
Balsall Common	P	0.064	Assumed Mid Class Good	Present Day	**0.03**	0.03	0.09

New permits were calculated for NH_4 and P as there is a deterioration of the 'Bad' class. These were calculated using the present day result from the RQP calculation to eradicate the deterioration of this class. Table 12 shows the permit values required can be achieved with BAT for both the pollutants.

Table 12: WwTW discharge quality to eradicate deterioration of 'Bad' WFD class

Parameter	Worst Case Scenario	Present Day Target	Values required to meet target		
			Mean	SD	95%ile
NH4	Future	4.31	1.99	2.08	5.87
P	Future	2.26	2.28	2.52	6.94

A.3.10 Barston WwTW

Barston WwTW discharges into the River Blythe as shown in Figure 11. There are 2350 proposed residential developments that have been designated to connect to Barston WwTW.

Figure 11: Barston WwTW discharge location

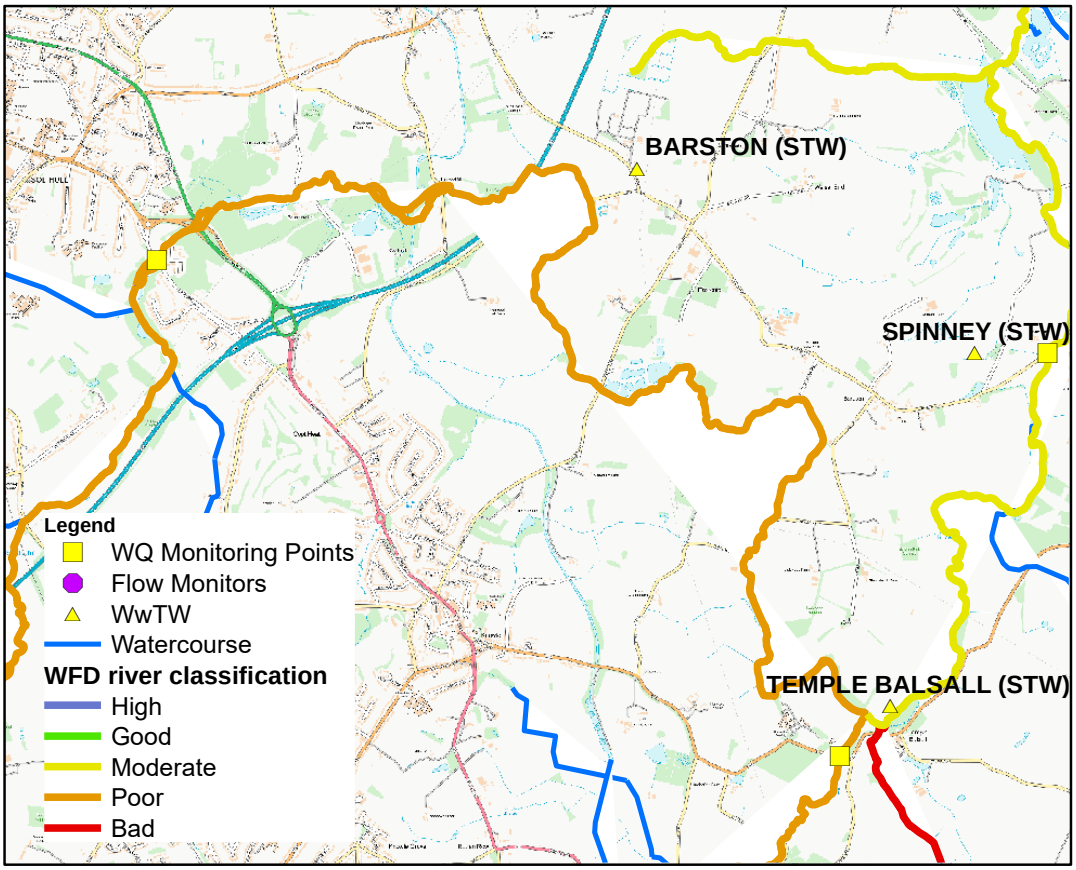


Table 13: River Bylthe at Sandalls Bridge watercourse status and objectives

	Overall	BOD	Ammonia	Phosphorus
2015 status	Moderate	N/A	High	Moderate
Objective	Good	N/A	High	Good

Table 13 shows the current status of the receiving watercourse including the overall status as well as the individual statuses for NH_4 and P. No status has been given for BOD, but for the RQP calculations it will be assumed that BOD is reaching a good WFD target.

Table 14: Consent Values for DWF, BOD, NH_4 and P at Barston WwTW

DWF (m3/d)		BOD (mg/l)		NH4 (mg/l)		P (mg/l)	
Permitted DWF	Measured Q90	95%ile consent value	Modelled 95%ile	95%ile consent value	Modelled 95%ile	Mean consent value	Modelled mean
11200	8380	10	9.42	3	2.25	1	1.43

Table 14 shows the consent values for Barston WwTW. The works has permitted values for 2015 DWF, BOD and NH4 and is currently working within these limits. However, the works is currently working above the P consent. As no data has been given for the future dilution of the pollutant, it is assumed they will remain the same. In this case, the works will still be operating in the future within the consented values, except for P.

Table 15: Input data and RQP results for Barston WwTW

Parameter	Statistic	River	Source	Present Day			Future growth		
				WRC	Source	RQP Result	WRC	Source	RQP Result
Flow (Ml/d)	Mean	0.505	Low Flow Softw are	11.55	Observed Data		18.72	Calculated using STW parameters	
	SD			8.38			13.6		
	5%ile	0.045							
BOD (mg/l)	Mean	2.28	Observed Data	4.78	Observed Data	7.77	4.78	Observed Data	7.91
	SD	1.270		2.403			2.403		
	Target 90%ile	5.00	2015 WFD						
NH4 (mg/l)	Mean	0.104	Observed Data	0.72	Observed Data	1.58	0.72	Observed Data	1.60
	SD	0.930		0.89			0.89		
	Target 90%ile	0.30	2015 WFD						
P (mg/l)	Mean	0.159	Observed Data	0.558	Observed Data	0.56	0.558	Observed Data	0.57
	SD	0.070		0.459			0.459		
	Target Mean	0.149	2015 WFD						
P (mg/l)	Mean	0.043	Assumed Mid Class Good	0.558	Observed Data	0.55	0.558	Observed Data	0.56
	SD	0.014		0.459			0.459		
	Target Mean	0.056	2015 WFD						

Table 15 shows the input data and RQP results for Barston. The model results indicate that all pollutants fail the 2015 WFD target. There is no deterioration greater than 10% and there is no class deterioration for any of the pollutants, thus a new permit is not required for deterioration.

The RQP function was used to calculate the required discharge quality for all pollutants to meet the river targets, assuming a good status upstream. The model results in Table 16 indicate the targets can be achieved for both the present day and the future scenario using BAT for BOD only. GES is not achievable for NH_4 or P for the present day flows even when assuming a 'Good Status' upstream and BAT at the WwTW. The watercourse is unable to meet GES as a consequence of current technological limits and not as a result of the proposed development.

Table 16: Discharge Quality required to meet good WFD status for all pollutants

WwTW	Pollutant	Target	Upstream river quality	Scenario	Mean	SD	95%ile
Barston	BOD	5	Good	Future Grow th	3.07	1.49	**5.92**
Barston	BOD	5	Good	Present Day	3.14	1.53	**6.05**
Barston	NH4	0.3	High	Future Grow th	0.14	0.15	**0.42**
Barston	NH4	0.3	High	Present Day	0.14	0.15	**0.42**
Barston	P	0.149	Moderate	Future Grow th	**0.15**	0.11	0.37
Barston	P	0.149	Moderate	Present Day	**0.15**	0.11	0.37
Barston	P	0.056	Assumed Mid Class Good	Future Grow th	**0.06**	0.04	0.14
Barston	P	0.056	Assumed Mid Class Good	Present Day	**0.06**	0.04	0.14

A.3.11 Coleshill WwTW

Coleshill WwTW discharges into the River Tame as shown in Figure 12. There are 2100 residential developments that have been designated to Coleshill WwTW from the Solihull district, 1351 from the Birmingham District[47] and 662 residential developments from North Warwickshire District[48].

Figure 12: Coleshill WwTW discharge location

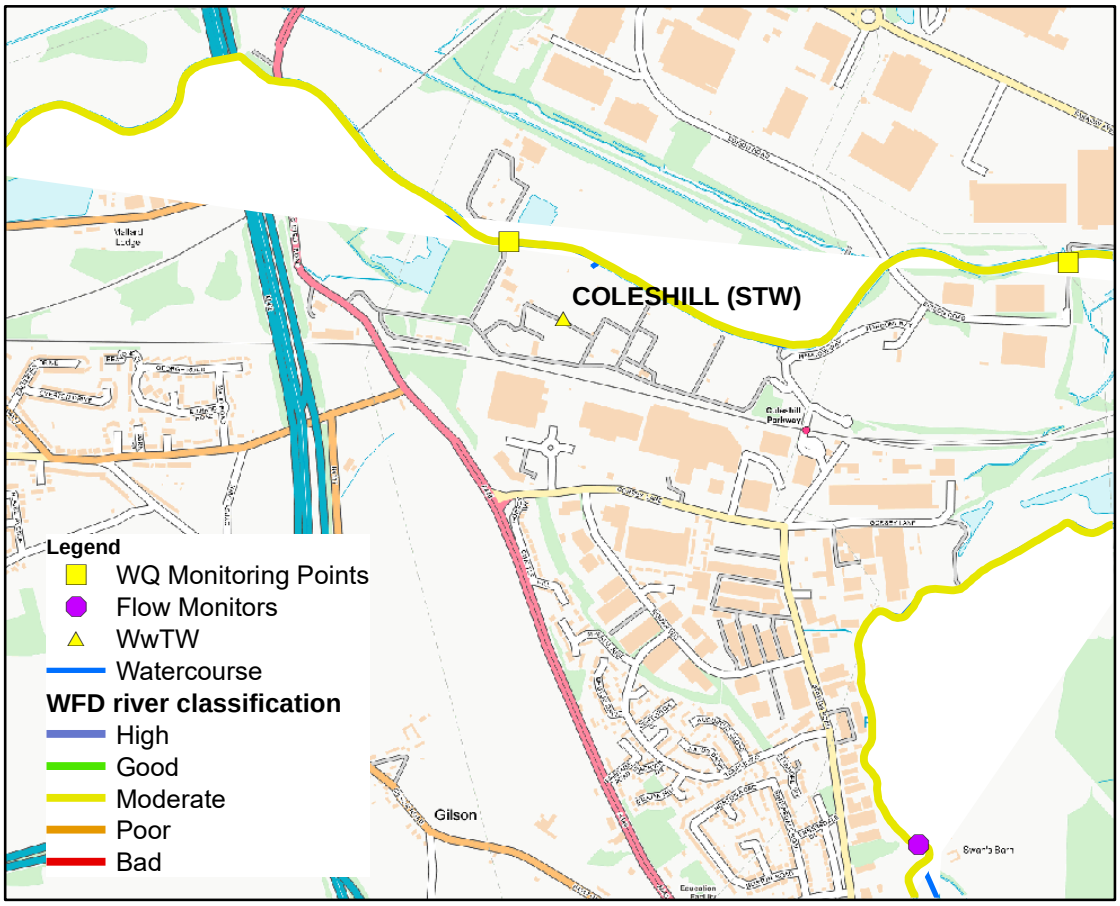


Table 17: River Tame watercourse status and objectives

	Overall	BOD	Ammonia	Phosphorus
2015 status	Moderate	N/A	High	Bad
Objective	Good	N/A	High	Good

Table 17 shows the current status of the receiving watercourse including the overall status as well as the individual statuses for NH_4 and P. No status has been given for BOD, but for the RQP calculations it will be assumed that BOD is reaching a good WFD target.

Table 18: Consent Values for DWF and BOD at Coleshill WwTW

DWF (m3/d)		BOD (mg/l)		NH4 (mg/l)		P (mg/l)	
Permitted DWF	Measured Q90	95%ile consent value	Modelled 95%ile	95%ile consent value	Modelled 95%ile	Mean consent value	Modelled mean
65000	46870	20	9.15	5	2.47	Not available	

47 Birmingham District Proposed Site Allocations (2013) available from https://www.birmingham.gov.uk/directory_record/467/submission_plan accessed online on 15/12/2016

48 North Warwickshire District Draft Site Local Plan (2015) available from: https://www.northwarks.gov.uk/info/20028/forward_planning/1357/local_plan_2016 accessed online on 15/12/2016

Table 18 shows the consent values for Coleshill WwTW. The works has permitted values for 2015 DWF, BOD and NH_4 and is currently working within these limits. As no data has been given for the future dilution of the pollutants, it is assumed they will remain the same. In this case, the works will still be operating in the future within the consented values.

Table 19: Inputs and RQP results for Coleshill WwTW

Parameter	Statistic	River	Source	Present Day			Future growth		
				WRC	Source	RQP Result	WRC	Source	RQP Result
Flow (Ml/d)	Mean	4.45	Low Flow Softw are	68.45	Observed Data		81.13	Calculated using STW parameters	
	SD			46.87			57.92		
	5%ile	0.71							
BOD (mg/l)	Mean	3.84	Observed Data	3.67	Observed Data	6.93	3.67	Observed Data	6.96
	SD	3.90		2.880			2.88		
	Target 90%ile	5.00	2015 WFD						
NH4 (mg/l)	Mean	0.580	Observed Data	0.759	Observed Data	1.67	0.759	Observed Data	1.68
	SD	0.670		1.03			1.03		
	Target 90%ile	0.30	2015 WFD						
P (mg/l)	Mean	1.76	Observed Data	3.52	Observed Data	3.46	3.52	Observed Data	3.48
	SD	1.42		1.13			1.13		
	Target Mean	0.992	2015 WFD						
P (mg/l)	Mean	0.050	Assumed Mid Class Good	3.52	Observed Data	3.36	3.52	Observed Data	3.39
	SD	0.017		1.13			1.13		
	Target Mean	0.066	2015 WFD						

Table 19 shows the input data and RQP results for Coleshill. The model results indicate that all pollutants fail the 2015 WFD targets but there is no deterioration greater than 10% and there is no class deterioration. However, for P there is a deterioration within the 'Bad' ecological class which is not permitted, revision of the permit is likely to be required.

The RQP function was used to calculate the required discharge quality for all pollutants to meet the river targets, assuming a good status upstream. The model results in Table 20 indicate the targets can be achieved for both the present day and future growth scenario using BAT for BOD only. GES is not achievable for NH_4 or P for the present day even when assuming a 'Good Status' upstream and BAT at the WwTW. The watercourse is unable to meet GES as a consequence of current technological limits and not as a result of the proposed development.

Table 20: Discharge Quality required to meet good WFD status for all pollutants

WwTW	Pollutant	Target	Upstream river quality	Scenario	Mean	SD	95%ile
Coleshill	BOD	5	Good	Future Grow th	2.65	1.96	**6.43**
Coleshill	BOD	5	Good	Present Day	2.61	1.94	**6.35**
Coleshill	NH4	0.3	High	Future Grow th	0.12	0.16	**0.36**
Coleshill	NH4	0.3	High	Present Day	0.11	0.13	**0.35**
Coleshill	P	0.992	Bad	Future Grow th	**Not Achievable**		
Coleshill	P	0.992	Bad	Present Day	**Not Achievable**		
Coleshill	P	0.066	Assumed Mid Class Good	Future Grow th	**0.07**	0.02	0.11
Coleshill	P	0.066	Assumed Mid Class Good	Present Day	**0.07**	0.02	0.11

A new permit was calculated for P as there is a deterioration of the 'Bad' class. This was calculated using the present day result from the RQP calculation to eradicate the deterioration of this class. Table 21 shows the permit values required can be achieved with BAT for P.

Table 21: WwTW discharge quality to eradicate deterioration of 'Bad' WFD class

Parameter	Worst Case Scenario	Present Day Target	Values required to meet target		
			Mean	SD	95%ile
P	Future	3.46	3.55	1.12	5.62

A.3.12 Meriden WwTW

Meriden WwTW discharges into the River Blythe as shown in Figure 13. There are 50 residential developments that have been designated to Meriden WwTW from the Solihull district.

Figure 13: Meriden WwTW discharge location

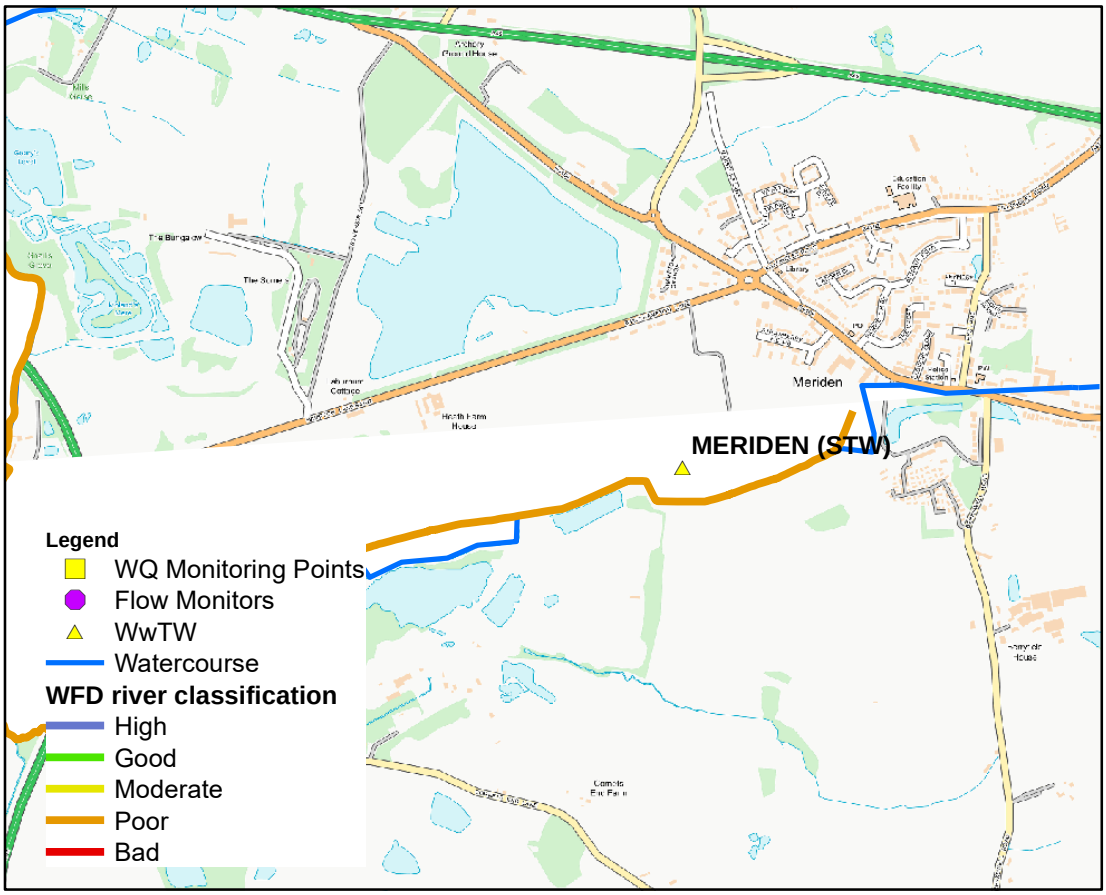


Table 22: River Blythe at Patrick's Bridge watercourse status and objectives

	Overall	BOD	Ammonia	Phosphorus
2015 status	Moderate	Good	Good	Poor
Objective	Good	Good	Good	Good

Table 22 shows the current status of the receiving watercourse including the overall status as well as the individual statuses for NH_4 and P. The River Blythe has a moderate overall status but both BOD and NH_4 have a good WFD status.

Table 23: Consent Values for DWF and BOD at Meriden WwTW

DWF (m3/d)		BOD (mg/l)		NH4 (mg/l)		P (mg/l)	
Permitted DWF	Measured Q90	95%ile consent value	Modelled 95%ile	95%ile consent value	Modelled 95%ile	Mean consent value	Modelled mean
752	568	15	4.63	10	2.88	2	5.40

Table 23Table 18 shows the consent values for Meriden WwTW. The works has permitted values for BOD and NH_4 and is currently working within these limits. However, P is working above its current consented value. As no data has been given for the future dilution of pollutants, it is assumed they will remain the same. In this case, the works will still be operating in the future within the consented values except for P.

Table 24: Input data and RQP results for Meriden WwTW

Parameter	Statistic	River	Source	Present Day			Future growth		
				WRC	Source	RQP Result	WRC	Source	RQP Result
Flow (Ml/d)	Mean	0.021	Low Flow Softw are	0.894	Observed Data		1.046	Calculated using STW parameters	
	SD			0.568			0.664		
	5%ile	0.003							
BOD (mg/l)	Mean	2.45	Assumed Mid Class Good	1.96	Observed Data	3.71	1.96	Observed Data	3.72
	SD	1.71		1.39			1.39		
	Target 90%ile	5.00	2015 WFD						
NH4 (mg/l)	Mean	0.210	Assumed Mid Class Good	0.80	Observed Data	1.89	0.80	Observed Data	1.90
	SD	0.240		1.44			1.44		
	Target 90%ile	0.60	2015 WFD						
P (mg/l)	Mean	0.048	Assumed Mid Class Good	5.336	Observed Data	5.26	5.336	Observed Data	5.28
	SD	0.016		1.298			1.298		
	Target Mean	0.063	2015 WFD						

Table 24 shows the input data and RQP results for Meriden. The model results indicate that NH_4 and P fail the 2015 WFD target but there is no deterioration greater than 10% and there is no class deterioration. However, for P there is a deterioration within the 'Bad' ecological class which is not permitted, revision of the permit is likely to be required..

The RQP function was used to calculate the required discharge quality for NH_4 and P to meet the river targets, assuming a good status upstream. The model results in Table 25 indicate that the targets cannot be achieved for NH_4 or P even when assuming a 'Good Status' upstream and BAT at the WwTW. The watercourse is unable to meet GES as a consequence of current technological limits and not as a result of the proposed development.

Table 25: Discharge Quality required to meet good WFD status for BOD

WwTW	Pollutant	Target	Upstream river quality	Scenario	Mean	SD	95%ile
Meriden	NH4	0.6	Good	Future Grow th	0.26	0.38	**0.90**
Meriden	NH4	0.6	Good	Present Day	0.26	0.39	**0.91**
Meriden	P	0.063	Assumed Mid Class Good	Future Grow th	**0.06**	0.02	0.09
Meriden	P	0.063	Assumed Mid Class Good	Present Day	**0.06**	0.02	0.09

A new permit was calculated for P as there is deterioration of the 'Bad' class. This was calculated using the present day result from the RQP calculation to eradicate the deterioration of this class. Table 26 shows the permit values required can be achieved with BAT for P.

Table 26: WwTW discharge quality to eradicate deterioration of 'Bad' WFD Class

Parameter	Worst Case Scenario	Present Day Target	Values required to meet target		
			Mean	SD	95%ile
P	Future	5.26	5.38	41.29	7.71

A.3.13 Norton Green WwTW

Norton Green WwTW discharges into the Cuttle Brook as shown in Figure 14. There are 750 residential developments that have been designated to Meriden WwTW from the Solihull district and 20 from the Warwick District.

Figure 14: Norton Green WwTW discharge location

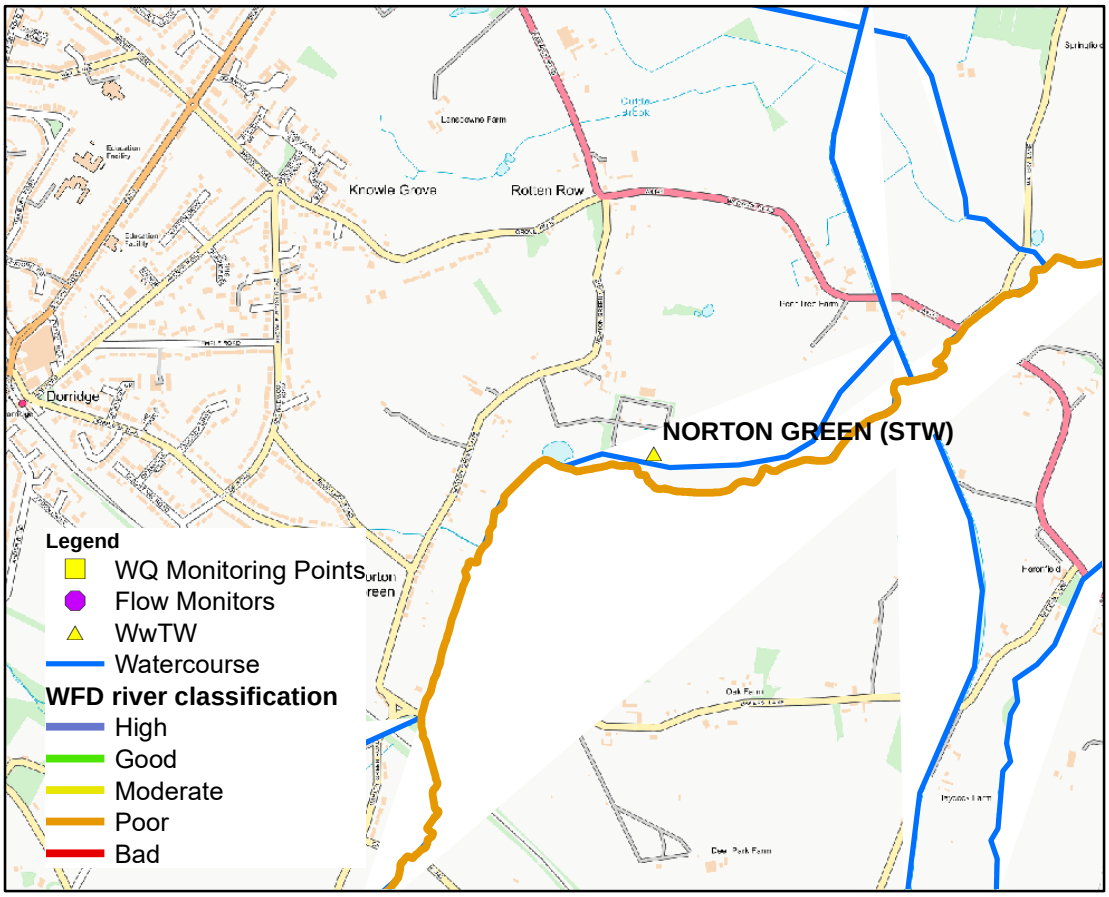


Table 27: Cuttle Brook watercourse status and objectives

	Overall	BOD	Ammonia	Phosphorus
2015 status	Moderate	N/A	High	Poor
Objective	Good	N/A	High	Good

Table 27 shows the current status of the receiving watercourse including the overall status as well as the individual statuses for NH_4 and P. The River Blythe has a moderate overall status and NH_4 has a high WFD status. No status has been given for BOD, but for the RQP calculations it will be assumed that BOD is reaching a good WFD target.

Table 28: Consent Values for DWF and BOD at Norton Green WwTW

DWF (m3/d)		BOD (mg/l)		NH4 (mg/l)		P (mg/l)	
Permitted DWF	Measured Q90	95%ile consent value	Modelled 95%ile	95%ile consent value	Modelled 95%ile	Mean consent value	Modelled mean
3180	2038	15	7.53	10	2.94	1	4.29

Table 28Table 18 shows the consent values for Meriden WwTW. The work has permitted values for BOD and NH_4 and is currently working within these limits. However, P is working above its current consented value. As no data has been given for the future dilution of the pollutants, it is

assumed they will remain the same. In this case, the works will still be operating in the future within the consented values, except for P.

Table 29: Input data and RQP results for Norton Green

Parameter	Statistic	River	Source	Present Day			Future growth		
				WRC	Source	RQP Result	WRC	Source	RQP Result
Flow (Ml/d)	Mean	0.099	Low Flow Softw are	3.320	Observed Data		5.67	Calculated using STW parameters	
	SD			2.030			3.460		
	5%ile	0.01							
BOD (mg/l)	Mean	2.45	Assumed Mid Class Good	2.76	Observed Data	5.70	2.76	Observed Data	5.77
	SD	1.71		2.569			2.569		
	Target 90%ile	5.00	2015 WFD						
NH4 (mg/l)	Mean	0.210	Assumed Mid Class Good	1.049	Observed Data	2.19	1.049	Observed Data	2.22
	SD	0.240		1.026			1.026		
	Target 90%ile	0.60	2015 WFD						
P (mg/l)	Mean	0.065	Assumed Mid Class Good	4.238	Observed Data	4.18	4.238	Observed Data	4.22
	SD	0.022		1.087			1.087		
	Target Mean	0.063	2015 WFD						

Table 29 shows the input data and RQP results for Norton Green. The model results indicate that all pollutants fail the 2015 WFD targets, but there is no deterioration greater than 10% and there is no class deterioration. However for P there is a deterioration within the 'Bad' ecological class which is not permitted, revision of the permit is likely to be required.

The RQP function was used to calculate the required discharge quality for all pollutants to meet the river targets, assuming a good status upstream. The model results in Table 30 indicate the targets can be achieved for both the present day and future growth scenarios using BAT. The targets cannot be achieved for NH_4 or P even when assuming a 'Good Status' upstream and BAT at the WwTW. The watercourse is unable to meet GES as a consequence of current technological limits and not as a result of the proposed development.

Table 30: Discharge quality required to meet good WFD targets for all pollutants

WwTW	Pollutant	Target	Upstream river quality	Scenario	Mean	SD	95%ile
Norton Green	BOD	5	Assummed Mid Class Good	Future Grow th	2.46	2.12	**6.52**
Norton Green	BOD	5	Assummed Mid Class Good	Present Day	2.49	2.15	**6.60**
Norton Green	NH4	0.6	Assummed Mid Class Good	Future Grow th	0.29	0.26	**0.79**
Norton Green	NH4	0.6	Assummed Mid Class Good	Present Day	0.30	0.27	**0.80**
Norton Green	P	0.063	Assumed Mid Class Good	Future Grow th	**0.06**	0.02	0.09
Norton Green	P	0.063	Assumed Mid Class Good	Present Day	**0.06**	0.02	0.09

A new permit was calculated for P as there is a deterioration of the 'Bad' class. These were calculated using the present day result from the RQP calculation to eradicate deterioration of this class. Table 31 shows the permit values required can be achieved with BAT for P.

Table 31: WwTW discharge quality to eradicate deterioration of 'Bad' WFD class

Parameter	Worst Case Scenario	Present Day Target	Values required to meet target		
			Mean	SD	95%ile
P	Future	4.18	4.24	1.08	6.19

A.4 Summary and Conclusions

A.4.14 Method

The increased discharge of effluent due to a growth in population served by a Waste Water Treatment Works (WwTW) may impact on the quality of the receiving water. The Water Framework Directive (WFD) does not allow a watercourse to deteriorate from its current class (either water body or element class).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourse. Where the scale of development is such that a deterioration is predicted, a new Environmental Permit (EP) may be required for the WwTW to improve the quality of the final effluent, so that the extra pollution load will not result in a deterioration in the water quality of the watercourse. This is known as a "no deterioration" or "load standstill".

This assessment identified six WwTW to asess, however one of these has been excluded as it mostly supplies the Birmingham District. Three of the remaining five has taken into account the growth in other surrounding districts. The EA reviewed the list of the WwTW and has suggested that a water quality assessment should be undertaken on five of these WwTWs.

A.4.15 Results

Table 32 summarises the modelling results for passing or failing the following targets:

- 'Good status'
- ' No deterioration greater than 10%'
- 'No Class deterioration'

Table 32: RQP results summarised for passing of failing targets of: 'Good Status', No >10% Deterioration', and 'No Class Deterioration'

Watercourse (WRC discharging into it)	Scenario	Achieves 'Good status' target?			Achieves 'No > 10% deterioration' target?			Achieves No 'Class deterioration' target?		
		BOD	NH4	P	BOD	NH4	P	BOD	NH4	P
Key		Achieves good status			No deterioration			No class deterioration		
		NA			Up to 10% deterioration			NA		
		Fails good status			More than 10% deterioration			Class deterioration		
Balsall Common	Present day	no	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future grow th	no	no	no	2%	3%	1%	yes	yes	no
Barston	Present day	no	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future grow th	no	no	no	2%	1%	2%	yes	yes	yes
Coleshill	Present day	no	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future grow th	no	no	no	0%	1%	1%	yes	yes	no
Meriden	Present day	yes	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future grow th	yes	no	no	0%	1%	0%	yes	yes	no
Norton Green	Present day	no	no	no	N/A	N/A	N/A	N/A	N/A	N/A
	Future grow th	no	no	no	1%	1%	1%	yes	yes	no

A.4.16 Best Available Technology (BAT) Assessment

Table 33 summarises the results assuming BAT is applied for each WwTW.

Table 33: Summary of results assuming BAT is applied

Watercourse (WwTW)	Could the development cause a greater than 10% deterioration in WQ?	Could the development cause a deterioration in WFD class of any element?		Could the development prevent the water body from reaching GES?
Key	Sufficient Environmental Capacity. Proposed development has no significant impact on the water body's potential for reaching GES	Good Ecological Status cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.	Proposed development can be accommodated with a tighter permit and upgrade to the treatment. This is achievable with current technology.	Environmental capacity could be a constraint to growth.
River Blythe (Balsall Common WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for NH_4 and P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.		Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Blythe (Barston WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	No class deterioration predicted. No WwTW upgrade is required.		Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Tame (Coleshill WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.		Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Blythe (Meriden WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.		Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
River Blythe (Norton Green WwTW)	Predicted deterioration is less than 10%. No WwTW upgrade is required.	There is deterioration within the 'Bad' class for P, which is not permitted. Upgrade to the WwTW is needed and is achievable with BAT.		Good Ecological Status cannot be achieved for NH_4 or P due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.

Table 34 reports additional results on the runs and model results used to compare against BAT. Further explanation of the column headers are:

- Scenario: specifies the discharge flow and quality scenario data used as an input in the RQP run;
- Target: specifies the target to achieve;
- Upstream river quality: specifies if the upstream river condition used for the run is the actual situation or if GES was assumed;
- Mean, SD and 95%ile: these are the RQP tool output representing the discharge value required to meet the specific target. For BOD and NH_4 the value to compare with BAT is the 95%ile, whilst for P is the mean.

Table 34: Runs and Model results for the BAT assessment

WwTW	Pollutant	Target	Upstream river quality	Scenario	Mean	SD	95%ile
Balsall Common	BOD	4	High	Future Grow th	2.18	1.4	**4.92**
Balsall Common	BOD	4	High	Present Day	2.22	1.44	**5.00**
Balsall Common	NH4	0.3	High	Future Grow th	0.14	0.15	**0.41**
Balsall Common	NH4	0.3	High	Present Day	0.14	0.15	**0.42**
Balsall Common	P	0.164	Moderate	Future Grow th	**0.16**	0.18	0.49
Balsall Common	P	0.164	Moderate	Present Day	**0.16**	0.18	0.49
Balsall Common	P	0.064	Assumed Mid Class Good	Future Grow th	**0.03**	0.03	0.09
Balsall Common	P	0.064	Assumed Mid Class Good	Present Day	**0.03**	0.03	0.09
Barston	BOD	5	Good	Future Grow th	3.07	1.49	**5.92**
Barston	BOD	5	Good	Present Day	3.14	1.53	**6.05**
Barston	NH4	0.3	High	Future Grow th	0.14	0.15	**0.42**
Barston	NH4	0.3	High	Present Day	0.14	0.15	**0.42**
Barston	P	0.149	Moderate	Future Grow th	**0.15**	0.11	0.37
Barston	P	0.149	Moderate	Present Day	**0.15**	0.11	0.37
Barston	P	0.056	Assumed Mid Class Good	Future Grow th	**0.06**	0.04	0.14
Barston	P	0.056	Assumed Mid Class Good	Present Day	**0.06**	0.04	0.14
Coleshill	BOD	5	Good	Future Grow th	2.65	1.96	**6.43**
Coleshill	BOD	5	Good	Present Day	2.61	1.94	**6.35**
Coleshill	NH4	0.3	High	Future Grow th	0.12	0.16	**0.36**
Coleshill	NH4	0.3	High	Present Day	0.11	0.13	**0.35**
Coleshill	P	0.992	Bad	Future Grow th	**Not Achievable**		
Coleshill	P	0.992	Bad	Present Day	**Not Achievable**		
Coleshill	P	0.066	Assumed Mid Class Good	Future Grow th	**0.07**	0.02	0.11
Coleshill	P	0.066	Assumed Mid Class Good	Present Day	**0.07**	0.02	0.11
Meriden	NH4	0.6	Good	Future Grow th	0.26	0.38	**0.90**
Meriden	NH4	0.6	Good	Present Day	0.26	0.39	**0.91**
Meriden	P	0.063	Assumed Mid Class Good	Future Grow th	**0.06**	0.02	0.09
Meriden	P	0.063	Assumed Mid Class Good	Present Day	**0.06**	0.02	0.09

A.4.17 Conclusions

The following conclusions are drawn from this water quality impact assessment:

- Balsall Common, Barston, Meriden and Norton Green are all operating above the Phosphorous permit conditions. Any growth would therefore further increase discharges of P beyond what the EA has permitted.
- There is no deterioration greater than 10% or class deterioration predicted at any of the WwTWs. There is, however, deterioration within the 'Bad' class at Balsall Common, Coleshill, Meriden and Norton Green, which is not permitted. However, in all cases this deterioration could be prevented by tightening permits and upgrading the WwTWs.
- At all works, modelling predicts that Good status cannot be achieved due to current technology limits for treatment of Phosphorus and Ammonia, even if the upstream water quality was meeting Good status. In these cases, the technology is considered to be the reason for not achieving GES, not the proposed growth.
- Consequently, environmental capacity is not considered to be a constraint to growth at any of the WwTWs assessed. However, it would be anticipated that Balsall Common, Barston, Meriden and Norton Green WwTWs will need to be brought into compliance with their Phosphorous permits before any significant growth is connected to these treatment works.

B Appendix - Sewerage System Capacity Assessment

Site Ref	Site Name	Size	Units	Sewage Treatment Works Catchment	Sewerage Comment			Potential impact on sewerage infrastructure
					Known network constraints	Assumed connectivity	Surface water disposal	
LPR14	Arran Way - Smiths Wood	2.3	82	Coleshill	This site is located in the lower reaches of the Coleshill and Barston catchment.	There are two foul systems within the vicinity where a connection from the site could be made; the sewers are different sizes, 225mm and 600mm. Whether a suitable connection into the 600mm trunk is feasible would require modelling. A capacity assessment of the 225mm sewer would be necessary to understand if the new site could cause this sewer to surcharge.	There two potential surface water connections points, to either a 375mm or 675mm sewer. The sewer records are not available once these pipes reach the western side of the M6.	Medium (unknown surface water asset availability)

LPR01	Barratts Farm - Balsall Common	56	1958	Balsall Common	This site is located at top of the existing sewerage system and is on the opposite side of the catchment in relation to Balsall Common sewage treatment works. Downstream of the proposed site are 6 flooding locations which could be further impacted by this new development.	There are two assumed connections points for foul discharges from this site. The northern extent of the site overlaps a combine sewer of 150mm diameter; this sewer would be unable to provide the necessary foul drainage. The south east boundary of the development site incorporates a Sewage Pumping Station (Balsall Common - Waste Lane (SPS)) which current servers around 25 properties. It is highly unlikely this Pump Station would have the capacity to accommodate increased flows.	There is a watercourse within the development site boundary which already receives surface water flow from areas further south in the catchment. These water courses drain to the north and east and could potentially be utilised to drain this new site.	High (Significant development with no suitably sized foul sewers in the immediate vicinity)
LPR07	Chester Road/ Moorend Avenue - Fordbridge	3.8	132	Coleshill	The site is located on the western fringe of Shard End and Chelmsley Wood and as such is closer to the Coleshill Sewage Treatment Works than the surrounding urban area. The foul discharge could be connected to the 1125mm trunk sewer heading north towards the M6.	As the site is located within a meander of the River Cole any foul drainage needs to drain northwards towards the Coleshill Sewage Treatment Works. It is assumed that the development will connect to MH SP17879601 or SP18870602.	A new surface water system could be commissioned running directly to the River Cole which surrounds the southern boundary of the development site. To the north a surface water system already exists which also outfalls to the River Cole.	Low - subject to hydraulic modelling

							There is a single pollution event (STW Category 3) from the surface water outfall on the opposite bank which occurred on 20/07/2016.	
LPR16	East of Solihull - Lugtrout Lane Hampton Lane	36	1266	Coleshill	The majority of the site is currently greenfield and as such has minimal foul or surface water infrastructure. Any foul water will enter the nearby LugTrout Lane SPS to the north west. Future capacity at this asset will be reduced.	It is assumed that the development will connect to MH SP16805508. The flows will quickly enter Lugtrout lane SPS which pumps just over 300m until entering a 300mm sewer draining to Coleshill STW. There are known issues regarding capacity at this pumping station.	To the north of the development zone runs the Grand Union canal. The current surface water system drainages to the canal, it is unknown whether the existing 225mm surface water sewer running along the northern boundary of the site has the capacity to receive the sites surface water discharge. At the north west point of the proposed site	High (Incapacity at Lugtrout lane, potential for futher flooding incidents, requires detailed modelling)

							the surface water system increases in size to 675mm.	
LPR11	Former TRW site - The Green, Shirley	20	715	Coleshill	There are four pollution events which occurred downstream on 11/01/2011, 26/01/2011, 11/04/2011 and, 07/05/2012. All category three events. Two associated with misconnections and two with third party.	It is assumed that the development will connect to the foul network at MH SP12777301 and the surface network at MH SP12777407.	A surface water system exists to the north of site and with a potential connection at MH SP12777407. Further investigation of the receiving water course would be required to ascertain whether it has the capacity to manage the surface water flows.	High (size of development , distance from Coleshill treatment works, flows crossing large portion of catchment, limited capacity of surface water drainage)

LPR12	Frog Lane - Balsall Common	9.7	339	Balsall Common	There are numerous historic blockages recorded at the existing residential area to the west of this site.	It is highly likely that connections to the foul and surface water sewers would be made on Hampton road. Potentially at surface MH SP18771203 and MH SP18771202 for the foul.	A suitable surface water system currently exists and drains north westwards to Purnells Brook through a series of pipes increasing in size from 225 to 525mm.	Medium - (hydraulic flooding event downstream of site, subject to hydraulic modelling)
LPR08a	Hampton Road Knowle	1.6	54	Barston	There is a minimal amount of sewerage network upstream of the proposed site. The area is located near to the Barston sewage treatment works. The local residential area is prone to blockages and sewer gradients are relatively gentle.	To the west of the site runs a 300mm foul sewer but the topography of the area is particularly level so achieving a suitable gradient to this sewer might be difficult.	The site and predicted number of units would suitably connect to the surface system to the west of the site which drains north west to Purnell's Brook.	Low - subject to hydraulic modelling
LPR08b	Hampton Road Knowle	9.8	343	Barston	Currently a brownfield site which drains only 2.5KM to the Barston STW. Both the main foul sewer to the treatment works and a potentially suitable water course for surface water	Assuming the sewer has capacity then the new development could connect at MH SP18770600 preventing the need for another sewer crossing Purnell's Brook.	If Purnell's brook was unable to receive the surface water flows from this site then the Grand Union canal is ~500m north.	Low - subject to hydraulic modelling

					drainage pass through the site. Unfortunately the foul sewer networks run on the far side of the water course so the new foul sewerage system would have to cross this watercourse.			
LPR15	Jensen House, Auckland Drive - Smiths Wood	4.1	142	Coleshill	Currently a brownfield site which drains to Coleshill STW. The site is positioned on the eastern edge of the urban area. The surrounding area is also a blockage hotspot. Connectivity of this residential area in sewer records has a number of gaps therefore further investigation may be required to establish downstream connectivity and what watercourse the surface water system discharges to	There are numerous available connections to the existing sewerage system. Depending on the layout of the site this will impact which manhole/s are selected.	There numerous available connections to the existing surface water system. Depending on the layout of the site will impact which manhole/s are selected.	Low - subject to hydraulic modelling

LPR05	Chester Road/ Moorend Avenue - NSRA	3.4	120	Coleshill	There are several recorded foul blockages in close vicinity to the site. Downstream of the site there have been three pollutions on the surface water system outfall at Babb's Mill Recreation Ground. These occurred on 17/02/2009, 26/04/2010, 30/04/2010 and 1/06/2010. All associated with mis-connections.	A large portion of the catchment sewerage network is upstream of the development site. Any proposed connection will be connecting into a trunk sewer. Further modelling would be required to ensure the new connection is protected from flooding.	Existing site already utilising the surface water sewer for runoff therefore as long as contributing area and run off rate are roughly the same it is not expected that there should be any issues with hydraulic capacity of the downstream surface water sewer or watercourse	Low - (subject to hydraulic modelling)
LPR20	Land Damson Parkway - Bickenhill	94	3283	Coleshill	The site is largely a greenfield site. It is centrally located in the Coleshill and Barston SMP catchment and as such drains through a large portion of the catchment. Hydraulic flood risk register points significantly downstream of site (near to Coleshill	Running along the lower south eastern boundary of the site is a 300mm sewer which quickly enters the trunk main running to Coleshill treatment works.	Currently no surface water assets exist within the site boundary. A small unnamed watercourse of unknown capacity runs north eastwards along the eastern boundary of the catchment. This watercourse	High (Significant known flooding problems downstream of this site, connection risk to trunk main)

					STW).		enters the Low Brook just north of the development site.	
LPR06	Meriden Road - Hampton-in-Arden	3.6	125	Barston	The development is located very close to the Meriden Road Sewage Pumping Station and associated tanks. The emergency overflow drains ~300m to the east entering an unnamed brook. There has been a pollution event at this outfall on 21/09/2011 resulting in an EA category 4 pollution. Foul flows from this group of assets are pumped directly to the Barston Sewage Treatment Works. A capacity assessment of this arrangement of assets should be undertaken to investigate the sites	It assumed that the foul flows would be connected to the Meriden Road Sewage Pumping Station.	There is a minimal surface water drainage system to the north west of the site which drains a small modern housing estate. The outfall of this system enters the River Blythe 200m north of the development site. This watercourse is also marked as A Site of Specific Scientific Interest and careful management of surface water flows would be required to protect the ecology of the river.	Medium - (Known capacity issues, interaction with SSSI site)

					performance. Hampton in Arden has issues with it's pumping stations both in terms of performance and hydrogen sulphide. They are all interconnected therefore a wider assessment may be required for this site.			
LPR17	Moat Lane, Vulcan Road - Solihull	5.1	180	Coleshill or Barston	The proposed development site is a redevelopment of a light-medium industrial area. The site already contains a foul and separate surface water system. To the south of the site is a reported hydraulic flooding which occurred very close to the current site entrance. This incident occurred on 26/09/1998. The site is located very near the head of the	An assumed foul connection could be made at MH SP15814107 if the layout of the foul drainage system remains similar to the current arrangement.	The surface water system consists of a 600mm sewer running south to north through the site, 70 meters after leaving the site the surface water outfalls into the Grand Union canal.	Medium - (Known capacity issues, distance to Sewage Treatment Works)

					sewer system and as such has to drain across a large portion of the Coleshill and Barston catchment.			
LPR18	Sharmans Cross Road - Solihull	4.3	151	Barston	There are no known properties at risk of hydraulic flooding surrounding the site or downstream.	Limited access to the development site restricts the potential options for sewer connections. Only the two site entrances on the north west side provide an opportunity to access the sewer network on Sharmans Cross Road.	Surface water disposal would be possible by connecting to the surface water sewer to the south of the development site. The capacity of the receiving water course is unknown so further investigation would be required.	Low (subject to hydraulic modelling)

LPR02	South of Dog Kennel Lane - Shirley	45	1586	Coleshill	The site is located in the south west of the Coleshill and Barston SMP Catchment and foul flows drain across the whole catchment to reach Coleshill Sewage Treatment Works. The proposed area is mostly a greenfield site with barely any sewerage assets within the boundaries.	The assumed foul connectivity of this site would be into the 450mm sewer which runs for several lengths parallel to the southern extent of the site. This sewer also serves the village of Cheswick Green to the south. This sewer increases in size after leaving the village and is also in the vicinity of the River Blythe SSSI site. Detailed modelling would be necessary to ensure that any increases in foul flows doesn't cause an escape of sewage which could pollute the River Blythe.	A surface water connection could be made at the western extent of the site. An assumed connection point could be at MH SP11779101. The receiving water course joins the River Blythe at Cheswick Green. The concerns with this potential solution is the capacity of the water course and whether existing 225mm surface water sewer has the necessary capacity to drain a 45ha site. It would be likely that another surface water system would be required or retention ponds should be incorporated into	High- (>500 properties, Subject to hydraulic modelling to prevent pollution of SSSI site)

							any site plans.	
LPR09	South of Knowle Station Rd, Warwick Rd, Knowle	48	1671	Norton Green	This site crosses the boarder between the SMP catchments of Coleshill & Barston and Norton Green. According to the gradient of the land it is expected that any foul drainage would be transferred in a southerly direction. The foul flows would end up being treated at the Norton Green STW. North of the development in the Coleshill & Barston catchment there has been one incident of external hydraulic flooding on	Due to the gradient of the site and the proximity of the Norton Green STW it is expected that the sites foul flows would gravitate southwards into the Norton Green SMP catchment. Decision to be made as to which STW to discharge to. Topography suggest Norton Green STW however this is a much small works than Coleshill or Barston and signifcant upsizing may be required for a site this large. There is also a hydraulic flood risk register point at Norton Green STW.	Accessible to the site are three water courses draining to the east. These outfall into the Grand Union Canal. Further assessment of the brooks capacity would be required to understand the capacity of each.	High- (>500 properties, Potential capacity issues)

					10/11/2014.			
LPR13	South of Shirley - Whitlocks End Fm Dickens Hth Rd	29	1018	Coleshill	The site is located in the south west of the Coleshill and Barston SMP Catchment and foul flows drain right across the catchment to Coleshill Sewage Treatment Works. The proposed area is mostly a greenfield site with a 450mm sewer flowing north to south and a surface water sewer of 1425mm connected to a water course.	The assumed foul connectivity of this site would be into the MH SP11777201 of the 450mm sewer running north to south.	Since a watercourse exists within the site, any surface water flows could outfall into this. A capacity assessment of this watercourse would be necessary.	High - (Size of site (>500 properties), Potential capacity issues)

LPR19	UK Central Hub/HS2 interchange - Bickenhill	153	5361	Coleshill	The constraints on the network at this location are unknown as the whole drainage system will need to be constructed. It is highly unlikely that any of the surrounding residential sewers have the necessary capacity.	The site has no sewers currently crossing it and any of the local foul networks would become surcharged and flood if the site was connected to them.	The Hollywell Brook and another unnamed water course cross the site to the east. Further investigation is absolutely necessary to understand if these water courses can manage the surface water flows from such a large site. There is no surface water system which the site could connect into.	High (Significant development with no suitably sized foul sewers in the immediate vicinity, requires hydraulic modelling and optioneering)
LPR04	West of Dickens Heath - Tythe Barn Lane	45	1581	Minworth	This development is at a head of a run that discharges into the Coleshill and Barston catchment however it discharges to a pumping station that appears to discharge to another pumping station in Minworth (which in turn	The most suitable foul connections for this development site are on its eastern boundary.	Surface water from the site could be taken north to the Stratford -upon-Avon canal which forms the northern boundary of the site.	High (size of development , distance from Coleshill treatment works, flows crossing large portion of catchment, potential pumping station capacity issues)

					eventually discharges to Minworth STW). It should be noted that it is known that a number of the pumping stations in Dickens Heath have been turned from Minworth to Coleshill and therefore downstream rising main connectivity should be checked.			
LPR10	West of Meriden Birmingham Road - Meriden	3.5	123	Meriden	There are no known properties at risk of hydraulic flooding surrounding the site or downstream. Meriden STW is a small STW therefore capacity assessment at the works may also be required	Foul flows could potentially be connected to the network present in Maxstoke Lane. Topography suggests that it would be difficult to connect to public sewer. There is a private foul sewer on Birmingham Road that would be more suitable.	The site is adequately served by a surface water sewer on its east boundary and an unnamed water course across its northern boundary. The site currently contains a pond which could be utilised as a surface water retention pond.	Low (subject to hydraulic modelling)

LPR03	Windmill Lane - Kenilworth Road, Balsall Common	15	539	Balsall Common	The site is predominately greenfield with sewers only to the north west and north east corners.	It is assumed that the best options for connectivity to the existing foul and surface water systems are at the northern boundary of the development site. There are opportunities to use the two water courses to the west of the site	There are opportunities to use the two water courses to the west of the site.	High (size of site, subject to hydraulic modelling)

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Saltaire
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