Southern Staffordshire Councils Water Cycle Study – Phase 1 Scoping Study

Final Report

February 2020

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Southern Staffordshire Councils

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Revision History

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V1.0 – 10/12/2019	Draft Report	Southern Staffordshire Councils Jack Robinson (Severn Trent Water) Steve Colella (South Staffs Water)
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Contract

This report describes work commissioned by Andrew Lindop on behalf of the Southern Staffordshire Councils by an email dated the 7th December 2018. Lucy Finch and Richard Pardoe of JBA Consulting carried out this work.

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Purpose

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Acknowledgements

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Executive summary

In December 2018, JBA Consulting was commissioned by the Southern Staffordshire Councils (SSCs) to undertake a Water Cycle Study (WCS) to inform the SSCs Local Plans. This study assesses the potential issues relating to future development within Southern Staffordshire and the impacts on water supply, wastewater collection and treatment and water quality. 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 the bill payers.

In addition to increased housing demand, future climate change presents further challenges to 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 the figure below and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

The Water Cycle

Source: Environment Agency – Water Cycle Study Guidance

This study will assist the SSCs 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 Water Cycle Study has been carried out in co-operation with Severn Trent Water (STW), South Staffs Water (SSW), the Environment Agency (EA) and the neighbouring Local Planning Authorities (LPAs).

Potential development sites were provided by the SSCs and wastewater treatment works (WwTW) likely to serve growth in the area were provided by Severn Trent Water. Each development site was then allocated to a WwTW in order to understand the additional wastewater flow resulting from the planned growth. Available information was collated on water policy and legislation, water resources, water quality and environmental designations within the study area and used

to assess the requirements for further study in a Phase 2 WCS. Where further study is required, a proposed methodology is provided.

As the SSCs are at a very early stage of the site selection process, a large number of sites were assessed, and if all sites were brought forward, this would give growth far exceeding each Council's need. For this reason, for wastewater, the assessments were conducted on WwTW assuming different percentages of growth would come forward, to give a more realistic overview of the potential level of growth.

Water Resources

Lichfield, Tamworth and Cannock are entirely covered by South Staffs Water Resource Zone (WRZ). Stafford Borough is covered by North Staffs, Stafford and Shelton WRZs and South Staffordshire is covered by South Staffs, Shelton, Stafford and Wolverhampton WRZs. Growth accounted for within STW and SSW's Water Resource Management Plans is broadly in line the Ministry of Housing Communities and Local Government (MHCLG) household projections for Southern Staffordshire and in line with the current local plan housing targets.

The WRMPs shows a supply-demand deficit around 2024-2026 for the North Staffs and South Staffs WRZ if no action is taken, however both WRMPs go on to define a number of actions that will address this. Severn Trent Water and South Staffs Water confirmed that they would have adequate water resources for all the proposed development sites.

Although STW and SSW have not relied on new homes being more water-efficient than existing metered homes, the opportunity exists through the planning system to ensure that new homes meet the higher standard of domestic water usage in line with the general principles of sustainable development and supported by the location of the study area in a region of moderate water stress.

On the basis that there is a plan to address the supply-demand deficit, and sufficient time to adapt the long-term plan to include emerging trends in population, no further assessment is recommended as part of a Phase 2 Outline study.

Water supply infrastructure

Severn Trent Water and South Staffs Water responded to the request for an assessment of water supply infrastructure within Southern Staffordshire. As development within Southern Staffordshire occurs, it will be necessary to undertake detailed modelling of the water supply infrastructure to allow for appropriate infrastructure upgrades and local reinforcements. STW and SSW do not expect water supply to be a constraint to development within Southern Staffordshire.

No further analysis of water supply infrastructure is recommended as part of a Phase 2 Outline study.

Wastewater collection infrastructure

STW provide wastewater services to the whole of Southern Staffordshire. 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 STW is therefore essential to ensure that sewerage capacity can be provided without delaying development.

STW provided a red/amber/green assessment of the sewer network in each Council's potential development sites, which represents the relative difficulty of providing wastewater infrastructure. The housing need of South Staffordshire, Lichfield and Tamworth could be met by sites given a "green" RAG rating for wastewater collection. This is not the case for Stafford and Cannock Chase, where a large number of sites were rated "red" and "amber", so to meet the housing need here, some red and amber rated sites would need to come forward.

Early engagement with STW is required to allow time for the infrastructure upgrades required to accommodate development of red and amber rated sites if required.

Further study of the wastewater network is recommended as part of a Phase 2 Outline as the Local Plans develop and the SSCs have greater certainty over which sites will be brought forward for development.

Wastewater treatment capacity

STW provided assessments of the WwTW serving growth in each scenario based on both hydraulic capacity and headroom in the environmental permit. JBA carried out a flow permit assessment in parallel to this, based on different percentage bands of growth.

The results of JBA's assessment show that the majority of WwTW in Southern Staffordshire can accommodate some level of growth and not exceed the maximum Dry Weather Flow before 2045.

Severn Trent scored a large number of WwTW red as part of their flow capacity RAG assessment; however, this was based on the 100% growth scenario, which is likely to be an overestimate of growth. These results should therefore be considered in conjunction with JBA's assessment.

Once the SSCs have confirmed which sites will be developed, and STW have modelled the additional demand, where capacity is not currently available, STW will complete necessary improvements to provide the capacity. They will ensure that their assets have no adverse effect on the environment and that appropriate levels of treatment are provided at each of their sewage treatment works.

Further study of the wastewater treatment capacity is recommended as part of a Phase 2 Outline study as the Local Plans develop and the SSCs have greater certainty over which sites will be brought forward for development.

Odour

40 sites within Southern Staffordshire are close enough to a WwTW that an odour assessment is recommended as part of the planning process; 7 in Stafford, 15 in South Staffordshire, 9 in Lichfield, 1 in Tamworth and 8 in Cannock. The cost of this should be met by the developer.

No further assessment of odour is recommended in a phase 2 WCS. Any future assessment should be carried out as part of the planning process.

Water quality

The increased wastewater discharges at the WwTWs serving growth in Southern Staffordshire have the potential to impact downstream water quality in the receiving watercourses, with ammonia being the water quality indicator that appears to be the most sensitive to increased effluent flows.

Once the SSCs have greater certainty over which sites will be brought forward for development, water quality modelling, using a catchment-wide approach is required in order to understand the current capacity of the water environment and the impact of the potential growth.

Flood risk from additional foul flow

The impact of increased effluent flows is unlikely to have a significant impact on the flood risk of the receiving watercourses of WwTW serving growth in Southern Staffordshire, with the exception of Little Aston WwTW. This is, however, assuming 100% of proposed sites will come forward which is unlikely, therefore the flood risk impact for the final sites should be considered as part of a Phase 2 study.

Environmental constraints

A number of Sites of Special Scientific Interest (SSSIs) exist within Southern Staffordshire and there is a possibility of point source pollution (from WwTW) or diffuse pollution (for example from surface runoff from development) to impact these sites. Opportunities exist to mitigate this through implementation of SuDS schemes to manage surface runoff.

The impact of WwTW on water quality should be assessed in a Phase 2 Study.

Overall conclusion

This study indicates that while a certain level of growth can be accommodated with minimal additional infrastructure, significant new infrastructure and upgrades to existing network and wastewater treatment works will be required to accommodate growth in Southern Staffordshire.

Early engagement with water companies is therefore recommended as part of the planning process.

It is recommended that more detailed water quality modelling is carried out in a Phase 2 Outline study to assess the cumulative impact of growth across the whole study area on the Water Framework Directive classification of the receiving waterbodies in order to ensure that the environmental capacity of the catchment is not a constraint to growth.

Further study of the wastewater network is also recommended once greater certainty over which sites will be brought forward for development.

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Abbreviations/Glossary

ALS	Abstraction Licensing Strategy
AMP	Asset Management Plan
AMR	Automatic Meter Reading
AONB	Area of Outstanding Natural Beauty
AP	Assessment Point
ASNW	Ancient Semi-Natural Woodland
BIDS	Business, Industrial, distribution and Storage
BOD	Biochemical Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Methodology
CAMS	Catchment Abstraction Management Strategies
CAPEX	Capital Expenditure
CED	Common End Date
CFMP	Catchment Flood Management Plan
CfSH	Code for Sustainable Homes
CSO	Combined Sewer Overflow
DCLG	Department of Communities and Local Government (Replaced by MHCLG)
DWF	Dry Weather Flow
DWI	Drinking Water Inspectorate
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
EC	European Community
ECA	European Communities Act
EFI	Ecological Flow Indicator
EP	Environmental Permit
EU	European Union
FEH	Flood Estimation Handbook
FFT	Flow to Full Treatment
FWMA	Flood and Water Management Act
FZ	Flood Zone
GIS	Geographic Information Systems
HOF	Hands-Off Flow
HOL	Hands-off Level
HQM	Home Quality Mark
JBA	Jeremy Benn Associates

LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
l/p/d	Litres per person per day
Ml/d	Mega (Million) litres per day
MHCLG	Ministry of Housing Communities and Local Government
NH4	Ammonia
NPPF	National Planning Policy Framework
OAN	Objectively Assessed Need
OfWAT	Water Service Regulation Authority
OPEX	Operational Expenditure
OS	Ordnance Survey
P	Phosphorous
RAG	Red/Amber/Green assessment
RBD	River Basin District
RBMP	River Basin Management Plan
ReFH	Revitalised Flood Hydrograph
RoFSW	Risk of Flooding from Surface Water (replaced uFMfSW)
RQP	River Quality Planning tool
RZ	Resource Zone
SA	Sustainability Appraisals
SAC	Special Area of Conservation
SBP	Strategic Business Plan
SEA	Strategic Environmental Assessment
SfA	Sewers for Adoption
SFRA	Strategic Flood Risk Assessment
SHELAA	Strategic Housing and Economic Land Availability Assessment
SHMA	Strategic Housing Market Assessment
SPA	Special Protection Area
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SS	Suspended Solids
SSCs	Southern Staffordshire Councils
SSSI	Site of Special Scientific Interest
SSW	South Staffs Water
STW	Severn Trent Water
SU	Sewerage Undertaker
SSSWMP	Southern Staffordshire Surface Water Management Plan
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
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

WTW	Water Treatment Works
WwTW	Wastewater Treatment Works

1 Introduction

1.1 Terms of reference

JBA Consulting was commissioned by the Southern Staffordshire Councils (SSCs – Stafford Borough, Lichfield District, Cannock Chase District, Tamworth Borough and South Staffordshire District) to undertake a Water Cycle Study (WCS) for Southern Staffordshire. The purpose of the WCS is to form part of a comprehensive and robust evidence base to inform the preparation of the Council's Local Plans, which will set out a vision and framework for development in the area for the Local Plan periods and will be used to inform decisions on the location of future development.

Unmitigated future development and climate change can adversely affect the environment and water infrastructure capacity. A WCS will provide the required evidence, together with an agreed strategy to ensure that planned growth occurs within environmental constraints, with the appropriate infrastructure in place in a timely manner so that planned allocations are deliverable.

1.2 The Water Cycle

Planning Practice Guidance on Water Supply, Wastewater and Water Quality[1] describes a water cycle study as:

"a voluntary study that helps organisations work together to plan for sustainable growth. It uses water and planning evidence and the expertise of partners to understand environmental and infrastructure capacity. It can identify joined up and cost-effective solutions, that are resilient to climate change for the lifetime of the development.

The study provides evidence for Local Plans and sustainability appraisals and is ideally done at an early stage of plan-making. Local authorities (or groups of local authorities) usually lead water cycle studies, as a chief aim is to provide evidence for sound Local Plans, but other partners often include the Environment Agency and water companies."

The Environment Agency's guidance on WCS[2] recommends a phased approach:

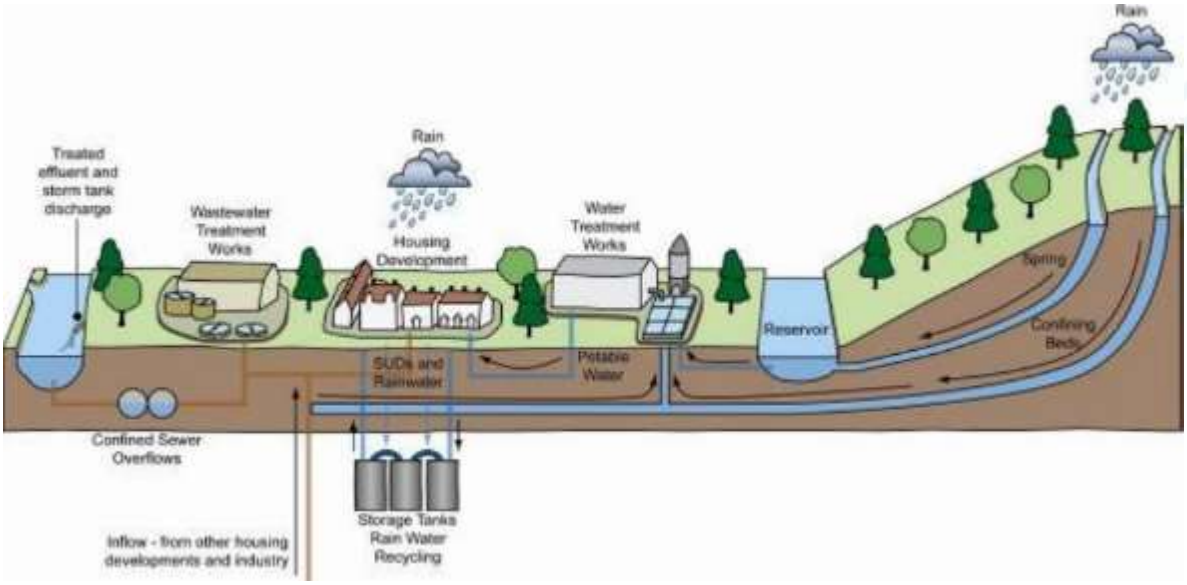
- Phase 1: Scoping study, focussing on formation of a steering group, identifying issues for consideration and the need for an outline study.
- Phase 2: Outline study, to identify environmental constraints, infrastructure constraints, a sustainability assessment and consideration of whether a detailed study is required.
- Phase 3: Detailed study, to identify infrastructure requirements, when they are required, how they will be funded and implemented and an overall assessment of the sustainability of proposed infrastructure.

Figure 1-1 below shows the main elements that compromise the Water Cycle and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

1 Planning Practice Guidance: Water supply, wastewater and water quality, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality#water-supply-wastewater-and-water-quality--introduction on: 24/07/2019

2 Water Cycle Study Guidance, Environment Agency (2009). Accessed online at: http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geho0109bpff-e-e.pdf on: 24/07/2019

Figure 1-1 The Water Cycle



1.3 Impacts of Development on the Water Cycle

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. It is possible that allocating large numbers of new homes at some locations may result in the capacity of the existing available infrastructure being exceeded. This situation could potentially lead to service failures to water and wastewater customers, have adverse impacts on the environment or cause the high cost of upgrading water and wastewater assets being passed on to bill payers. Climate change presents further challenges such as increased intensity and frequency of rainfall and a higher frequency of drought events that can be expected to put greater pressure on the existing infrastructure.

1.4 Objectives

As a WCS is not a statutory requirement, Local Planning Authorities are advised to prioritise the different stages of the WCS to integrate with their Local Plan programme. This scoping report is written to support the development of the Southern Staffordshire Development Plans and to identify whether an outline/detailed WCS is required.

The WCS brief from the SSCs stated that the overall objective of the WCS is to produce a high level baseline assessment of the study area, identifying known capacity issues and available headroom within water and wastewater services; document how much growth is allowed for in existing water company plans and identify current capacity available to receive and accept growth without the need for upgrading infrastructure and determine what sustainable infrastructure is required and where it is needed. This should be assessed by considering the following issues:

- Water demand and supply;
- Wastewater infrastructure and treatment;
- Water quality and the environment;
- Flood risk and drainage.

1.4.1 Study Area

The SSCs are made up Tamworth Borough, Lichfield District, Cannock Chase District, Stafford Borough and South Staffordshire District. Southern Staffordshire covers an

area of 1,447km^2 and has a population of approximately 516,600. Stafford Borough has the largest population of approximately 130,900.

The main rivers in the Southern Staffordshire area are the River Trent, River Tame, River Sow and River Penk. There are also smaller watercourses that drain into these rivers.

Water supply is provided by Severn Trent Water (STW) and South Staffs Water (SSW), and wastewater services are provided only by Severn Trent Water.

1.5 Record of Engagement

1.5.1 Introduction

Preparation of a WCS requires significant engagement with stakeholders, within the Local Planning Authority area, with water and wastewater utilities, with the Environment Agency, and where there may be cross-boundary issues, with neighbouring local authorities. This section forms a record of engagement for the WCS.

1.5.2 Scoping Study Engagement

The preparation of this WCS was supported by the following engagement:

Inception meeting

Engaged Parties	SSCs Severn Trent Water Environment Agency
Details	Scope of works and data collection requirements reviewed.

Neighbouring authorities

Engaged Parties	Newcastle-under-Lyme Borough Council Stoke on Trent City Council Staffordshire Moorlands District Council East Staffordshire Borough Council South Derbyshire District Council North West Leicestershire District Council North Warwickshire Borough Council Birmingham City Council Walsall Council City of Wolverhampton Council Dudley Metropolitan Borough Council Bromsgrove District Council Redditch Borough Council Wyre Forest District Council Shropshire Council Telford and Wrekin Council
Details	Request for water cycle studies conducted in their area, and housing growth that would be served by WwTW within or shared with the SSCs. Not all authorities were contacted, if growth in the given authority did not share wastewater infrastructure with one of the SSCs.

Collaboration with Water Companies

Engaged Parties	Severn Trent Water South Staffs Water
Details	Water company assessments of water and wastewater infrastructure and capacity constraints.

2 Future Growth in Southern Staffordshire

2.1 Development sites in Southern Staffordshire

Each of the SSCs are at different stages of their site identification and Local Plan process. For the purpose of the WCS, the sites considered as part of the study have been given the term "Sites to assess" regardless of the Council.

Figure 2-1 shows the location of development sites (sites to assess) under consideration within Southern Staffordshire and Figure 2-2, Figure 2-3, Figure 2-4, Figure 2-5 and Figure 2-6 show housing and employment sites to assess for Stafford, South Staffordshire, Lichfield, Tamworth and Cannock respectively.

Figure 2-1 Potential development sites in the study area

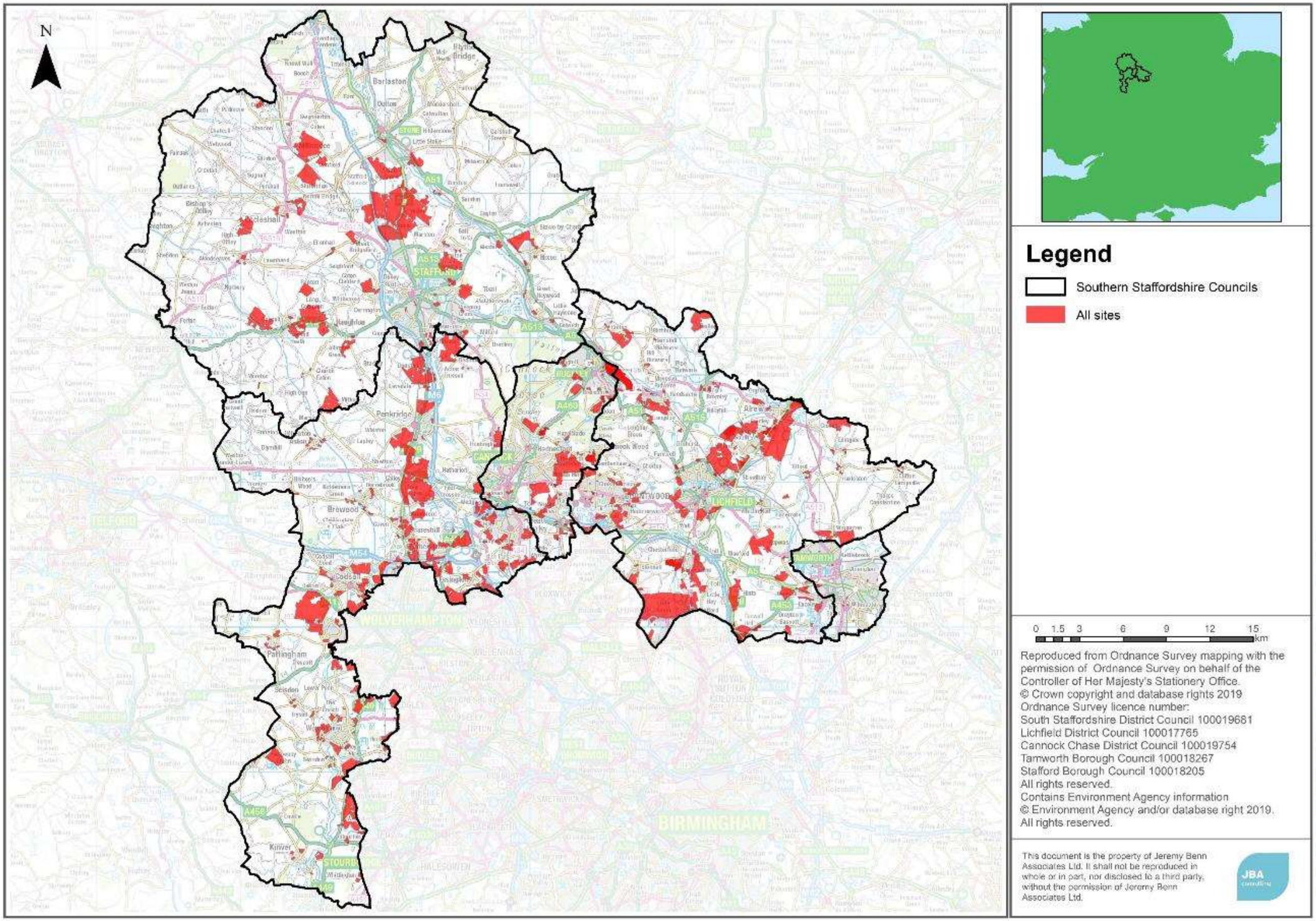


Figure 2-2 Stafford Borough potential development sites

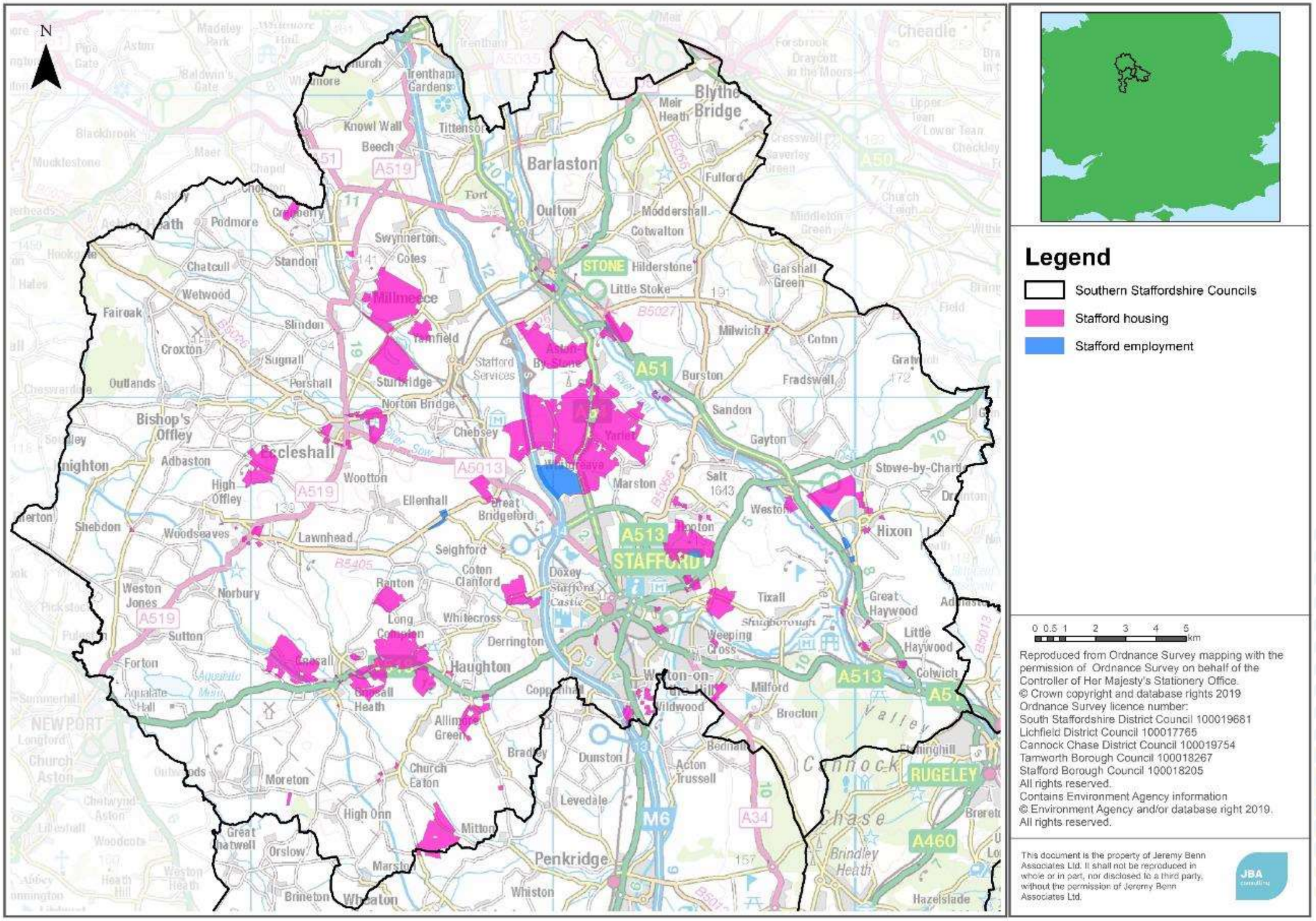


Figure 2-3 South Staffordshire District potential development sites

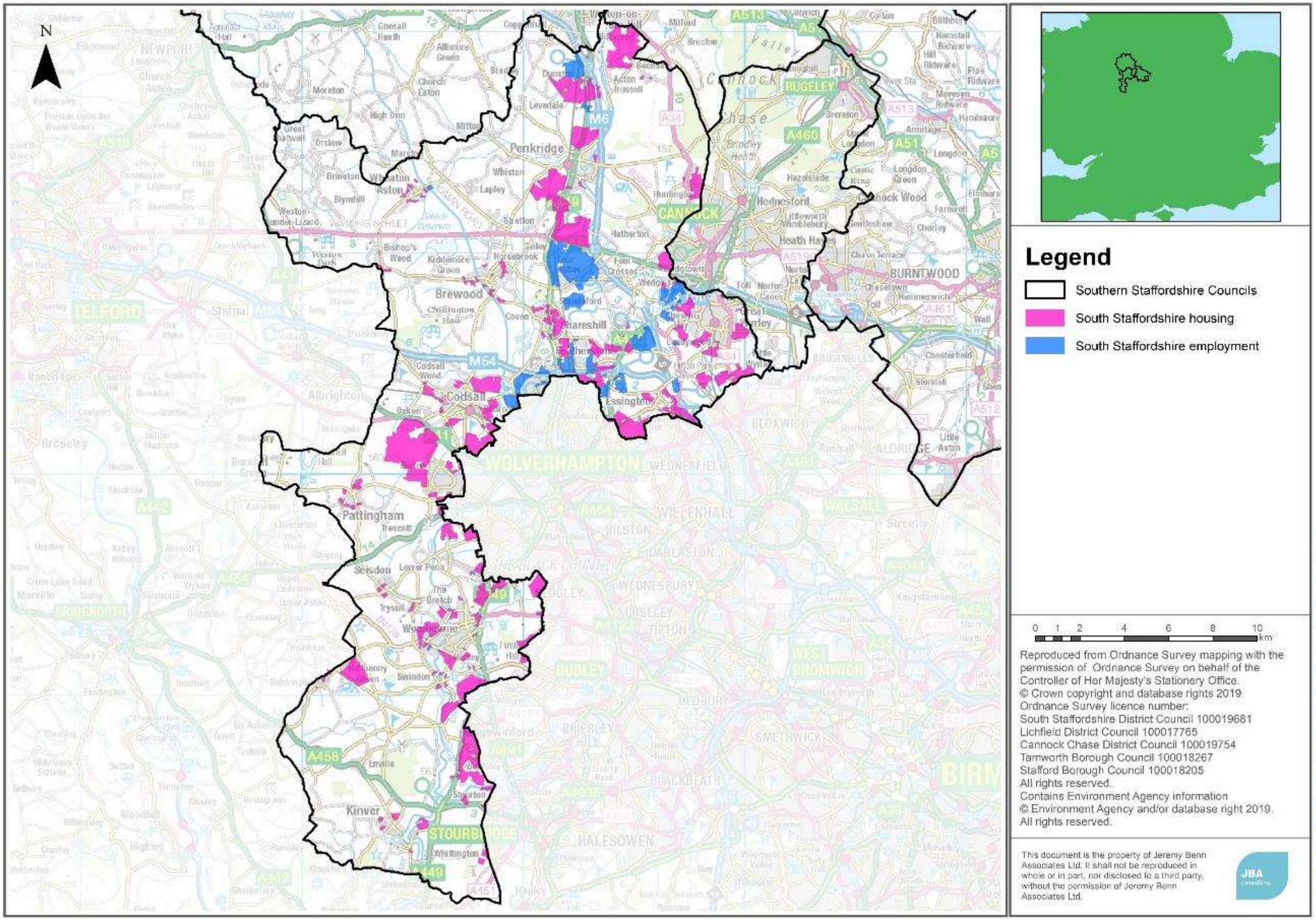


Figure 2-4 Lichfield District potential development sites

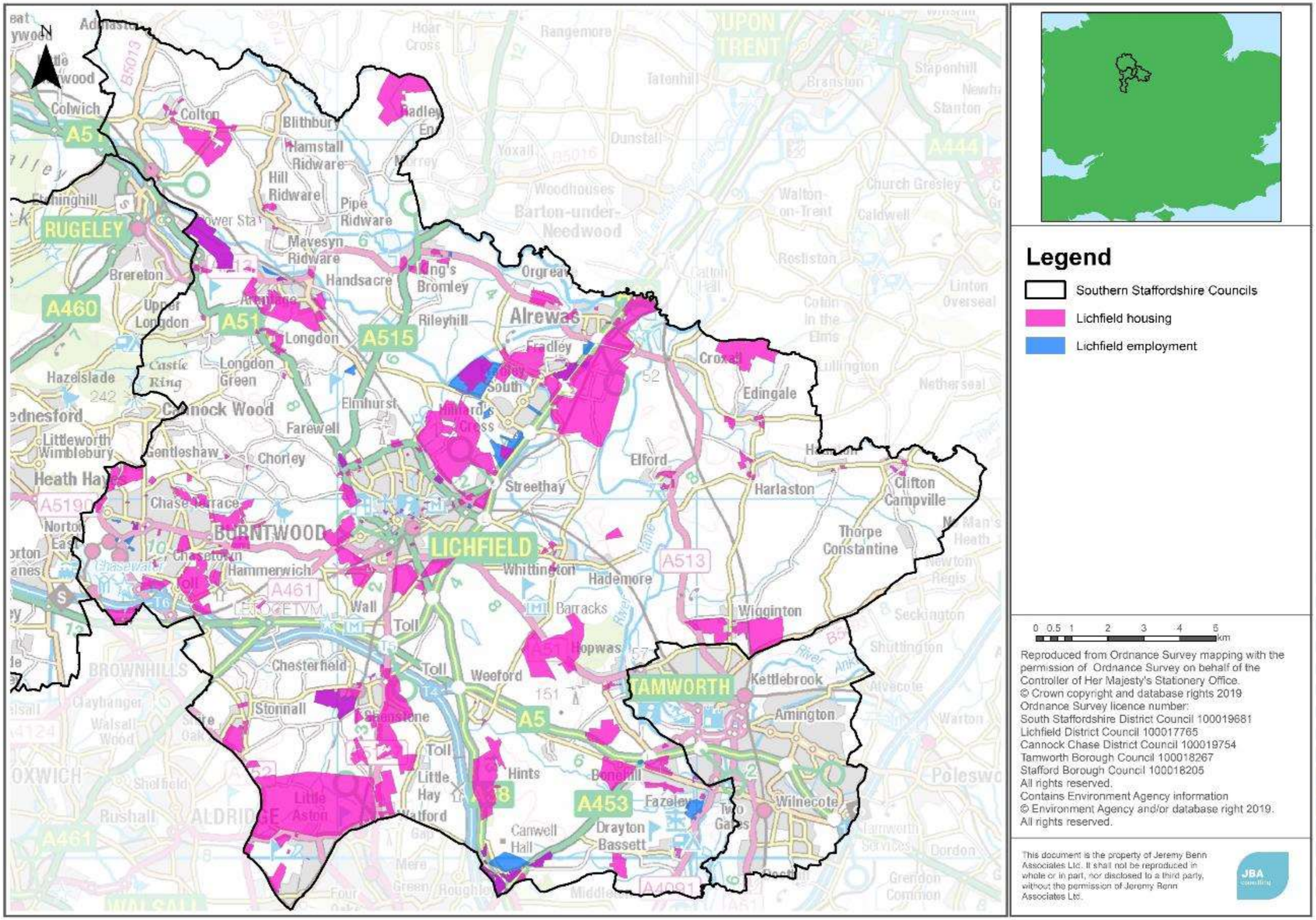


Figure 2-5 Tamworth Borough potential development sites

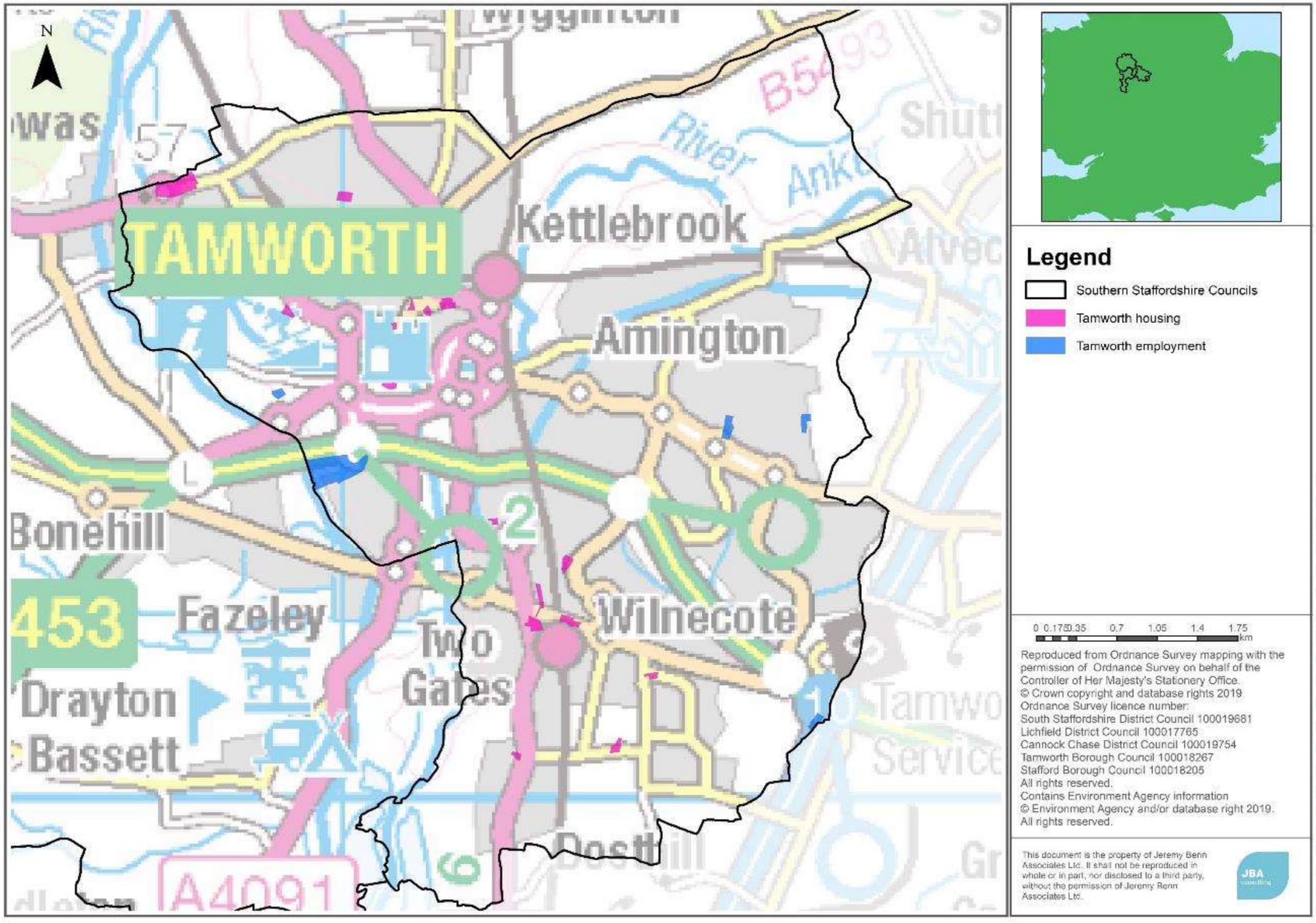
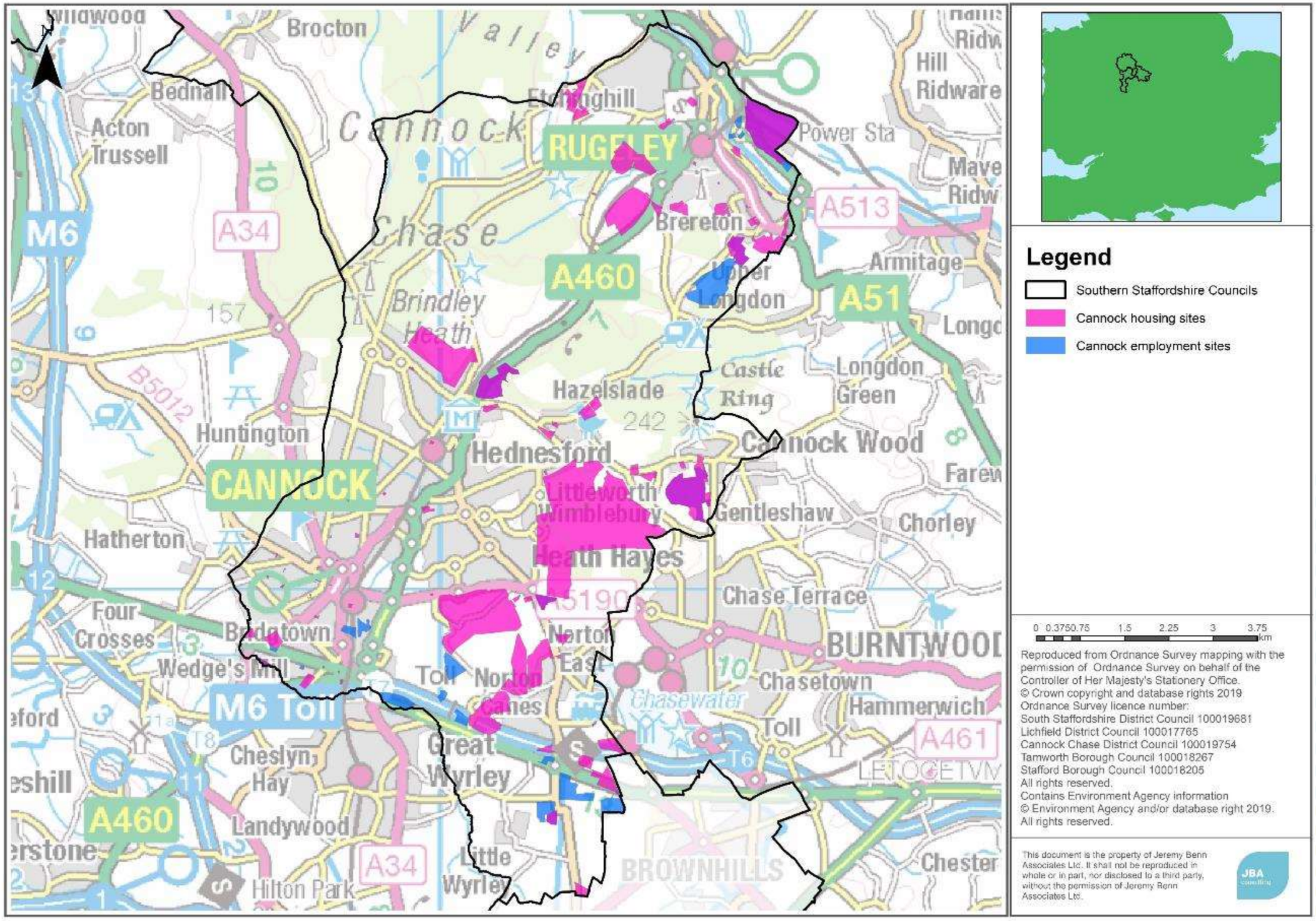


Figure 2-6 Cannock Chase District potential development sites



2.2 Growth in Southern Staffordshire

Each Council provided their current assessment of potential Objectively Assessed Housing Need (OAN) for their Local Plan period and is shown in Table 2-1. Where a range has been specified for housing need, the larger value is used for the assessments throughout the WCS to represent a "worst-case" scenario.

Table 2-1 Summary of OAN for housing

Local authority	Housing need per annum	Local Plan period	Total housing need from 2018 to end of Local Plan period
Stafford	500	2018-2040	11,000
South Staffordshire	254	2018-2037	4,826
Lichfield	481-556	2018-2040	10,582-12,232
Tamworth	177	2018-2031	2,301
Cannock Chase	284-423	2018-2036	5,112-7,614

It should be noted that since this study as commissioned South Staffordshire have now agreed to make a 4000-dwelling contribution to towards meeting the unmet need arising from the wider Housing Market Area. This will need to be factored into any future Phase 2 work.

Since the assessments were completed, Stafford have revised their OAN from 500/yr to between 408-746/yr giving a range of 8,160 – 14,920 over their plan period. The Phase 1 assessments are based on a figure of 500/yr and the updated OAN will be incorporated into future assessments in Phase 2.

2.3 Overall growth

The Southern Staffordshire Councils individually provided development site boundaries across the study area to assess as part of the Water Cycle Study.

Where site boundaries were found to be overlapping, the largest site (with the highest water demand) was used to represent the growth in that location. The additional smaller site was retained for the purposes of the site by site assessments but did not contribute to overall water or wastewater demand in the growth scenarios.

The tables below show growth in each of the Southern Staffordshire Councils, across each Council's respective local plan period. As the Councils currently have a large pool of sites, if all the sites to assess were to go ahead, this would result in numbers of houses far exceeding each Council's OAN. For this reason, the growth derived from the "sites to assess" have been split into percentage bands, to understand what level of growth from the "sites to assess" would be needed to meet the OAN, with completions, commitments and windfall also contributing. This is outlined in Table 2-7.

Lichfield have also defined preferred growth areas, outlining where the Council would prefer residential and employment development to occur and this is set out on page 114 of the Council's Preferred options and policy directions document[3]. At the time of the study the Council were not in a position to provide an estimate of the number of sites at these growth areas, however high level assessments of wastewater infrastructure relating to these growth areas has been undertaken in section 6.5.3 and 7.5.

Table 2-2 Stafford Borough housing growth over plan period

Type of growth	Level of growth 2020-2040 (number of houses)						
	100%	80%	60%	40%	20%	10%	5%
Completions (2017/18)	499	499	499	499	499	499	499

3 Preferred options and policy directions, Lichfield District Council (2019) Accessed online at: https://www.lichfielddc.gov.uk/downloads/file/225/local-plan-review-preferred-options-and-policy-directions on: 11/11/2019

Commitments	5,613	5,613	5,613	5,613	5,613	5,613	5,613
Windfall	660	660	660	660	660	660	660
Call for sites	57,134	45,707	34,280	22,854	11,427	5,713	2,857
Total	**63,906**	**52,479**	**41,052**	**29,626**	**18,199**	**12,485**	**9,628**

Table 2-3 South Staffordshire District housing growth over plan period

Type of growth	Level of growth 2018-2037 (number of houses)						
	100%	80%	60%	40%	20%	10%	5%
Completions (2017/18)	None	None	None	None	None	None	None
Commitments	1,823	1,823	1,823	1,823	1,823	1,823	1,823
Windfall	570	570	570	570	570	570	570
Sites to assess	61,048	48,838	36,629	24,419	12,210	6,105	3,052
Total	**63,441**	**51,231**	**39,022**	**26,812**	**14,603**	**8,498**	**5,445**

Table 2-4 Lichfield District housing growth over plan period

Type of growth	Level of growth 2018-2040 (number of houses)						
	100%	80%	60%	40%	20%	10%	5%
Completions (2017/18)	893	893	893	893	893	893	893
Commitments	4,770	4,770	4,770	4,770	4,770	4,770	4,770
Windfall	990	990	990	990	990	990	990
Sites to assess	62,269	49,815	37,361	24,908	12,454	6,227	3,113
Total	**68,922**	**56,468**	**44,014**	**31,561**	**19,107**	**12,880**	**9,766**

Table 2-5 Tamworth Borough housing growth over plan period

Type of growth	Level of growth 2018-2031 (number of houses)						
	100%	80%	60%	40%	20%	10%	5%
Completions (2017/18)	235	235	235	235	235	235	235
Commitments	2,900	2,900	2,900	2,900	2,900	2,900	2,900
Windfall	533	533	533	533	533	533	533
Sites to assess	578	462	347	231	116	58	29
Total	**4,246**	**4,130**	**4,015**	**3,899**	**3,784**	**3,726**	**3,697**

Table 2-6 Cannock Chase District housing growth

Type of growth	Level of growth 2018-2036 (number of houses)						
	100%	80%	60%	40%	20%	10%	5%
Completions (2017/18)	764	764	764	764	764	764	764
Commitments	2,465	2,465	2,465	2,465	2,465	2,465	2,465

Windfall	198	198	198	198	198	198	198
Sites to assess	14,186	11,349	8,512	5,674	2,837	1,419	709
Total	**17,613**	**14,776**	**11,939**	**9,101**	**6,264**	**4,846**	**4,136**

Table 2-7 Percentage of "sites to assess" houses required to meet OAN

Council	Maximum OAN from 2018-end of Local Plan Period	Number of houses required to meet OAN (from sites to assess)	Percentage of "sites to assess" houses required to come forward to meet OAN
Stafford	11,000	4,228	7%
South Staffs	4,826	2,433	4%
Lichfield	12,232	5,579	9%
Tamworth	2,301	0*	0%*
Cannock Chase	7,614	4,187	30%

*Note that this value is 0 as Tamworth's committed sites exceed the OAN for the plan period.

2.4 Growth from neighbouring authorities

Growth within a neighbouring Local Planning Authority was considered as part of the WCS where sites may be served by infrastructure within or shared with Southern Staffordshire, to ensure that all growth to a WwTW was considered.

The following authorities neighbouring Southern Staffordshire did not have any shared infrastructure serving growth in both authorities:

- East Staffordshire District Council
  - Checkley WwTW also serves part of East Staffordshire District, however the shapefile of Local Plan sites provided by East Staffordshire Council show no sites being served by Checkley.
- North Warwickshire Borough Council
  - Tamworth and Minworth WwTW also serve parts of North Warwickshire Borough, however shapefiles of Local Plan site allocations show no sites being served by either of these WwTW.
- Telford and Wrekin Council
  - No shared infrastructure
- South Derbyshire District Council
  - No shared infrastructure
- North West Leicestershire District Council
  - No shared infrastructure
- Newcastle-under-Lyme Borough Council
  - Strongford WwTW serves Newcastle and Stafford Borough, however there is no proposed growth in Stafford Borough served by Strongford WwTW.
- Wyre Forest District Council
  - Roundhill WwTW serves a very small part of Wyre Forest, however no proposed growth in the District is served by Roundhill.

2.4.1 Stoke-on-Trent City Council

JBA Consulting completed the Stoke-on-Trent and Newcastle-under-Lyme WCS in 2019 and obtained the growth data from this study. One committed site in Stafford Borough is served by Checkley WwTW which serves part of Stoke-on-Trent.

Table 2-8 Growth in Stoke-on-Trent

WwTW	Residential dwellings	Employment Space (m^2)
Checkley	35	32,760 (1,248 employees)

2.4.2 Staffordshire Moorlands District Council

JBA Consulting completed the Stoke on Trent and Newcastle under Lyme WCS (which is also bordered by Staffordshire Moorlands) and obtained the growth data from this study.

Table 2-9 Growth in Staffordshire Moorlands

WwTW	Residential dwellings	Employment Space (m^2)
Checkley	1,887	109,150

2.4.3 Birmingham Council

Minworth WwTW serves the majority of Birmingham and has a catchment that extends into Bromsgrove, Solihull, Dudley, Sandwell, Wolverhampton, Walsall, North Warwickshire and Stratford-On-Avon. There is a small area of the east of Birmingham that is served by a WwTW not shared with Southern Staffordshire. It is outside the scope of this study to ascertain which sites contained in the Birmingham SHLAA[4] are served by Minworth, and which are served from other WwTW, it is assumed that the whole of the Birmingham growth figures would be served by Minworth. A similar approach is taken with employment land growth in the Minworth catchment. The Birmingham Employment Land Availability Assessment[5] states an employment requirement of 100,000 jobs by 2031 and this figure will be included in the growth forecast as an indicative level of employment demand.

Table 2-10 Growth in Birmingham

WwTW	Time period	Residential dwellings	Employees
Minworth	Short term – within 5 years	20,413	100,000
	Medium term – 6 to 10 years	16,665	
	Longer term – beyond 10 years	10,278	

2.4.4 Bromsgrove District Council

The published Bromsgrove District Plan was used to estimate growth in wastewater catchments that crossed into Bromsgrove. No employment sites were identified.

Table 2-11 Growth in Bromsgrove

WwTW	Residential dwellings	Employment Space (m^2)
Minworth	178	0
Roundhill	301	0

4 Strategic Housing Land Availability Assessment 2018, Birmingham City Council (2018). Accessed online at: https://www.birmingham.gov.uk/downloads/download/2148/strategic_housing_land_availability_assessment_2018 on: 26/07/2019

5 Employment Land Availability Assessment 2018, Birmingham City Council (2018). Accessed online at: https://www.birmingham.gov.uk/downloads/file/11281/employment_land_availability_assessment_2018 on: 26/07/2019

2.4.5 Shropshire Council

At the time of writing this WCS JBA were conducting a WCS for Shropshire Council as well. A small number of committed sites are served by Blymhill WwTW in both Shropshire and South Staffordshire.

Table 2-12 Growth in Shropshire

WwTW	Residential dwellings	Employment Space (m^2)
Blymhill	4	0

2.4.6 The Black Country Authorities

At the time of writing this WCS, JBA were conducting a WCS for the Black Country Authorities (Dudley, Sandwell, Wolverhampton and Walsall). There is a number of WwTW serving growth in both Southern Staffordshire and the Black Country and the potential growth from the Black Country at these WwTW is shown in Table 2-13.

Table 2-13 Growth in the Black Country

WwTW	Residential dwellings	Number of employees
Barnhurst	12,064	27
Burntwood	195	0
Coven Heath	526	0
Goscote	1,906	6,297
Gospel End	7	0
Little Aston	3	0
Lower Gornal	2,484	387
Minworth	46,800	5,817
Roundhill	16,870	4,866
Trescott	403	0
Walsall Wood	356	2,900

2.5 Employment Land

2.5.1 Stafford Borough

Stafford Borough published its latest Employment Land Review (ELR)[6] in 2012. The ELR concluded to provide 160ha of employment land over the period 2011-2031, which has also been set out in the Local Plan. An Economic Development and Housing Needs Assessment was published in 2020 this identified a future land requirement of between 68ha and 181ha between 2020 and 2040.

2.5.2 South Staffordshire Economic Needs Assessment

Part 1 of South Staffordshire's EDNA[7] was published in 2018 by WECD and identifies a future employment land requirement of between 67 and 86 ha for the period 2018-2037, giving an oversupply of approximately 20 ha. The Council are engaged in ongoing discussions on making an employment land contribution to meet unmet needs arising from within the Black Country Authorities area. Should a figure be agreed, this would need to be reflected in future phases of the study.

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6 Employment Land Review 2012 Stafford Borough Council (2012). Accessed online at: https://www.staffordbc.gov.uk/live/Documents/Planning%20Policy/Further%20Information%20and%20Evidence/Employment/Employment-Land-Review-2012.pdf/ on: 12/08/2019

7 Economic Development Needs Assessment Part 1, WECD for South Staffordshire District Council (2018). Accessed online at: https://www.sstaffs.gov.uk/doc/179880/name/South%20Staffs%20EDNA%20Final%20Report%2007%2009.pdf/ on: 12/08/2019

2.5.3 Tamworth and Lichfield HEDNA

Tamworth and Lichfield have jointly commissioned a Housing and Economic Development Needs Assessment (HEDNA) to be completed in 2019.

2.5.4 Cannock Chase Economic Needs Assessment

Cannock's Economic Development Needs Assessment (EDNA)[8] was updated in 2019 by Lichfields and identified the current and future employment requirements for the Local Plan period 2018-2036, with an extension to 2038 provided as a sensitivity to the figures.

Several growth scenarios for objectively assessed need for employment land were analysed in the EDNA – Experian economic forecasts, past job growth trends, regeneration and past take up rates.

The study showed that between 22.52 and 97.52 ha of land is required for employment for the Local Plan period 2018-2036, and between 25.59 and 111.64 ha of land is required for employment if the Local Plan period is extended to 2038. A flexibility factor (FF) has been included in these estimates.

8 Economic Development Needs Assessment, Lichfields for Cannock Chase District Council (2019). Accessed online at: https://www.cannockchasedc.gov.uk/sites/default/files/economic_development_needs_assessment.pdf on: 12/08/2019

3 Legislative and Policy Framework

3.1 Introduction

The following section reviews the national, regional and local policies that must be considered by the LPAs, water companies and developers during the planning stage. Key extracts from these policies relating to water consumption targets and mitigating the impacts on the water from the new development are summarised below.

3.2 National Policy

3.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[9] 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. A comprehensive revision was issued in July 2018. This was further revised in February 2019[10], but the changes were not significant from the July 2018 version for policy areas relevant to the WCS. The NPPF provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans. Key paragraphs include:

Paragraph 34:

> *"Plans should set out the contributions expected from development. This should include setting out the levels and types of affordable housing provision required, along with other infrastructure (such as that needed for education, health, transport, flood and water management, green and digital infrastructure). Such policies should not undermine the deliverability of the plan."*

Paragraph 149:

> *"Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply..."*

Paragraph 170 (e):

> *"…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."*

In March 2014, the Planning Practice Guidance was issued by the Department for Communities and Local Government, with the intention of providing guidance on the application of the National Planning Policy Framework (NPPF) in England. The MHCLG is in the process of updating the Guidance to consider the necessary 2018 and 2019 updates of the NPPF. Of the sections relevant to this study, only the Water Supply, Wastewater and Water Quality section has been updated.

Of relevance to this study;

- Flood Risk and Coastal Change[11]

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9 National Planning Policy Framework, Department for Communities and Local Government (2012)
10 National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2019). Accessed online at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 on: 24/07/2019
11 Planning Practice Guidance: Flood Risk and Coastal Change, Department for Communities and Local Government

- Water Supply, Wastewater and Water Quality[12].
- Housing - Optional Technical Standards[13].

3.2.2 Planning Practice Guidance: Flood Risk and Coastal Change

Diagram 1 in the Planning Practice Guidance sets out how flood risk should be considered in the preparation of Local Plans (Figure 3-1). These requirements are addressed principally in the Council's Strategic Flood Risk Assessment.

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

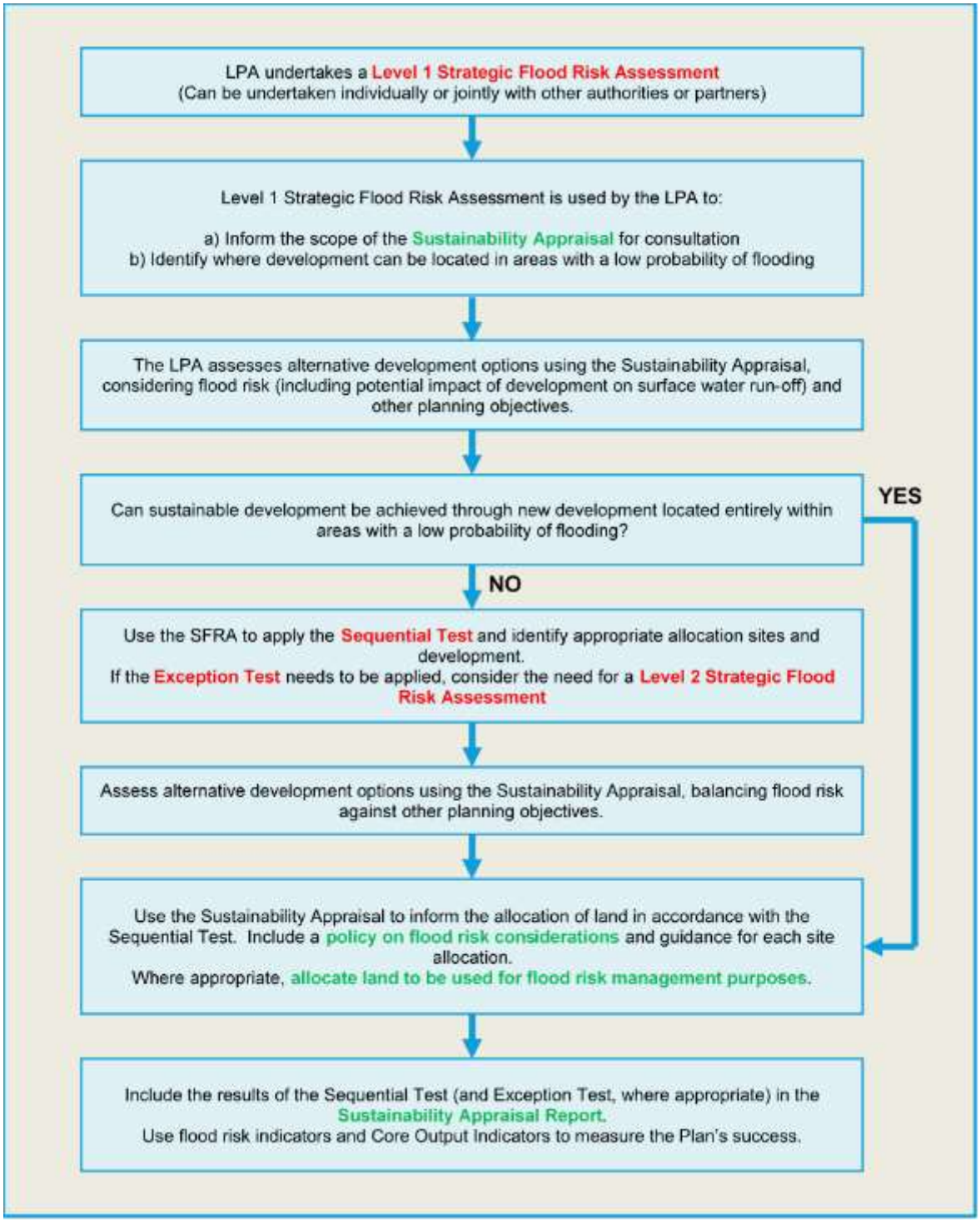
A summary of the specific guidance on how infrastructure, water supply, wastewater and water quality considerations should be accounted for in both plan-making and planning applications is summarised below in Figure 3-2.

(2014). Accessed online at: http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/ on: 24/07/2019.

12 Planning Practice Guidance: Water supply, wastewater and water quality, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality on: 24/07/2019

13 Planning Practice Guidance: Housing - Optional Technical Standards, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/guidance/housing-optional-technical-standards on: 24/07/2019

Figure 3-1 Flood Risk and the Preparation of Local Plans[14]



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

Figure 3-2 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 only 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	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).

3.2.4 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 also to consider the impact of setting this optional standard on housing viability. A 2014 study[15] into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £9 for a four-bedroom house.

3.2.5 Building Regulations

The Building Regulations (2010) Part G[16] was amended in early 2015 to require that all new dwellings must ensure that the potential water consumption must not exceed 125 litres/person/day, or 110 litres/person/day where required under planning conditions.

3.2.6 BREEAM

The Building Research Establishment Environmental Assessment Methodology (BREEAM) is an internationally recognised method for assessing, rating and certifying the sustainability of buildings. BREEAM 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. 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.

The Councils have the opportunity to seek BREEAM status for all new, residential and non-residential buildings. Whilst BREEAM contains the flexibility to achieve this in a number of ways, a "Very Good" rating for water resources would typically relate to a 40% improvement over baseline building water consumption[17]. As a minimum, a 12.5% improvement must be demonstrated to obtain BREEAM status. Guidance is provided on how to calculate this. Table 3-1 shows the BREEAM credits available for percentage improvement over baseline building water consumption in precipitation zone 1, which covers the whole of the UK.

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15 Housing Standards Review: Cost Impacts, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on: 24/07/2019

16 The Building Regulations (2010) Part G - Sanitation, hot water safety and water efficiency, 2015 edition with 2016 amendments. HM Government (2016). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/504207/BR_PDF_AD_G_2015_with_2016_amendments.pdf on: 12/08/2019

17 BREEAM International New Construction 2016: Technical Manual SD233 2.0, BREEAM (2016). Accessed online at: https://www.breeam.com/discover/technical-standards/newconstruction/ on: 12/08/2019

Table 3-1 BREEAM credits for improvement over baseline water consumption

BREEAM Credits	Percentage improvement over baseline water consumption
1	12.5%
2	25%
3	40%
4	50%
5	55%
Exemplary	65%

3.2.7 Sustainable Drainage Systems (SuDS)

From April 2015, Local Planning Authorities (LPA) have been given the responsibility for ensuring that sustainable drainage is implemented on developments of 10 or more homes or other forms of major development through the planning system. 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[18] 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." This requirement is also now incorporated in the 2019 update of the NPPF (paragraph 165). 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[19]. 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.
- Staffordshire County Council are the LLFA and play a key role in ensuring that the proposed drainage schemes for all new developments comply with technical standards and policies in relation to SuDS. The Staffordshire County Council's "Sustainable Drainage Systems (SuDS) Handbook" was published in February 2017[20] and contains guidance for the design and application of SuDS in Staffordshire.

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18 Sustainable drainage systems: Written statement - HCWS161, UK Government (2014). Accessed online at: http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/ on: 24/07/2019

19 Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems, Defra (2015). Accessed online at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards on: 24/07/2019

20 Staffordshire Drainage Systems (SuDS) Handbook, Staffordshire County Council (2017). Accessed online at: https://www.staffordshire.gov.uk/environment/Flood-Risk-Management/Documents/SuDS-Handbook.pdf on: 24/07/2019

- An updated version of the CIRIA SuDS Manual[21] 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, adoption processes and standards, as these vary by region and should be checked early in the planning process.
- CIRIA also publish "Guidance on the Construction of SuDS" (C768)[22], which contains detailed guidance on all aspects of SuDS construction, with specific information on each SuDS component available as a downloadable chapter.
- Severn Trent Connect (part of Severn Trent Water) do not currently have a SuDS adoption manual. In its Addendum to Sewers for Adoption 7th Edition[23], Severn Trent Connect (STC) states that it "will consider the adoption of SuDS as long as the systems are designed and constructed in accordance with the CIRIA SuDS Manual (C753)" and also outlines the SuDS techniques that are adoptable by STC.
- The water industry is currently developing Sewers for Adoption version 8, a guide to sewer standards that must be met if they are to be adopted by water and sewerage companies in England. This is expected to include a significant expansion of what can be considered an adoptable surface water sewer, to include some forms of SuDS[24]. If implemented, this could lead to many more SuDS systems being adopted by Severn Trent Water during the plan period. A pre-implementation version released in April 2018 included this in section C3.

3.3 Regional Policy

3.3.1 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMP) are high level policy documents covering large river basin catchments. They aim to set policies for sustainable flood risk management for the whole catchment covering the next 50 to 100 years. South Staffordshire is covered by the River Severn CFMP (2009)[25] and the River Trent CFMP (2010)[26].

3.3.2 Surface Water Management Plans (SWMPs)

SWMPs outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. The Southern Staffordshire SWMP[27] was produced in April 2011. Phase 2 SWMPs for settlements rated highly for

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21 The SuDS Manual (C753), CIRIA (2015).
22 Guidance on the Construction of SuDS (C768), CIRIA (2017), Accessed online at: https://www.ciria.org/ItemDetail?iProductcode=C768&Category=BOOK on: 12/08/2019
23 Addendum to Sewers for Adoption 7th Edition, Severn Trent Connect. Accessed online at: https://www.severntrentconnect.com/media/1567/severn-trent-connect-addendum-to-sewers-for-adoption-7th-final.pdf on: 23/07/2019
24 Water UK (2017) Sewers for Adoption 8: Revised Principles Paper
25 River Severn Catchment Flood Management Plan, Environment Agency (2009). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289103/River_Severn_Catchment_Management_Plan.pdf on: 24/07/2019
26 River Trent Catchment Flood Management Plan, Environment Agency (2010). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289105/River_Trent_Catchment_Management_Plan.pdf on: 24/07/2019
27 Southern Staffordshire Surface Water Management Plan (2011). Accessed online at: https://www.staffordbc.gov.uk/live/Documents/Forward%20Planning/Examination%20Library%202013/D41--SOUTHERN-STAFFORDSHIRE-SURFACE-WATER-MANAGEMENT-PLAN-PHASE-1-ADDENDUM.pdf on: 24/07/2019

surface water flooding was produced for Stafford, Cannock, Lichfield, Penkridge and Tamworth.

3.3.3 Water Resource Management Plans

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

- Future demand (due to population and economic growth).
- Future water availability (including the impact of sustainability reductions).
- Demand management and supply-side measures (e.g. water efficiency and leakage reduction, water transfers and new resource development).
- How the company will address changes to abstraction licences.
- How the impacts of climate change will be mitigated.

Where necessary, they set out the requirements for developing additional water resources to meet growing demand and describe how the balance between water supply and demand will be balanced over the period 2015 to 2040.

- Using cost-effective demand management, transfer, trading and resource development schemes to meet growth in demand from new development and to restore abstraction to sustainable levels.
- In the medium to long term, ensuring that sufficient water continues to be available for growth and that the supply systems are flexible enough to adapt to climate change.

The Severn Trent and South Staffs WRMPs covers Southern Staffordshire and are reviewed in section 4.

3.4 Local Policy

3.4.1 Localism Act

The Localism Act (2011) changes the powers of local government and was intended to re-distribute the balance of decision making from central government back to councils, communities and individuals. 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"*[28].

The Localism Act also provides new rights to allow local communities to prepare Neighbourhood Development Plans, or Neighbourhood Development Orders, where the ambition of the neighbourhood is aligned with strategic needs and priorities for the area. This means that local people can decide where new homes and businesses should go and also what they should look like. Local Planning Authorities are required to provide technical advice and support in the process.

3.4.2 Infrastructure Delivery Plan (IDP)

The purpose of an Infrastructure Delivery Plan (IDP) is to evaluate various services to determine if there is enough infrastructure to support the future levels of housing and employment in the area. It identifies deficiencies and surpluses and answers the following questions:

- What is required for the future?

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28 Localism Act 2011: Section 110, UK Government (2011). Accessed online at: http://www.legislation.gov.uk/ukpga/2011/20/section/110 on: 12/08/2019

- When will it be required?
- Who is responsible for providing it?
- How will it be funded?
- Are there funding gaps and if so, how will they be bridged?

The plan aims to sustainably develop towns and districts whilst maintaining a high-quality environment.

3.5 Environmental Policy

3.5.1 Urban Wastewater Treatment Directive (UWWTD)

The UWWTD[29] is an EU Directive that concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of 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. The Directive has been transposed into UK legislation through enactment of the Urban Wastewater Treatment (England and Wales) Regulations 1994 and 'The Urban Waste Water Treatment (England and Wales) (Amendments) Regulations 2003'.

3.5.2 Habitats Directive

The EU Habitats Directive[30] aims to protect the wild plants, animals and habitats that make up our diverse natural environment. The directive created a network of protected areas around the European Union of national and international importance called Natura 2000 sites. These include:

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

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

3.5.3 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 not meeting the "good status" threshold.

River Basin Management Plans (RBMP) are required under the WFD. RBMPs document the baseline classification of each waterbody in the plan area, the objectives, and the measures required to achieve those objectives. Southern Staffordshire lies largely within the Humber River Basin District (RBD) [31] with parts in the Severn River Basin District[32].

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29 UWWTD. Accessed online at: https://eur-lex.europa.eu/eli/dir/1991/271/2014-01-01 on: 24/07/2019.
32. EU. The Habitats Directive. Accessed online at: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm on: 24/07/2019
31 Humber River Basin District River Basin Management Plan: 2015, Environment Agency (2015). Accessed at: https://www.gov.uk/government/publications/humber-river-basin-district-river-basin-management-plan: 12/08/2019
32 Severn River Basin District River Basin Management Plan: 2015, Environment Agency (2015). Accessed at: https://www.gov.uk/government/publications/severn-river-basin-district-river-basin-management-plan on: 12/08/2019

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 relevant RBMP. Another equally important objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment and compromise WFD objectives. The WFD objectives as outlined in the updated RBMPs are summarised below:

- Prevent deterioration of the status of surface waters and groundwater.
- Achieve objectives and standards for protected areas.
- 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.
- Reverse any significant and sustained upward trends in pollutant concentrations in groundwater.
- Stop discharges/emissions of priority hazardous substances entering surface waters.
- Reduce the pollution of groundwater and prevent or limit the entry of pollutants.

Local Planning Authorities (LPAs) must have regard to the Water Framework Directive as implemented in the Environment Agency's River Basin Management Plans. It is of primary importance when assessing the impact of additional wastewater flows on local river quality.

3.5.4 Protected Area Objectives

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

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

The types of protected areas are:

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas)
- Areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish)
- Bodies of water designated as recreational waters, including Bathing Waters
- Nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive (UWWTD)
- 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 do 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.
- 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)

- 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.
- Prevent further such pollution.

Nutrient Sensitive Areas (Urban Wastewater Treatment Directive)

- Protect the environment from the adverse effects of urban wastewater discharges and waste water discharges from certain industrial sectors

Natura 2000 Protected Areas (water dependent SACs and SPAs)

The objective for Natura 2000 Protected Areas identified in relation to relevant areas designated under the Habitats Directive or Birds Directive is to:

- Protect and, where necessary, improve the status of the water environment to the extent necessary to achieve the conservation objectives that have been established for the protection or improvement of the site's natural habitat types and species of importance.

3.5.5 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 largest. According to the Environment Agency, this is the minimum length of time that is sufficient for pollutants to become reduced in strength or diluted.

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 industrial sites and other polluters could affect the groundwater source despite being outside the normal catchment area.

The Environment Agency's approach to Groundwater protection[33] outlines how government policy on groundwater will be delivered in a series of position statements. The relevant statements to this study concern discharge to groundwaters, surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g. lorry parks) and from treated sewage effluent.

3.5.6 European Derived Legislation and Brexit

Much of the legislation regulating the water environment derives from UK enactment of European Union (EU) directives. Following the referendum decision of June 2016 that the UK will leave the EU, the UK Government announced that it would introduce the "European Union (Withdrawal) Bill" to repeal the European Communities Act 1972 and to transpose EU law into domestic law "wherever practical and appropriate". This Bill received Royal Assent on 26 June 2018. A White Paper published in March 2017[34] 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 apply in the UK before the country leaves the EU - will be converted into domestic law by the Bill and will continue to apply until UK legislators decide otherwise.

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

3.6 Water Industry Policy

3.6.1 The Water Industry in England

Water and sewerage services in England and Wales are provided by 10 Water and Sewerage Companies (WaSCs) and 12 'water-only' companies. The central legislation relating to the industry is the Water Industry Act 1991. The companies 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 - 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:

- Non-domestic customers will be able to switch their water supplier and/or sewerage undertaker (from April 2017)
- New businesses will be able to enter the market to supply these services

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33 The Environment Agency's approach to groundwater protection, Environment Agency (2018). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598778/LIT_7660.pdf on: 12/08/2019

34 "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: 12/08/2019

- Measures to promote a national water supply network
- Enable developers to make connections to water and sewerage systems

3.6.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies;

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

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), accommodate growth and meet environmental objectives defined by the Environment Agency. OfWAT assesses and compares the plans with the objective of ensuring operating efficiencies. The industry is currently in Asset Management Plan 6 (AMP6) which runs from 2015 to 2020.

Water companies are required to ensure a high degree of certainty that additional assets will be required before they are funded. Longer term growth is considered by the companies in their internal asset planning processes and in their 25-year Strategic Direction Statements and WRMPs.

3.6.3 Drainage and Wastewater Management Plans

The UK Water Industry Research (UKWIR) "21st Century Drainage", created by water companies, governments, regulators, local authorities, academics and environmental groups, considers planning measures that can address the challenges of managing drainage in the future. Challenges include climate change, population growth, urban creep and meeting the Water Framework Directive.

The research recognised the progress made by the water industry in drainage and wastewater planning over the last few decades but noted that in the future greater transparency and consistency of long-term planning is required. The Drainage and Wastewater Management Plan (DWMP) framework[35] sets out how the industry intends to approach the challenge, with the objective publishing plans by the end of 2022, in order to inform their business plans for the 2024 Price Review.

DWMPs will be prepared for wastewater catchments or groups of catchments and will encompass surface water sewers within areas which do not drain to a treatment works. The framework defines drainage to include all organisations and assets which have a role to play in drainage, however, the plans do not address the broader issues of surface water management within catchments as the initiatives are led by are water companies.

Stakeholders, including LPAs and LLFAs, will be invited to join Strategic Planning Groups (SPGs), organised broadly along river basin district catchments.

As the DWMP process is only just commencing it cannot yet inform this study. In the future, however, DWMPs will provide more transparent and consistent information on sewer flooding risks and the capacity of sewerage networks and treatment works. Such information will be considered in SFRAs, Water Cycle Studies, and site-specific FRAs and Drainage Strategies. STW view is that *"this latest iteration of local plans from the LPAs will form a key element of strategic wastewater planning in the first edition of our DWMPs. We see DWMPs as an opportunity to work collaboratively with LPAs addressing risks and opportunities of growth scenarios covering the next 15 or so years.*

35 A framework for the production of Drainage and Wastewater Management Plans, UK Water Industry Research (2018). Accessed online at: http://www.water.org.uk/wp-content/uploads/2018/12/Water-UK-DWMP-Framework-Report-Main-Document.pdf on: 24/07/2019.

Collaboration and documentation of strategic partnerships could be used as evidence to help show deliverability and sustainability of Local Plans as well as forming infrastructure delivery proposals and options we can take into AMP8 helping for our future business plan."

3.6.4 Developer Contributions and Utility Companies

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

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

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

The above arrangements are third party transactions because the Town and Country Planning Act Section 106 agreements and Community Infrastructure Levy agreements may not be used to obtain funding for water or wastewater infrastructure.

3.6.5 Changes to Charging Rules for New Connections

OfWAT, the water industry's economic regulator, has published new rules covering how water and wastewater companies may charge customers for new connections[36]. These rules apply to all companies starting 1st April 2018. The two relevant water companies for the study area have published their charging arrangements on their websites[37,38]. The key changes include:

- More charges will be fixed and published on water company websites, providing greater transparency to developers and alternative connection providers to offer competitive quotations more easily.
- Fixed infrastructure charges for water and wastewater.
- Costs of network reinforcement will no longer be charged directly to the developer in their connection charges. Instead, the combined costs of all of the works required on a company's networks, over a five-year rolling period, will be covered by the infrastructure charges payed for all new connections.
- The definition of network reinforcement has changed and now applies only to works required as a direct consequence of the increased demand due to a development. Where the water company has not been notified of a specific development, for example when developing long-term strategic growth schemes, the expenditure cannot be recovered through infrastructure charges.
- Some suppliers offer charging incentives to encourage environmentally sustainable development:

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36 Charging rules for new connection services (English undertakers), OfWAT (2017). Accessed online at: https://www.ofwat.gov.uk/publication/charging-rules-new-connection-services-english-undertakers/ on: 24/07/2019
37 New Connections Charging, Severn Trent Water (2018). Accessed online at: https://www.stwater.co.uk/content/dam/stw/stw_buildinganddeveloping/STWChargingArrangementDocument-brandv0.230012018A.pdf 24/07/2019
35 Developer Services Charges 2018-2019, South Staffs Water (2018). Accessed online at: https://www.south-staffs-water.co.uk/media/2126/ssc-developer-charges-2018-19.pdf on: 24/07/2019

- Severn Trent Water[39] will provide 100% discount on the water infrastructure charge when builds are below 110 litres per person per day. The same 100% discount is also provided to the sewerage infrastructure charge when there is no surface water connection. A 75% reduction is applied when a surface water connection is available via a sustainable drainage system.
- South Staffs Water[40] will provide graded rebates to developers if builds are below 100 litres per person per day. A 10% reduction is applicable if properties are accredited with a BREEAM 'Very Good' rating, 25% with an 'Excellent' rating, and 40% with an 'Outstanding' rating. HQM-accredited (Home Quality Mark) buildings received a 25% reduction.

3.6.6 Sewers for Adoptions Version 8

Sewers for Adoption (SfA) provides detailed guidance for developers, designers and constructors on how to design and build foul and surface water sewerage systems to a standard such that will soon be adopted by water companies, under Section 104 of the Water Industry Act. Most new sewerage is designed and constructed following this guidance.

The standard, up to and including version 7, has included a narrow definition of sewers to mean below-ground systems comprising of gravity sewers and manholes, pumping stations and rising mains. This has essentially excluded the adoption of SuDS by water companies, with the exception of below-ground storage comprising of oversized pipes or chambers.

Water UK, the industry body representing water and sewerage companies in the UK, has led the development of version 8 (SfA8); a pre-implementation version was released in August 2018[41]. This recognises the roles of the various Risk Management Authorities with responsibilities for surface water management, and the expectation within NPPF that SuDS are implemented, as a first preference, for all developments. It therefore widens the definition of what can be defined as adoptable sewers, to include components that:

- drain buildings and yards appurtenant to buildings,
- have a channel,
- convey water to a sewer, surface water body or groundwater,
- have an effective point of discharge with a lawful authority to discharge.

This definition will allow for the adoption of components including swales, rills, bioretention systems, ponds, wetlands, basins, tanks, infiltration trenches and soakaways as adoptable sewers. The CIRIA SuDS Manual is widely referenced as the key source of design guidance. Watercourses and components which drain only highway surfaces are excluded for adoption under SfA 8.

The responsibility for the final approval of SfA 8 lies with the industry regulator OfWAT, and it is anticipated that it will come into effect in 2020. Therefore, during the life of the Local Plan, SfA8 will provide developers with a nationally consistent route for water companies to adopt SuDS components.

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39 Infrastructure Charges Discount Scheme, Severn Trent Water (2018). Accessed online at: https://www.stwater.co.uk/building-and-developing/regulations-and-forms/application-forms-and-guidance/infrastructure-charges/ 24/07/2019
37 Developer Services Charges 2018-2019, South Staffs Water (2018). Accessed online at: https://www.south-staffs-water.co.uk/media/2126/ssc-developer-charges-2018-19.pdf on: 24/07/2019
41 Water UK (2018) Sewers for Adoption Eighth Edition. August 2018. Accessed online at: https://www.water.org.uk/publication/sewers-for-adoption/on: 12/08/2019

4 Water Resources and Water Supply

4.1 Introduction

4.1.1 Surface Waters

Figure 4-1 shows the main watercourses within the study area, which lies mainly within the River Trent catchment. The River Trent enters Stafford Borough in the north from Stoke-on-Trent and flows south-east through Stafford Borough, Cannock District and Lichfield District and out of the study area downstream of Alrewas into East Staffordshire District. The main tributaries of the River Trent in Southern Staffordshire include the River Sow, River Tame, Rising Brook and the tributaries of these watercourses.

Watercourses in the south-west of South Staffordshire District, and the west of Stafford Borough are part of the River Severn catchment. The Smestow Brook is the main watercourse in the study area within the River Severn catchment which has its source in Wolverhampton and flows south through South Staffordshire to feed into the River Stour near Stourton and Kinver.

4.1.2 Geology

The geology of the catchment can be an important influencing factor in the way that water runs off the ground surface. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy. Figure 4-2 shows the bedrock geology of the Southern Staffordshire study area. The underlying geology in Southern Staffordshire is predominantly mudstone, sandstone and siltstone which make up the Triassic Rocks and Warwickshire Group.

Figure 4-3 shows superficial (at the surface) deposits predominantly of till (diamicton) and river terrace deposits from historical flood events, with bands of alluvium along the River Sow, River Trent and River Tame.

Figure 4-1 Significant watercourses within Southern Staffordshire

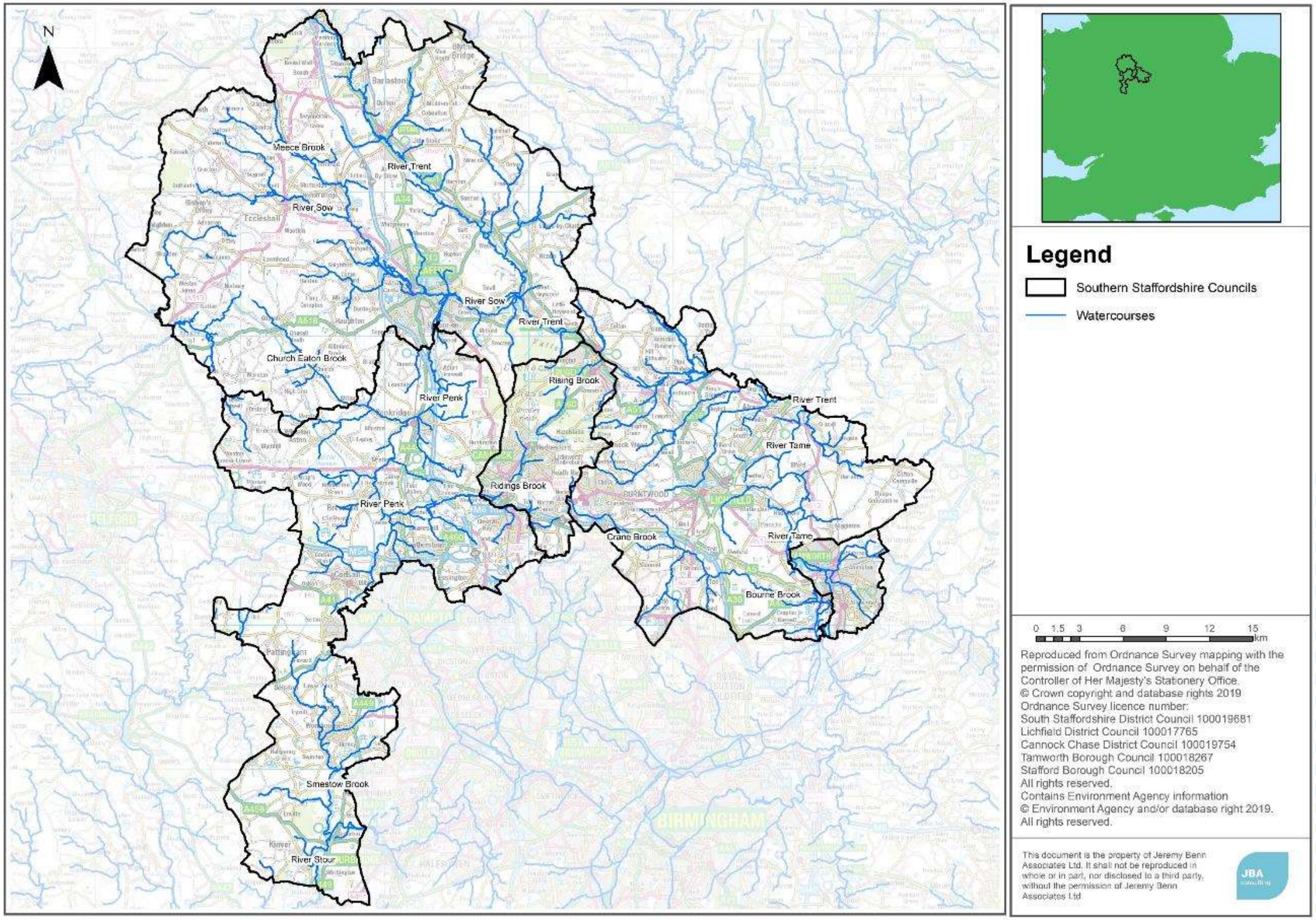


Figure 4-2 Bedrock geology of Southern Staffordshire

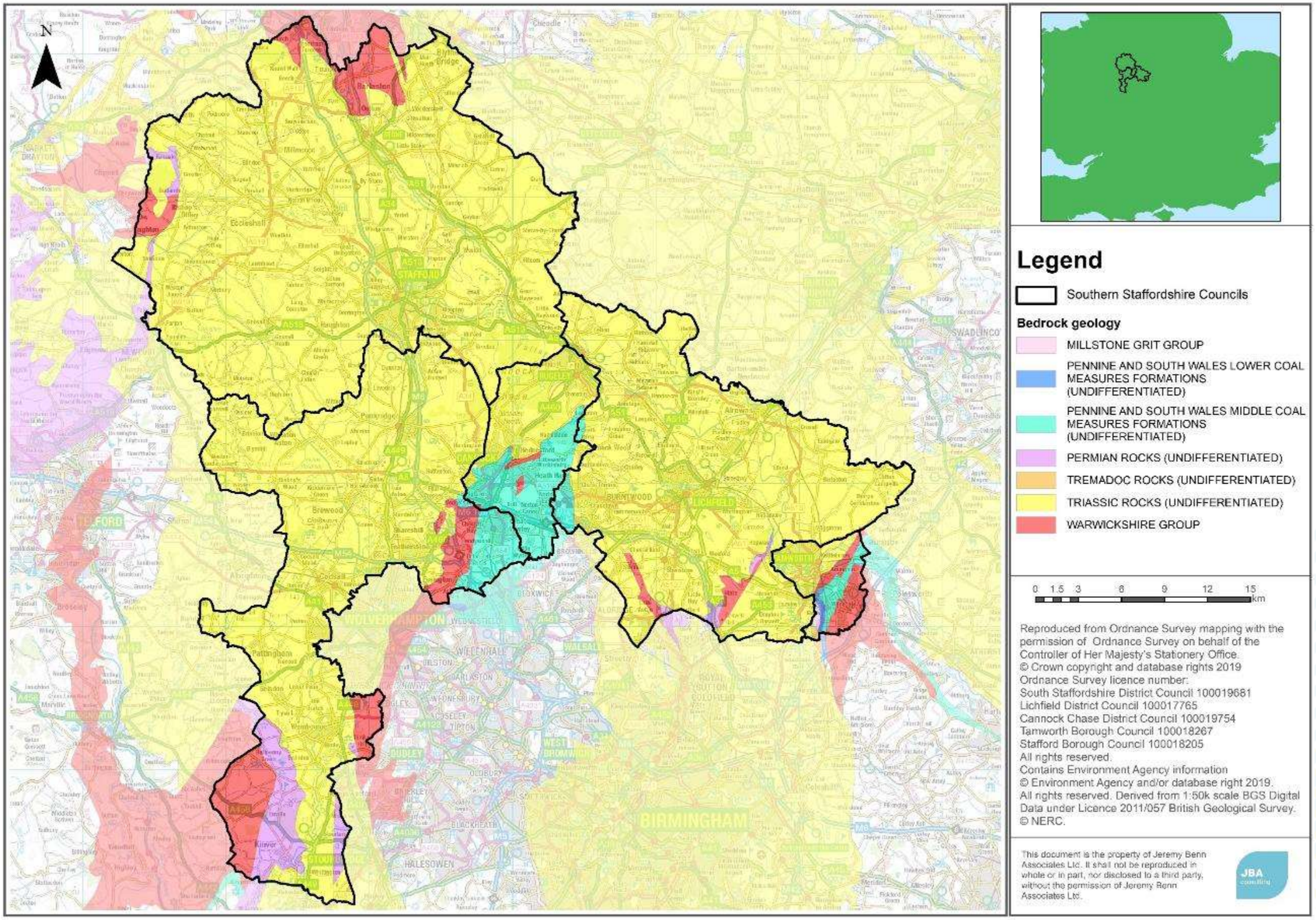
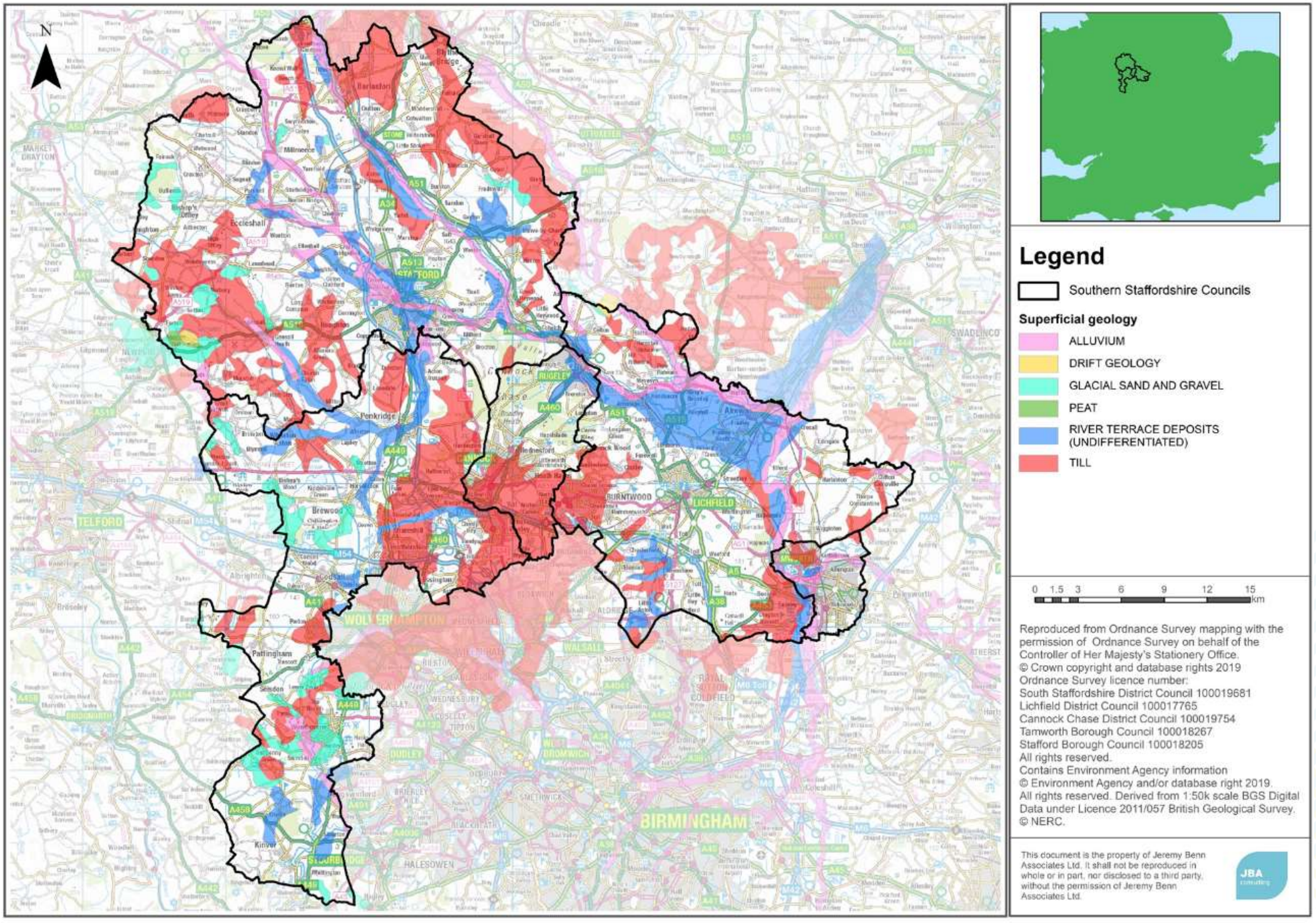


Figure 4-3 Superficial (at surface) geology of Southern Staffordshire



4.2 Availability of Water Resources

4.2.1 Abstraction Licencing Strategy

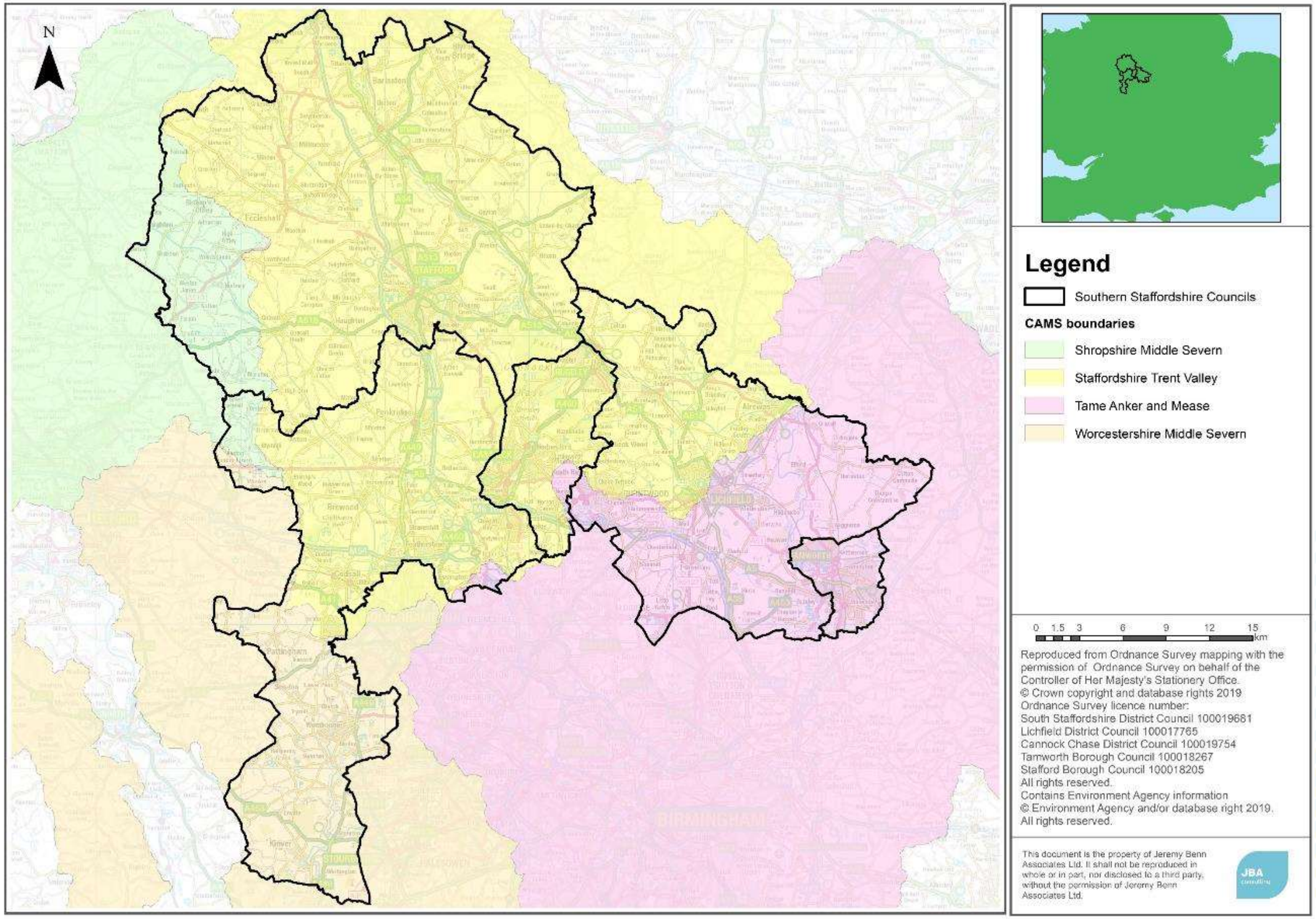
The Environment Agency (EA), working through their Catchment Abstraction Management Strategy (CAMS) process, prepare an Abstraction Licensing Strategy (ALS) for each sub-catchment within a river basin. This licensing strategy sets out how water resources are managed in different areas of England and contributes to implementing the Water Framework Directive (WFD). The ALS report provides information on the resources available and what conditions might apply to new licences. The licences require abstractions to stop or reduce when a flow or water level falls below a specific threshold, as a restriction to protect the environment and manage the balance between supply and demand for water users. The CAMS process is published in a series of ALSs for each river basin.

All new licences, and some existing licenses, are time limited. This allows time for a periodic review of the specific area as circumstances may have changed since the licences were initially granted. These are generally given for a twelve-year duration, but shorter license durations may also be granted. This is usually based on the resource assessment and environmental sustainability. In some cases, future plans or changes may mean that the EA will grant a shorter time limited licence, so it can be re-assessed following the change. If a licence is only required for a short time period, it can be granted either as a temporary licence or with a short time limit. If a licence is considered to pose a risk to the environment it may be granted with a short time limit while monitoring is carried out. The licences are then replaced with a changed licence, revoked or renewed near to the expiry date.

The ALS are 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[42]. Southern Staffordshire is covered by four ALS areas: Tame, Anker and Mease; Shropshire Middle Severn; Staffordshire Trent Valley and Worcestershire Middle Severn as shown in Figure 4-4 below.

42 Environment Agency (2018) Managing Water Abstraction. Accessed Online at: https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process on: 12/08/2019

Figure 4-4 CAMS Boundaries covering Southern Staffordshire



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 will not pose a risk to resources or the environment. 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 (all abstraction licences being used to full capacity) and recent actual flows (amount of water 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) or "Hands-off Level" (HOL) condition on a licence.

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

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.

4.2.3 Staffordshire Trent Valley ALS

The Staffordshire Trent Valley ALS[43], extends from the source of the River Trent on Biddulph Moor, north of Stoke-on-Trent to its confluence with the River Tame near Alrewas in Lichfield District.

The majority of the ALS, including the majority of the ALS covering the study area, has moderately reliable water resources, with water being available for abstraction at least 50% of the time. Areas with lower reliability include north-west of Stafford along the River Sow, the Rising Brook in Rugeley and the Bourne Brook in Lichfield District.

Surface water flows are assessed at Assessment Points (APs), which are significant points on the river, i.e. where two major rivers join or at a gauging station. There are 11 APs within the Staffordshire Trent Valley ALS, 9 of which fall within Southern Staffordshire: AP1, AP2, AP3, AP4, AP5, AP6, AP9, AP10 and AP11. Currently water is not available for further licensing at AP6 and AP9 as these are closed. There is water available for further licensing at the other APs in the study area subject to restrictions at the relevant gauging stations.

The groundwater availability in the Staffordshire Trent Valley ALS region is guided by the surface water assessment unless specific information on principal aquifers exists or local issues that need protecting overrule it.

Consumptive groundwater licences which do not have a direct impact upon main river flows may be permitted but may be subject to restrictions such as prescribed groundwater levels. Restrictions will be determined on a case-by-case basis, dependent upon the nature and scale of any abstraction.

Resource availability for the APs in Southern Staffordshire are presented in Table 4-2 below.

Table 4-2 Staffordshire Trent Valley resource availability

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)
1	Trent to and including Strongford WwTW	Staffordshire Trent Valley	Water available for further licensing	208Ml/d at Darlaston	212	13.3
2	River Trent u/s Sow	Staffordshire Trent Valley	Water available for further licensing	208Ml/d at Darlaston	212	13.3
3	River Trent u/s Tame	Staffordshire Trent Valley	Water available for further licensing	498Ml/d at Yoxall	295	43.1
4	River Sow u/s Doxey Brook	Staffordshire Trent Valley	Water available for further licensing	98Ml/d at Great Bridgeford	113	3.6
5	River Sow including Doxey Brook	Staffordshire Trent Valley	Water available for further licensing	498Ml/d at Yoxall	295	14.4

43 Staffordshire Trent Valley catchment abstraction licensing strategy, Environment Agency (2013). Accessed online at: https://www.gov.uk/government/publications/cams-staffordshire-trent-valley-abstraction-licensing-strategy on: 12/08/2019

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)
6	Scotch Brook	Staffordshire Trent Valley	Water not available for licensing	N/A	N/A	Closed
9	River Blithe d/s of reservoir	Staffordshire Trent Valley	Water not available for licensing	N/A	N/A	Closed
10	River Swarbourn	Staffordshire Trent Valley	Water available for further licensing	13.2Ml/d at Meadow Lane, Yoxall	295	43.1
	River Penk	Staffordshire Trent Valley	Water available for further licensing	82Ml/d at Penkridge	274	14.4

(1) Hands off Flow restriction

(2) Number of days per annum abstraction may be available

(3) Approximate volume available at restriction (Ml/D)

At AP1, 2, 3, 4, 5, 10 and River Penk, there is water available for licensing, subject to a HOF as stated in the above table. This means that for new licences:

- All new consumptive or partially consumptive licences will be issued with the HOF.
- Water is only available during periods of medium to high flows due to the HOF condition.

Additionally, at AP3 and AP5, the following also applies:

- Any new application for an abstraction which may have an impact on Cannock Chase SAC will require a Habitats Directive risk assessment.

At AP6 and AP9, there is no water available for further abstraction due to over licensing and abstraction. This means that no new consumptive licences will be granted and there is no impact on existing licence holders.

4.2.4 Worcestershire Middle Severn ALS

The Worcestershire Middle Severn ALS[44] covers the south of South Staffordshire District, including the Smestow Brook and its tributaries. The main water resource issue in the Worcestershire Middle Severn ALS is the historic over-abstraction of groundwater for public supply and the associated environmental impact as well as the high demand for water to irrigate agricultural land.

The part of the Worcestershire Middle Severn ALS covering Southern Staffordshire has very unreliable water resources, with water being available for abstraction less than 30% of the time.

There are 10 APs within the Worcestershire Middle Severn ALS, one of which fall within Southern Staffordshire: AP4. Currently there is restricted water available for licensing at this AP.

44 Worcestershire Middle Severn Abstraction Licencing Strategy, Environment Agency (2013). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/305450/lit_5356_35376b.pdf on: 12/08/2019

The groundwater availability in the Worcestershire Middle Severn ALS region is guided by the surface water assessment unless specific information on principal aquifers exists or local issues that need protecting overrule it.

Consumptive groundwater licences which do not have a direct impact upon main river flows may be permitted but may be subject to restrictions such as prescribed groundwater levels. Restrictions will be determined on a case-by-case basis, dependent upon the nature and scale of any abstraction.

Resource availability for AP4 is presented in Table 4-3 below.

Table 4-3 Worcestershire Middle Severn ALS resource availability

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)	Gauging station at AP?
4	River Stour at Smestow	Worcestershire Middle Severn	Restricted water available for licensing	260Ml/d at Callows Lane on the River Stour	73	26	No

(1) Hands off Flow restriction

(2) Number of days per annum abstraction may be available

(3) Approximate volume available at restriction (Ml/D)

At AP4, there is restricted water available for licensing subject to HOF of 260Ml/d at Callows Lane on the River Stour. This means that for new licenses:

- There is no water available for unconstrained abstraction i.e. abstraction with no HOF restriction.
- Water is only available during periods of high flows subject to a HOF condition.

4.2.5 Tame, Anker and Mease ALS

The Tame, Anker and Mease ALS[45] covers the River Tame from its source in the Black Country, through Birmingham, Tamworth, Lichfield to its confluence with the River Trent. The ALS extends further along the River Trent to Newton Solney just outside Burton-upon-Trent. This ALS covers all of Tamworth Borough, a large proportion of Lichfield District and small areas in South Staffordshire and Cannock Chase Districts.

The majority of the ALS, including the majority of the ALS covering the study area, has moderately reliable water resources, with water being available for abstraction at least 50% of the time. Areas with lower reliability include the south-west of Lichfield District.

There are 9 APs within the Tame, Anker and Mease ALS, 4 of which fall within Southern Staffordshire: AP5, AP6, AP7 and AP8. Currently there is water available for licensing at these APs with the exception of AP6 where water is not available for licensing.

The groundwater availability in the Tame, Anker and Mease ALS region is guided by the surface water assessment unless specific information on principal aquifers exists or local issues that need protecting overrule it.

Consumptive groundwater licences which do not have a direct impact upon main river flows may be permitted but may be subject to restrictions such as prescribed groundwater levels. Restrictions will be determined on a case-by-case basis, dependent upon the nature and scale of any abstraction.

45 Tame Anker and Meases Abstraction Licencing Strategy, Environment Agency (2013). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291402/LIT_3306_bc78df.pdf on: 13/08/2019

Resource availability for the APs within Southern Staffordshire is presented in Table 4-4 below.

Table 4-4 Tame, Anker and Mease ALS resource availability

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)
5	River Anker	Tame, Anker and Mease	Water available for further licensing	92.3Ml/d at Polesworth	310	23.5
6	Bourne Brook	Tame, Anker and Mease	Water not available for licensing	N/A	N/A	Closed
7	River Tame downstream of the River Blythe to the River Trent	Tame, Anker and Mease	Water available for further licensing	1520Ml/d at Drakelow	328	77
8	River Mease	Tame, Anker and Mease	Water available for further licensing	19.3Ml/d at Clifton Hall (in winter only)	145 (Nov to March only)	3.3

(1) Hands off Flow restriction

(2) Number of days per annum abstraction may be available

(3) Approximate volume available at restriction (Ml/D)

At AP5, AP7 and AP8, there is water available for further licensing subject to HOF as stated in the table above. This means that for new licenses:

- All new consumptive or partially consumptive licences will be issued with the HOF.
- Water will be available at all flows except lower flows due to the HOF condition.

Additionally, at AP7 the following applies:

- Applications for new abstractions may require evidence that the proposal will not affect flows in Sutton Park SSSI.

Additionally, at AP8 the following applies:

- Abstractions will require the approval of Natural England. The impact of any abstraction will be assessed across the flow rang against Natural England target flows.

At AP6 there is no water available for licensing, meaning that no new licences will be granted.

4.2.6 Shropshire Middle Severn ALS

The Shropshire Middle Severn ALS[46] is largely rural, mainly covering Shropshire, but also covers the west of Stafford Borough and a small area in the north-west of South Staffordshire District. It includes the Lonco Brook, Wood Brook, Back Brook, Wyndford Brook and Coley Brook in the study area.

The majority of the CAMS area has moderately reliable water resources, however in the area covering South Staffordshire District and part of the area covering Stafford Borough around Aqualate Mere, water resources unreliable, with water resources being available for less than 30% of the time.

There are 8 APs within the Shropshire Middle Severn ALS, one of which falls within Southern Staffordshire: AP4. Currently there is restricted water available for licensing at this AP.

The groundwater availability is guided by the surface water assessment unless specific information on principal aquifers exists or local issues that need protecting overrule it.

Consumptive groundwater licences which do not have a direct impact upon main river flows may be permitted but may be subject to restrictions such as prescribed groundwater levels. Restrictions will be determined on a case-by-case basis, dependent upon the nature and scale of any abstraction.

Resource availability for AP4 is presented in Table 4-5 below.

Table 4-5 Shropshire Middle Severn ALS resource availability

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)	Gauging station at AP?
4	Coley Brook at Coley Mill	Shropshire Middle Severn	Restricted water available for licensing	30Ml/d	73	2.1	Yes

(1) Hands off Flow restriction

(2) Number of days per annum abstraction may be available

(3) Approximate volume available at restriction (Ml/D)

At AP4, there is restricted water available for licensing. This means that for new licenses:

- There is no water available for unconstrained abstraction i.e. abstraction with no HOF restriction.
- Water is only available during periods of high flows subject to the HOF condition.
- Applications may need to be assessed under the Habitats Regulations and so applicants may be obliged to provide additional support with their request.

4.3 Recommendations for better management practices

The main options for this identified in the ALS 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,

46 Shropshire Middle Severn catchment abstraction licensing strategy, Environment Agency (2013). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291395/LIT_5393_7eeda4.pdf on: 13/08/2019

- 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.

4.3.1 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 to achieve 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[47] the Severn Trent and South Staffs Water supply regions are classed as areas of "moderate" water stress.

4.4 Water Resource Assessment: Water Resource Management Plans

4.4.1 Introduction

When new development within a Local Planning Authority is being 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, and without causing a negative impact on the waterbodies from which water is abstracted.

The aim of this assessment was to compare the future additional demand as a result of development proposed within the emerging Local Plan, with the demand allowed for by Severn Trent Water and South Staffs Water in their Water Resource Management Plans.

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 South Staffs Water and secondly by providing the water companies with a growth estimate allowing them to assess the impact of planned growth on their water resource zone.

4.4.2 Methodology

Severn Trent Water and South Staffs Water Water's Resource Management Plans (WRMP)[48] [49], covering the period 2020 to 2045 were reviewed and attention was mainly focussed upon:

- The available water resources and future pressures which may impact upon the supply element of the supply/demand balance.

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47 Water Stressed Areas - Final Classification, Environment Agency and Natural Resources Wales (2013). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf on: 13/08/2019

48 Water Resource Management Plan 2019, Severn Trent Water (2019). Accessed online at: https://www.severntrent.com/about-us/future-plans/water-resource-management/wrmp-19-documents/ on: 11/09/2019

49 Draft Water Resource Management Plan 2019, South Staffs Water (2019). Accessed online at: https://www.south-staffs-water.co.uk/about-us/our-strategies-and-plans/our-water-resources-plan on: 13/08/2019

- The allowance within those plans for housing and population growth and its impact upon the demand side of the supply/demand balance.

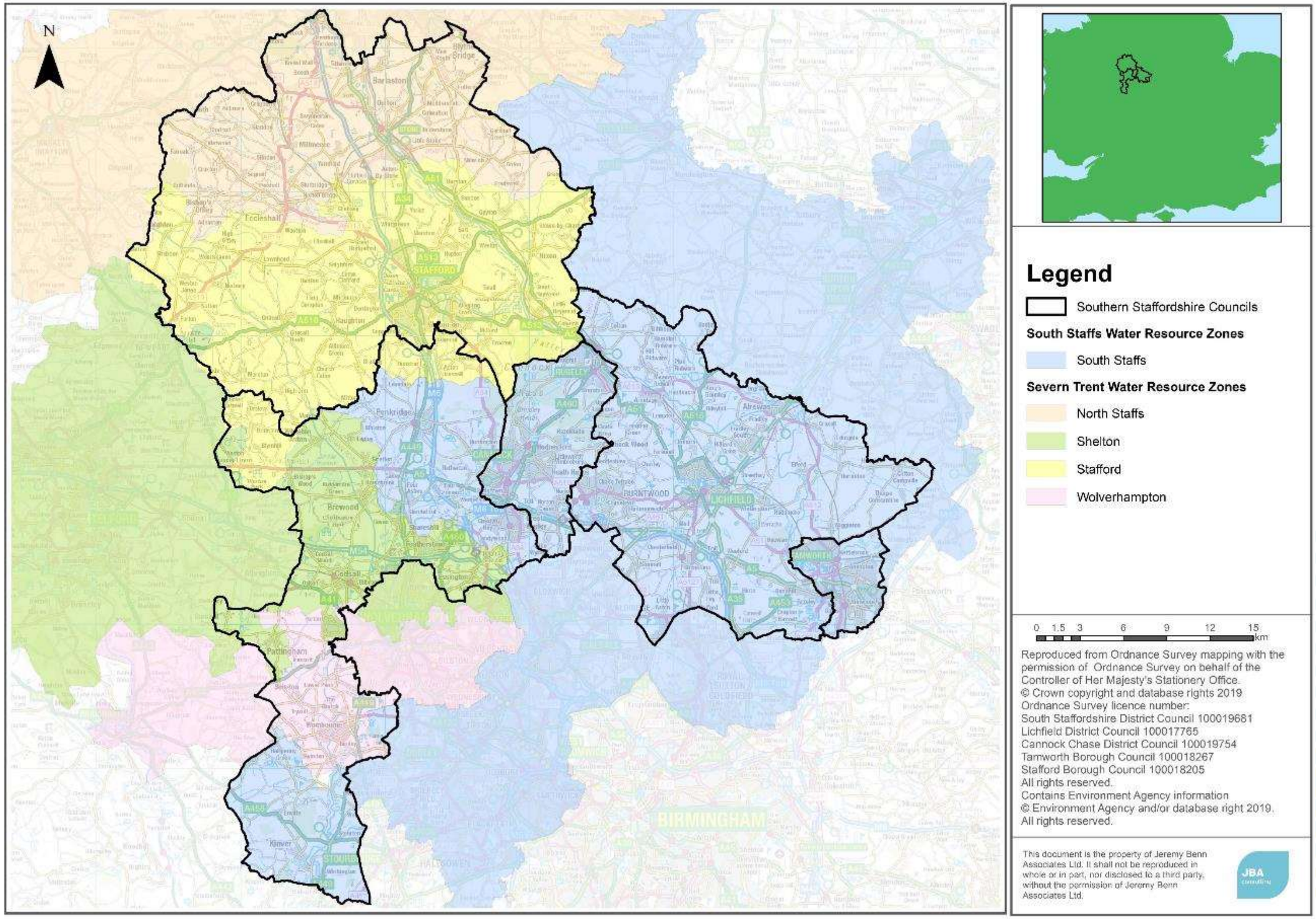
The spatial boundaries for each water company's water resource zones were used to overlay the local authority boundaries. The Ministry for Housing, Communities and Local Government (MHCLG) 2014-based estimates of household growth up to 2041[50] were collated for the local authorities which lie within each WRZ. The percentage of the current population of each local authority within the WRZ was estimated from the OS Code Point dataset and the WRZ boundary. The assessment has used MHCLG figures, because they are available for all LPAs within the water resource zone, and over a consistent timescale and methodology. The resulting total number of households in the base year within the WRZ is comparable with the figures quoted in the WRMPs.

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.

50 2014-Based Household Projections for England, Office for National Statistics (2018). Accessed online at: https://www.gov.uk/government/collections/household-projections#2014-based-projections on: 11/09/2019

Figure 4-5 Water Resource Zones



4.4.3 Severn Trent Water

Severn Trent Water is responsible for supplying parts of Southern Staffordshire with water. For the purposed of water resources planning, the supply area is divided into 15 Water Resources Zones (WRZs) which vary greatly in scale and have unique water resource concerns. All of Stafford Borough and parts of South Staffordshire District are within Severn Trent Water's supply area. Stafford is covered by the North Staffs, Shelton and Stafford WRZs, and South Staffordshire is covered by Shelton, Stafford and Wolverhampton WRZs.

Severn Trent's WRMP forecasts a significant deficit between supply and demand for water, with a focus to prevent the risk of future environmental deterioration, meaning that alternative ways of meeting customer demand need to be found as current water sources become unreliable. The water company aims to do this by:

- Using demand management measures to reduce the amount of water that is needed to put into the supply by:
  - Educating customers to use less water
  - Reducing network leakage
  - Reducing consumption by increasing the coverage of water meters
- Making the best of sustainable sources of supply by:
  - Reducing abstraction from sources that have a negative environmental impact
  - Ensuring future water abstractions do not pose a risk of environmental deterioration (a requirement of the Water Framework Directive)
  - Improving resilience and flexibility of the supply system
  - Increasing or optimising outputs for existing sustainable sources
  - Improving habitats and ecological resilience to low flows using catchment restoration techniques
  - Protecting drinking water supply sources from risk of pollution using catchment management measures
  - Optimising national use of resources

Across all of their WRZs, Severn Trent aim to improve long term supply capability by replacing output from unsustainable sources of abstraction. This includes reducing the pressures upon groundwater abstraction ensuring that there is no future increase associated with this source. Consequently, Severn Trent are focusing their supply upon surface water abstraction and existing reservoir storage. Also, it is proposed that the strategic water distribution links will be enhanced to allow increased flexibility around the system to move water to locations that require it most.

Across the water supply area, 34% of supply is provided by groundwater, with the majority (approximately 88%) being derived from Sherwood Sandstone or sandstone aquifers in the Midlands region. The sandstone aquifers have substantial storage and are typically not sensitive to short term changes in precipitation.

Vulnerability assessments of the WRZs across the supply area identified those most sensitive to the impacts of climate change. The results showed that the largest WRZs (Strategic Grid and Nottingham) are both vulnerable to potential changes in temperature and rainfall and all other WRZ are given a "low" vulnerability to climate change.

Of the 4 STW WRZ within Southern Staffordshire, North Staffs is the only WRZ which shows a significant supply/demand deficit by 2045, with a deficit present from 2025-26 and a maximum potential deficit 41.80 Ml/d in 2044-2045. As North Staffs has one of the largest supply/demand deficits within the STW supply area, strategic measures and supply schemes have been recommended for the WRZ, as summarised in Table 4-6.

Wolverhampton and Stafford WRZ show a surplus in supply/demand to 2045 and Shelton shows a surplus until 2043-44 when there is a minor deficit in supply/demand.

Leakage makes up around 23% of the total water that STW put into supply and measures to reduce leakage have helped to meet the demand of a growing population without having to increase abstraction. Between 2010 and 2020 STW reduced leakage by around 15% and the WRMP proposes to reduce leakage by a further 15% between 2020 and 2025, with an overall ambition to reduce leakage by 50% over the next 25 years. Proposed leakage targets for each of the WRZ in Southern Staffordshire are set out in Table 4-7.

Table 4-6 Summary of recommended supply schemes for North Staffordshire

Delivery Period	Scheme Description	Assumed Benefit
AMP7 to AMP8 2020-2030	Peckforton Group boreholes treatment enhancements	6.5 Ml/d
AMP 9 2030-2035	Improve Site L water treatment works outputs during low raw water periods	7 Ml/d

Table 4-7 Leakage targets for STW WRZs in Southern Staffordshire

WRZ	Leakage targets (Ml/d)					
	2019-20	2024-25	2029-30	2034-35	2039-40	2044-45
Stafford	5.4	5.4	4.6	3.9	3.5	3.2
Wolverhampton	14.4	14.4	12.2	10.4	9.4	8.4
Shelton	24.0	24.0	20.4	17.3	15.6	14.0
North Staffs	29.4	29.4	25.0	21.3	19.1	17.2

4.4.4 South Staffs Water

South Staffs Water are responsible for supplying water to the entirety of Tamworth Borough, Lichfield District and Cannock District as well as parts of South Staffordshire District. SSW is made up of one single WRZ – South Staffs.

The water resources comprise two surface water sources – the River Severn and Blithfield Reservoir, which provide about 50% of the total water resources. There are also 25 available groundwater resources which take water from the Sherwood Sandstone aquifer. SSW also provide a number of bulk water supplies to STW and receive a small number in return.

Assessment of the impact of climate change shows that it will reduce water available by approximately 9Ml/d by 2045.

Analysis of the supply-demand balance (dry-year) shows that SSW has a surplus until 2025-26. The deficit increases over time to a maximum of 17.81Ml/d in 2044-45.

To reduce demand in the supply area, the WRMP aims to do the following:

- Reduce leakage by 25% by 2024/25 and by 40% across the 25-year planning period;
- Double the percentage of customers that have a water meter over the lifetime of the WRMP; and
- Reduce the volume of water each person in the region uses by one litre per person per day by 2024/25.

4.4.5 Population and household growth

Severn Trent Water

Table 4-8 shows a comparison of household growth forecasts for the four STW WRZs, the Ministry of Housing Communities and Local Government (MHCLG) 2014-based household projections and the OAN for Stafford Borough and South Staffordshire District.

The MHCLG 2014-based projections forecast an 9.74% increase (average) in the number of households within Stafford Borough and South Staffordshire District between 2016 and 2036. This is lower than the average growth forecast for all authorities within the STW WRZs covering Southern Staffordshire (11.45%), and lower than the forecasts provided by Severn Trent's WRMP.

If growth in Stafford occurred according to the OAN, it would result in an increase in the number of households of approximately 17.35% until 2036, which exceeds what has been accounted for in the WRMPs covering Stafford Borough (North Staffs, Stafford and Shelton).

If growth in South Staffordshire occurred according to the OAN, it would result in an increase in the number of households of approximately 10.88% until 2036, which is lower that what has been accounted for in the WRMPs covering South Staffordshire District (Shelton, Stafford and Wolverhampton).

Table 4-8 Comparison of household growth forecasts (Severn Trent Water)

Forecast – Stafford Borough	2016	2036	% increase
MHCLG 2014-based forecast	57,651	64,029	11.06%
MHCLG 2014-based forecast – All LPAs in Shelton WRZ	189,076	212,762	12.53%
MHCLG 2014-based forecast – All LPAs in North Staffs WRZ	232,806	254,617	9.37%
MHCLG 2014-based forecast – All LPAs in Stafford WRZ	41,466	46,009	10.96%
WRMP Forecast – Shelton	212,400	246,590	16.10%
WRMP Forecast – North Staffs	250,953	282,530	12.58%
WRMP Forecast – Stafford	43,790	50,500	15.32%
OAN	57,651	67,651	17.35%
Forecast – South Staffordshire District	**2016**	**2036**	**% increase**
MHCLG 2014-based forecast	46,676	50,610	8.43%
MHCLG 2014-based forecast – All LPAs in Shelton WRZ	189,076	212,762	12.53%
MHCLG 2014-based forecast – All LPAs in Stafford WRZ	41,466	46,009	10.96%
MHCLG 2014-based forecast – All LPAs in Wolverhampton WRZ	105,809	119,458	12.90%
WRMP Forecast – Shelton	212,400	246,590	16.10%
WRMP Forecast – Stafford	43,790	50,500	15.32%
WRMP Forecast - Wolverhampton	110,000	124,268	12.97%
OAN	46,676	51,756	10.88%

South Staffs Water

Table 4-9 shows a comparison of household growth forecasts for the South Staffs WRZ, the Ministry of Housing Communities and Local Government (MHCLG) 2014-based household projections and the OAN for South Staffordshire District, Cannock Chase District, Lichfield District and Tamworth Borough.

The (MHCLG) 2014-based projections forecast an 9.29% increase (average) in the number of households within South Staffordshire, Cannock Chase, Lichfield and Tamworth between 2016 and 2036. This is lower than the growth forecast for all authorities in the South Staffs WRZ (14.22%), and lower than the forecast provided by the WRMP.

If growth in South Staffordshire and Tamworth occurred according to the OAN, it would result in an increase in the number of households of approximately 10.88% and 10.92% respectively until 2036, which is lower that what has been accounted for in the WRMP.

If growth in Cannock Chase and Lichfield occurred according to the OAN, it would result in an increase in the number of households of approximately 20.02% and 25.93% respectively until 2036, which exceeds what has been accounted for in the WRMP. If the lower figure of CCDC's OAN were used this would result in closer alignment with the WRMP assumptions.

Table 4-9 Comparison of household growth forecasts (South Staffs Water)

Forecast – Cannock Chase District	**2016**	**2036**	**% increase**
MHCLG 2014-based forecast	42,248	46,739	10.63%
MHCLG 2014-based forecast – All LPAs South Staffs WRZ	553,079	631,739	14.22%
WRMP Forecast – South Staffs	585,588	681,081	16.31%
OAN	42,248	50,708	20.02%
Forecast – Lichfield District	**2016**	**2036**	**% increase**
MHCLG 2014-based forecast	42,891	47,648	11.09%
MHCLG 2014-based forecast – All LPAs South Staffs WRZ	553,079	631,739	14.22%
WRMP Forecast – South Staffs	585,588	681,081	16.31%
OAN	42,891	54,011	25.93%
Forecast – South Staffordshire District	**2016**	**2036**	**% increase**
MHCLG 2014-based forecast	46,676	50,610	8.43%
MHCLG 2014-based forecast – All LPAs South Staffs WRZ	553,079	631,739	14.22%
WRMP Forecast – South Staffs	585,588	681,081	16.31%
OAN	46,676	51,756	10.88%
Forecast – Tamworth Borough	**2016**	**2036**	**% increase**
MHCLG 2014-based forecast – Tamworth Borough	32,405	34,679	7.02%
MHCLG 2014-based forecast – All LPAs South Staffs WRZ	553,079	631,739	14.22%
WRMP Forecast – South Staffs	585,588	681,081	16.31%
OAN	32,405	35,945	10.92%

4.4.6 Summary

Cannock District, Tamworth Borough and Lichfield District are entirely supplied by South Staffs Water WRZ. South Staffordshire District is supplied by South Staffs Water WRZ, and Severn Trent's Shelton, Stafford and Wolverhampton WRZs. Stafford Borough is supplied by STW's Shelton, Stafford and North Staffs WRZs. The WRMPs show that SSW's WRZ will have a supply/demand deficit from 2025 and STW's North Staffs WRZ will have a supply/demand deficit from 2024, however there are measures proposed to reduce supply/demand pressures.

The growth forecast planned for in the WRMPs is broadly in line with the OAN for South Staffordshire District and Tamworth Borough, however Stafford Borough, Lichfield District and Cannock District's OAN growth all exceed the growth planned in the WRMPs.

4.5 Severn Trent Water's Assessment

Severn Trent Water gave a RAG score of "green" to all of the sites identified in the study and provided the following comment:

"We have no additional concerns from a water resources supply perspective. Checking the figures in the OAN against those used in our Final WRMP, they are only marginally higher than planned for and this can be accounted for in our headroom assessment."

This confirms that although the level of growth that would occur if the SSCs deliver their housing need (based on the housing need summarised in section 2) is higher than that accounted for in the WRMP, there is sufficient water resources to accommodate all of SSCs' housing need.

4.6 South Staffs Water's Assessment

South Staffs Water gave a RAG score of "green" to all proposed development for the water resources assessment. There are sufficient water resources to serve the proposed growth (based on the housing need summarised in section 2) within Southern Staffordshire, and the adopted WRMP has planned for the increase in demand.

4.7 Water efficiency and water neutrality

Although Southern Staffordshire is not in an area of high water stress compared to the south and east of England, there are sub-areas within the county where abstraction of water is causing an environmental impact, and actions exist under WINEP to reduce this abstraction in order to contribute to meeting WFD targets.

Climate change is predicted to increase pressure on water resources, increasing the potential for a supply-demand deficit in the future, and making environmental damage from over abstraction of water resources more likely.

It is important therefore that new development does not result in an unsustainable increase in water abstraction. This can be done in a number of ways from reducing the water demand from new houses through to achieving "water neutrality" in a region by offsetting a new developments water demand by improving efficiency in existing buildings.

4.7.1 Water neutrality concept

Water neutrality is a relatively new concept for managing water resources, but one that is receiving increased interest as deficits in future water supply/demand are identified. The definition adopted by the Government and the Environment Agency[51] is:

> ***"For every development, total water use in the wider area after the development must be equal to or less than total water use in the wider area before development".***

It is useful to also refer to the refined definition developed by Ashton:

"For every new significant development, the predicted increase in total water demand in the region due to the development should be offset by reducing demand in the existing

[51] Water Neutrality: An improved and expanded water resources management definition (SC080033/SR1), Environment Agency, 2009. Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291675/scho1009bqzr-e-e.pdf on: 26/11/2019

community, where practical to do so, and these water savings must be sustained over time" (V Ashton, 2014)[52]

This definition states the need to sustain water saving measures over time, and the wording "predicted increase in total water demand" reflects the need for water neutrality to be designed in at the planning stage.

Both definitions refer to water use in the region or "wider area", and the extent of this area should be appropriate to local authority boundaries, water resource zones, or water abstraction boundaries depending on what is appropriate for that particular location. For instance, if a development site is in an area of water stress relating to a particular abstraction source, offsetting water use in a neighbouring town that is served by a different water source will not help to achieve water neutrality.

In essence water neutrality is about accommodating growth in a region without increasing overall water demand.

Water neutrality can be achieved in a number of ways:

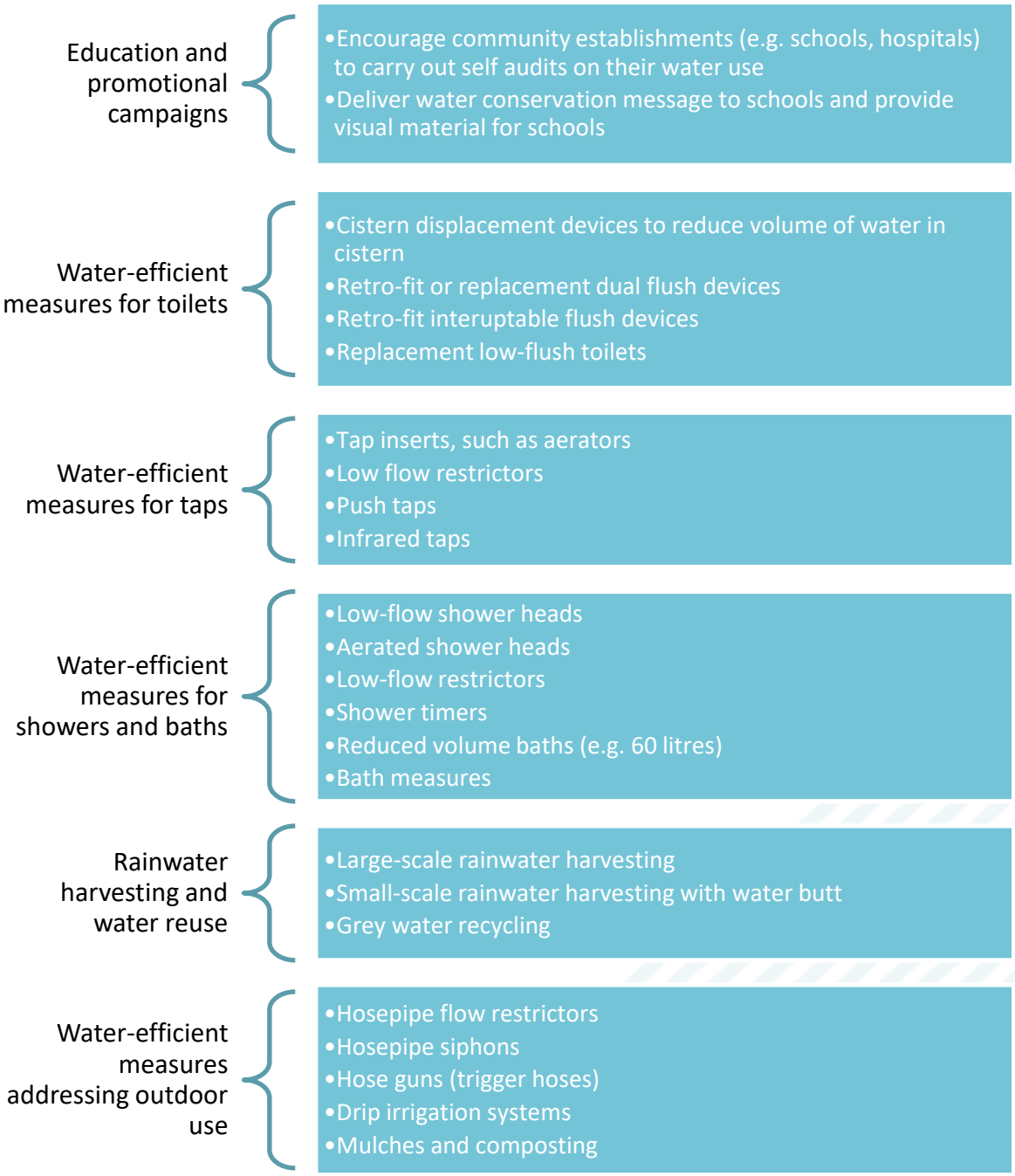
- Reducing leakage from the water supply networks
- Making new developments more water-efficient
- "Offsetting" new demand by retrofitting existing homes with water-efficient devices
- Encouraging existing commercial premises to use less water
- Implementing metering and tariffs to encourage the wise use of water
- Education and awareness-raising amongst individuals

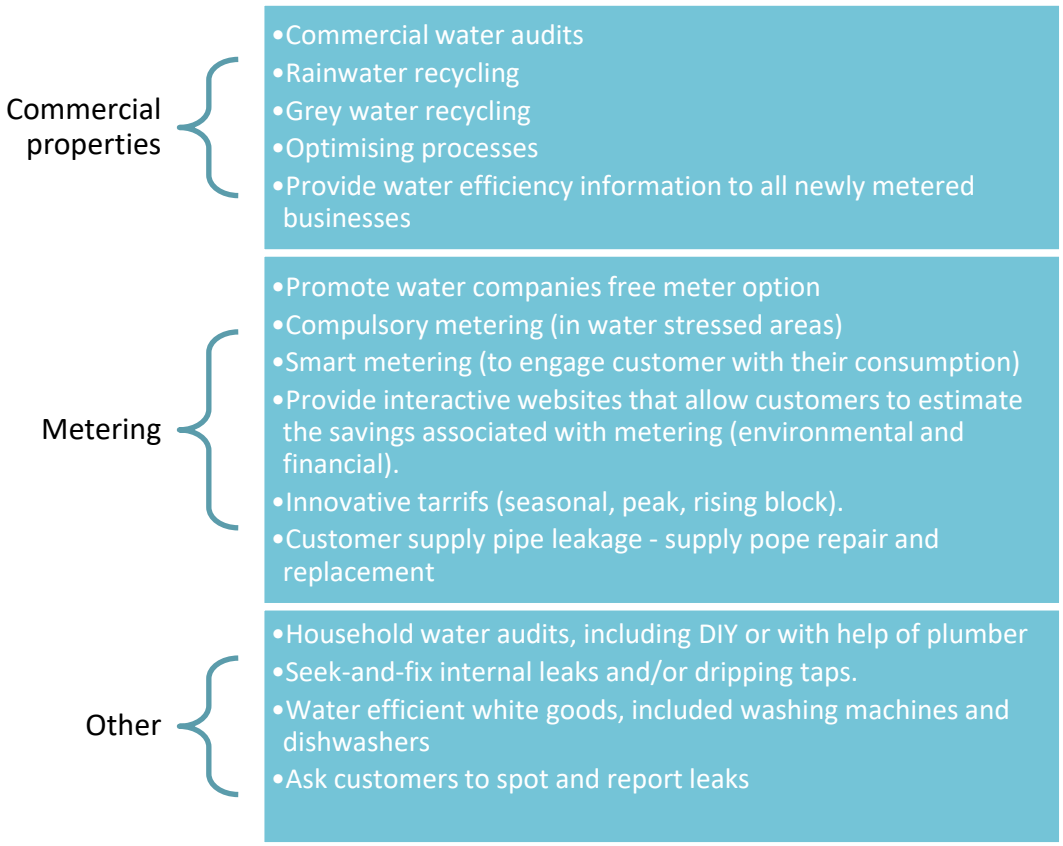
Suggestions for water-efficiency measures are listed in Figure 4-6 below.

52 Water Resources in the Built Environment, edited by Booth and Charlesworth (2014). Published by Wiley.

4.7.2 Consumer water efficiency measures

Figure 4-6 Consumer water-efficiency measures





Source: Adapted from Booth and Charleswell (2014)

Many interventions are designed to reduce water use if operated in a particular way, and so rely on the user being aware and engaged with their water use. The educational aspect is therefore important to ensure that homeowners are aware of their role in improving water efficiency.

4.7.3 Rainwater and Greywater Recycling

Rainwater harvesting

Rainwater recycling or rainwater harvesting (RwH) is the capture of water falling on buildings, roads or pathways that would normally be drained via a surface water sewer, infiltrate into the ground or evaporate. In the UK this water cannot currently be used as a drinking water supply as there are strict guidelines on potable water, but it can be used in other systems within domestic or commercial premises.

Systems for collection of rainwater can be simple water butts attached to a drainpipe on a house, or it could be a complex underground storage system, with pumps to supply water for use in toilet flushing and washing machines. By utilising rainwater in this way there is a reduced dependence on mains water supply for a large proportion of the water use in a domestic property.

Benefits of RwH

- **RwH reduces the dependence on mains water supply – reducing bills for homeowners and businesses**
- **Less water needs to be abstracted from river, lakes and groundwater**
- **Stormwater is stored in a RwH system reducing the peak runoff leaving a site providing a flood risk benefit (for smaller storms)**
- **By reducing surface water flow, RwH can reduce the first flush effect whereby polluted materials adhering to pavement surfaces during dry periods are removed by the first flush of water from a storm and can cause pollution in receiving watercourses.**

Challenges of RwH

- **Dependency on rainfall can limit availability of harvested rainwater during drought and hot weather events.**
- **Increased capital (construction) costs to build rainwater harvesting infrastructure into new housing (£2,674 for a 3/4bed detached home)**
- **Payback periods are long as the cost of water is low so there is little incentive for homeowners to invest. For further information see:** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINA

Greywater harvesting

Greywater refers to water that has been "used" in the home in appliances such as washing machines, showers and hand basins. Greywater recycling or greywater harvesting (GwH) is the treatment and re-use of this water in other systems such as for toilet flushing. By their nature, GwH systems require more treatment and are more complex than RwH systems, and there are limited examples of their use in the UK.

Greywater re-use refers to systems where wastewater is taken from source and used without further treatment. An example of this would be water from a bath or shower being used on plants in the garden. This sort of system is easy to install and maintain, however as mentioned above the lack of treatment to remove organic matter means the water cannot be stored for extended periods.

Greywater recycling refers to systems where wastewater undergoes some treatment before it is used again. These systems are complex and require a much higher level of maintenance than RwH or greywater re-use systems.

Domestic water demand can be significantly reduced by using GwH, and unlike with a RwH system where the availability of water is dependent on the weather, the source of water is usually constant (for instance if it is from bathing and showering). However, the payback period for a GwH system is usually long, as the initial outlay is large, and the cost of water relatively low. Viability of greywater systems for domestic applications is therefore currently limited. Communal systems may offer more opportunities where the cost can be shared between multiple households.

4.7.4 Energy and Water use

According to EU statistics (Eurostat 2017), 17% of the UK's domestic energy usage is for water heating. If less water was being used within the home, for instance through more water efficient showers, less water would need to be heated, and overall domestic energy usage would be reduced.

The Government is currently consulting on a Future Homes Standard that will involve changes to Part L (conservation of fuel and power) of the Building Regulations for new dwellings. Whilst there is no direct mention of water efficiency in this consultation, there is an important link between water use and energy use, and therefore between water use and carbon footprint.

4.7.5 Funding for water neutrality

Water neutrality is unlikely to be achieved by just one type of measure, and likewise it is unlikely to be achieved by just one funding source. Funding mechanisms that may be available could be divided into the following categories:

- Infrastructure-related funding (generally from developer payments)
- Fiscal incentives at a national or local level to influence buying decisions of households and businesses
- Water company activities, either directly funded by the five-year price review or as a consequence of competition and individual company strategies
- Joint funding through energy efficiency schemes (and possibly to integrate with the heat and energy saving strategy).

Currently in the UK, the main funding resource for the delivery of water efficiency measures is the water companies, with some discretionary spending by property owners or landlords. For water neutrality to be achieved, policy shifts may be required in order to increase investment in water efficiency. Possible measures could include:

- Further incentivisation of water companies to reduce leakage and work with customers to reduce demand
- Require water efficient design in new development
- Developer funding to contribute towards encouraging water efficiency measures
- Require water efficient design in refurbishments, when a planning application is made
- Tighter standards on water using fittings and appliances.

4.8 Conclusions

The WRMPs shows a supply-demand deficit around 2024-2026 for the North Staffs and South Staffs WRZs, however both go on to define a number of actions that will address this. Severn Trent Water and South Staffs Water have both commented that they would have adequate water resources for all proposed development sites.

Policies to reduce water demand from new developments, or to go further and achieve water neutrality in certain areas, could be defined to reduce the potential environmental impact of additional water abstractions in Southern Staffordshire, and also help to achieve reductions in carbon emissions.

The decision to adopt water neutrality is a significant step and would require support from water companies, the EA, and regulators, as well as a policy decision from the councils.

On the basis that there is a plan to address the supply-demand deficit, and sufficient time to adapt the long-term plan to include emerging trends in population, no further assessment is recommended as part of a Phase 2 Outline study.

4.9 Recommendations

The recommendations for water resources are provided in Table 4-10 below.

Table 4-10 Recommendations for water resources

Action	Responsibility	Timescale
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.	STW/SSW	Ongoing
Provide yearly profiles of projected housing growth to water companies to inform the WRMP update.	SSCs	Ongoing
Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas.	SSCs	In Local Plan
The concept of water neutrality has potentially a lot of benefit in terms of resilience to climate change and enabling all waterbodies to be brought up to Good status. Explore further with Severn Trent Water and the Environment Agency how the Council's planning and climate change policies can encourage this approach.	SSCs, EA, STW, SSW	In Local Plans and Climate Change Action Plans
Water companies should advise the SSCs of any strategic water resource infrastructure developments required within the Authority, where these may require safeguarding of land to prevent other type of development occurring.	STW/SSW/SSCs	In Local Plans

5 Water Supply Infrastructure

5.1 Introduction

An increase in water demand due to growth can exceed the hydraulic capacity of the existing supply infrastructure. This is likely to manifest itself as low pressure at times of high demand. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrades 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 systems, smaller scale assets which convey water around settlements to customers. This outline study is focused on the supply infrastructure. It is expected that developers should fund water company impact assessments and modelling of the distribution systems to determine requirements for local capacity upgrades to the distribution systems.

In addition to the work undertaken by water companies, there are opportunities for the local authority and other stakeholders to relieve pressure on the existing water supply system by increasing water efficiency in existing properties. This can contribute to reducing water consumption targets and help to deliver wider aims of achieving water neutrality.

A cost-effective solution can be for local authorities to co-ordinate with water supply companies and "piggyback" on planned leakage or metering schemes, to survey and retrofit water efficient fittings into homes[53]. This is particularly feasible within property owned or managed by the local authorities, such as social housing.

5.2 Methodology

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

5.3 Results

The following response was received from STW:

"Sites will be supplied from our existing water sources (with the exception of the Meece Brook and any other large new town developments). For specific developments some off site reinforcement may be required but this would need to be assessed on a site by site basis once timescales, phasing and actual development numbers are known."

"We are working closely with the Water Infrastructure Group (with Housing England, EA and Stafford Borough Council) to look into the Meecebrook garden community development. A specific pre-feasibility study will be required for water and waste to undertake a detailed assessment of the water network issues and supply mechanisms such a large new development might face. The government funding allocated to the feasibility for the development needs to cover this work."

South Staffs Water has confirmed that is has capacity available to serve the proposed growth in Southern Staffordshire, and water supply is not expected to be a constraint to development.

53 Water Efficiency Retrofitting: A Best Practice Guide, Waterwise (2009). Accessed online at: http://www.waterwise.org.uk/wp-content/uploads/2018/01/Waterwise-2009_Water-efficiency-Retrofitting_Best-practice.pdf on: 14/08/2019

5.4 Conclusions

Severn Trent Water and South Staffs Water responded to the request to assess the impacts of development on water supply infrastructure. Both STW and SSW 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 study area, detailed modelling of water supply infrastructure will allow any upgrades to be completed without restricting the timing, location or scale of the planned development.

No further analysis of water supply infrastructure is recommended as part of a Phase 2 Outline study.

5.5 Recommendations

Table 5-1 Recommendations for water supply infrastructure

Action	Responsibility	Timescale
Once a preferred options list of sites is developed, undertake network modelling to ensure adequate provision of water supply is feasible	STW/SSW SSCs	As part of the planning process
SSCs and Developers should engage early with STW/SSW to ensure infrastructure is in place prior to occupation.	SSCs STW/SSW Developers	Ongoing

6 Wastewater Collection

6.1 Sewerage undertakers

Severn Trent Water is the Sewerage Undertaker (SU) for the study area. The role of the sewerage undertaker includes the collection and treatment of wastewater from domestic and commercial premises, and in some areas, it also includes the drainage of surface water from building curtilages to combined or surface water sewers. It excludes, unless adopted by the SU, systems that do not connect directly to the wastewater network, e.g. Sustainable Drainage Systems (SuDS) or highway drainage. At present, STW do not adopt SuDS, although this position is likely to change following the implementation of Sewers for Adoption version 8 (see section 3.6.6 for details).

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 as the environmental regulator, may tighten consented effluent consents 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 have combined sewerage systems, where there is potential to discharge surface waters via sustainable drainage systems (SuDS) to groundwater, watercourses or surface water sewers. In some areas of Southern Staffordshire, there are known issues of surface water causing localised flooding. Strategic schemes to provide improved local surface water drainage may be required in such areas, rather than solely relying upon on-site soakaways on brownfield or infill plots.

STW are supportive of the use of SuDS to manage surface water run-off. They recommend that the Drainage Hierarchy is used to direct surface water to natural outfall routes such as infiltration or Watercourse, before utilising sewers, as supported by paragraph 80 of the NPPG. Surface water should also not be permitted to connect to a foul sewer.

6.2 Sewerage System Capacity Assessment

New residential developments add pressure to the existing sewerage systems. An assessment is required to identify the available capacity within the existing systems, and the potential to upgrade overloaded systems to accommodate future growth. The scale and cost of upgrading 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 an increase in its capacity. New infrastructure may be required if, for example, a site is not served by an existing system. Such new infrastructure will normally be secured through private third-party agreements between the developer and utility provider.

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 is normally funded via developer contributions, as third-party arrangements between the developer and utility provider.

6.3 Methodology

Severn Trent Water were provided with GIS shapefiles of potential sites, as well as a list of potential development sites including housing numbers or employment floor space of each site. Using this information, they were asked to assess each site using the range of datasets they hold.

The following red/amber/green traffic light definition was used to score each site/growth area:

Capacity available to serve the proposed growth	Infrastructure and/or treatment work upgrades are required to serve proposed growth, but no significant constraints to the provision of this infrastructure have been identified	Infrastructure and/or treatment upgrades will be required to serve proposed growth. Major constraints have been identified.

Comments were also received on each site.

RAG ratings were used to indicate where proposed development may have a detrimental impact on the performance of the existing public sewerage system taking into account the size of the development proposals. A red RAG score given by STW may reflect the presence of sewer flooding, CSO spills or pollution events in the vicinity of the site, on the assumption that an increase in wastewater flows from development would make those occurrences more likely in the future. It also takes into account the size of the site, with larger sites more likely to exacerbate existing issues in the network.

A red assessment does not reflect a "showstopper" and STW have a statutory duty to serve new development under the Water Industry Act 1991 – but they highlight areas where significant new infrastructure or network reinforcement will be required.

An amber assessment indicates where further modelling may be required to understand local capacity in the network, and a green assessment indicates that no constraints have been identified.

Sites that fell below STW's threshold for the size of development were not assessed. Typically, this may be a development of less than ten properties, or in an area of low risk.

It should be noted that this assessment does not replace appropriate assessments or modelling as part of developer engagement with the sewerage undertaker, evidence of which should be demonstrated to the LPA as an application progresses through the planning process.

6.4 Data collection

The following datasets were to assess the sewerage system capacity:

- Locations of promoted sites in GIS format (provided by SSCs)
- Site tracker spreadsheet (see Appendix A)
- Wastewater catchments (provided by Severn Trent Water)

6.5 Results – foul sewer network assessment

Sections 6.5.1 to 6.5.5 summarise the results of the RAG assessments for each of the Southern Staffordshire Councils. STW's comments regarding the foul sewerage network

capacity for each site can be found in the site tracker spreadsheet in Appendix A. Where sites were overlapping, only the larger site with the highest water demand has been considered in Table 6-1 to Table 6-6, however Appendix A shows the RAG assessments for all sites.

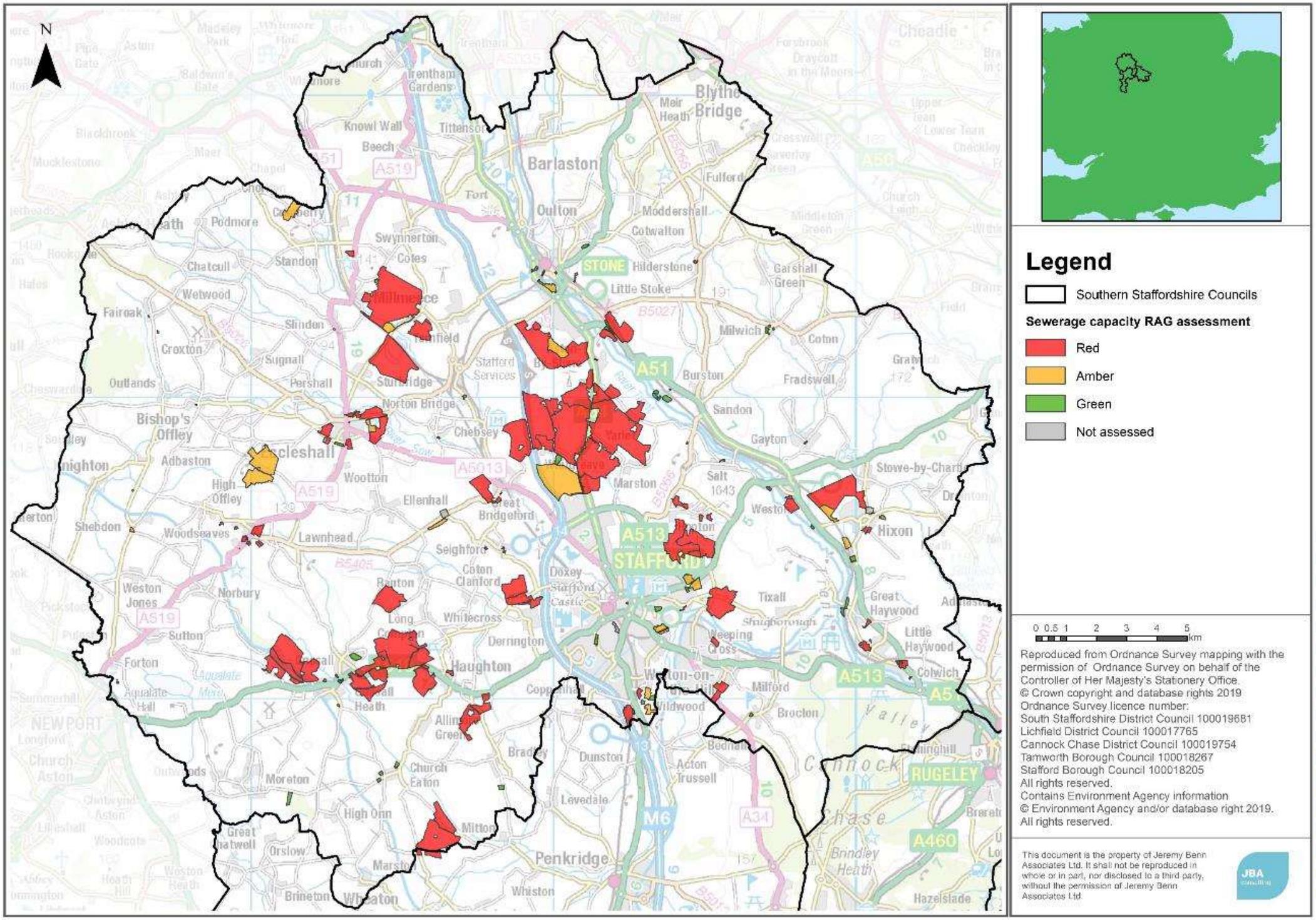
6.5.1 Stafford Borough

A red rating was given by STW to the majority of sites in Stafford Borough. This reflects the large number of houses in a limited area that does not currently have the wastewater infrastructure to accommodate the additional flows. Further analysis would be required by Severn Trent for all sites to confirm their feasibility. 4,228 houses need to come forwards from Stafford Borough's sites to assess to meet the housing need, therefore this cannot be met by green sites only, and engagement between the Council and STW would be needed to determine where infrastructure upgrades could be possible to accommodate the necessary growth from amber and red rated sites.

Table 6-1 Stafford Borough sewerage capacity RAG results

RAG rating	Total potential number of houses	Total potential employment floorspace (m^2)
Red	51,852	38,119
Amber	3,442	839,685
Green	1,462	44,457
Not assessed	378	33,780

Figure 6-1 Stafford Borough sewerage capacity RAG results



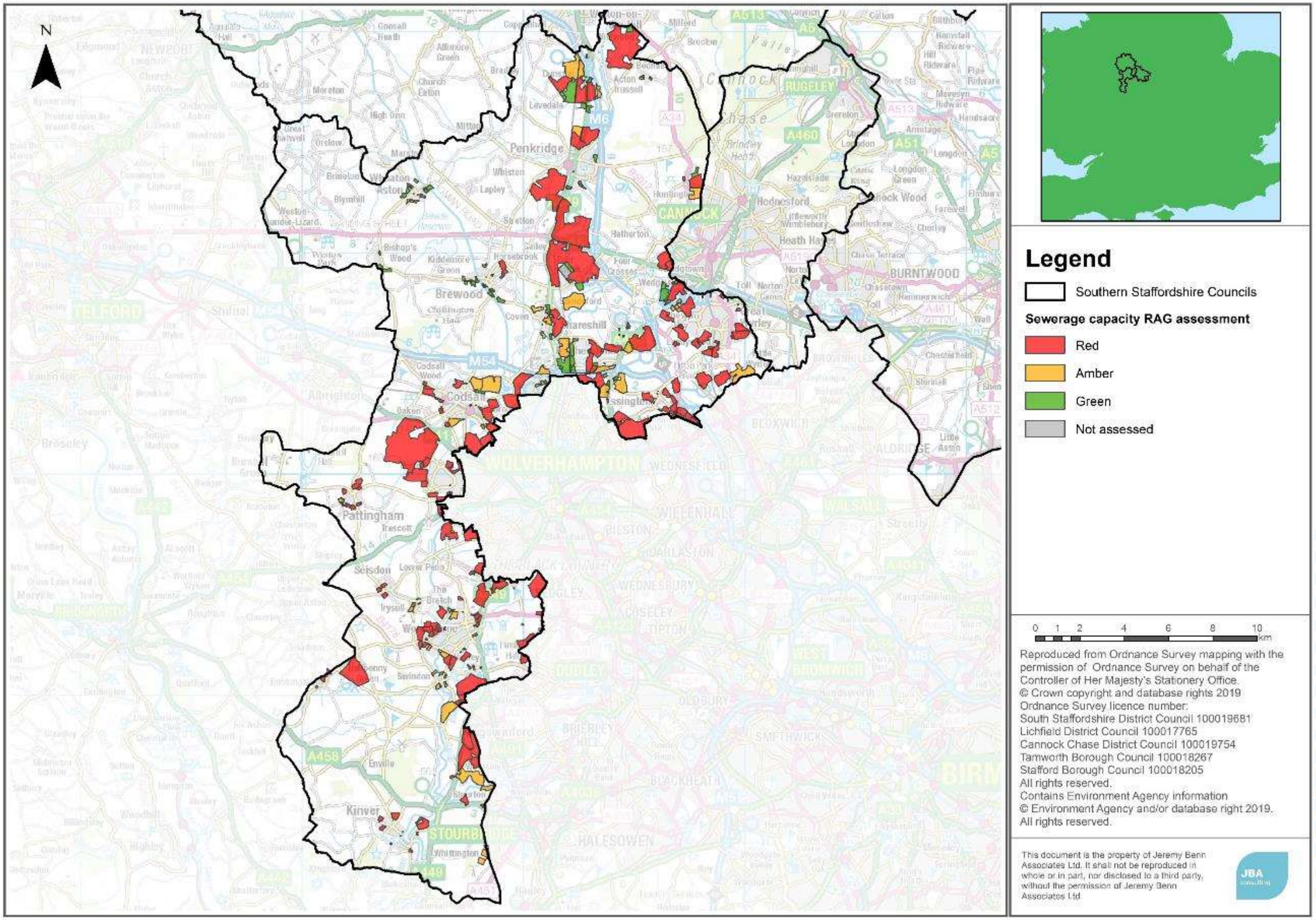
6.5.2 South Staffordshire District

A red rating was given by STW to the majority of sites in South Staffordshire District. This reflects the large number of houses in a limited area that does not currently have the wastewater infrastructure to accommodate the additional flows. Further analysis would be required by Severn Trent for all sites to confirm their feasibility. 2,433 houses need to come forward from South Staffordshire District's sites to assess to meet the housing need, therefore all of South Staffordshire's housing need could be met by green sites, however engagement between the Council and STW would be needed to determine where infrastructure upgrades could be possible to accommodate the necessary growth from amber and red rated sites, if required.

Table 6-2 South Staffordshire District sewerage capacity RAG results

RAG rating	Total potential number of houses	Total potential employment floorspace (m^2)
Red	48,396	837,924
Amber	8,491	881,007
Green	3,997	561,591
Not assessed	164	22,343

Figure 6-2 South Staffordshire District sewerage capacity RAG results



6.5.3 Lichfield District

A red rating was given by STW to the majority of sites in Lichfield District. This reflects the large number of houses in a limited area that do not currently have the wastewater infrastructure to accommodate the additional flows. Further analysis would be required by Severn Trent Water for all sites to confirm their feasibility. 5,579 houses need to come forward from Lichfield District's sites to assess to meet the housing need, therefore this could be met by sites given a green RAG rating, however engagement between the Council and STW would be needed to determine where infrastructure upgrades could be possible to accommodate the necessary growth from amber and red rated sites, if required.

Table 6-3 Lichfield District sewerage capacity RAG results

RAG rating	Total potential number of houses	Total potential employment floorspace (m^2)
Red	26,747	251,280
Amber	14,692	163,472
Green	9,062	111,108
Not assessed	11,768	255,624

Lichfield have set out preferred strategic options for growth focussing residential and employment development around some of the main urban areas in the district.

Employment growth has been proposed in the following areas:

- East Lichfield
- East Burntwood
- South-west of Fradley

Residential growth has been proposed in the following areas:

- Armitage with Handsacre
- Kings Bromley
- Alrewas
- Fradley
- Lichfield
- Whittington
- Hopwas
- Fazeley, Mile Oak and Bonehill
- Shenstone
- Little Aston
- Stonnal
- Burntwood

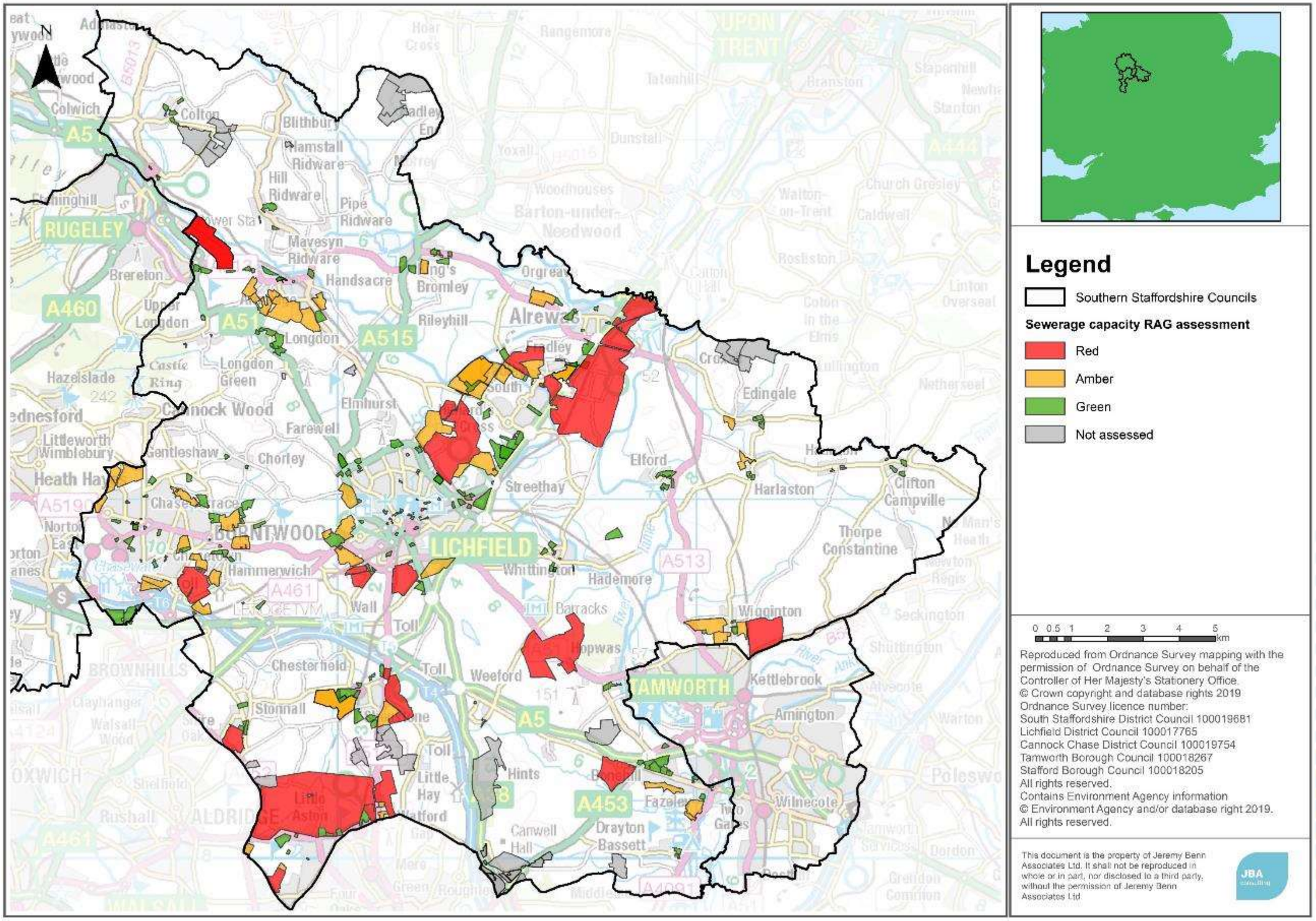
Severn Trent's RAG assessment results have been considered by each of the preferred growth areas in Table 6-4. Note that the growth area boundaries have not been defined in detail and therefore for the purpose of this assessment, the entire urban area for each of the preferred growth areas was used.

Table 6-4 Lichfield District sewerage capacity RAG results by preferred growth area

Preferred area for residential growth	Total number of dwellings by RAG result			
	Red	Amber	Green	Not assessed
Armitage with Handsacre	0	2,412	251	7
Kings Bromley	0	133	337	11
Alrewas	0	0	91	6
Fradley	767	772	241	0
Lichfield	940	1,765	1,602	325
Whittington	0	0	198	17
Hopwas	0	0	70	14
Fazeley, Mile Oak and Bonehill	970	380	675	17
Shenstone	1000	756	615	0
Little Aston	315	115	320	0
Stonnall	565	0	174	0
Burntwood	1,111	3,187	1,099	110

A number of red and amber sites exist in some of the preferred growth option areas. Early engagement with Severn Trent will be required if Lichfield District Council need to develop any of the red or amber rated sites. It is also recommended that this assessment is revisited when the Council have a list of preferred sites, rather than just growth areas.

Figure 6-3 Lichfield District sewerage capacity RAG results



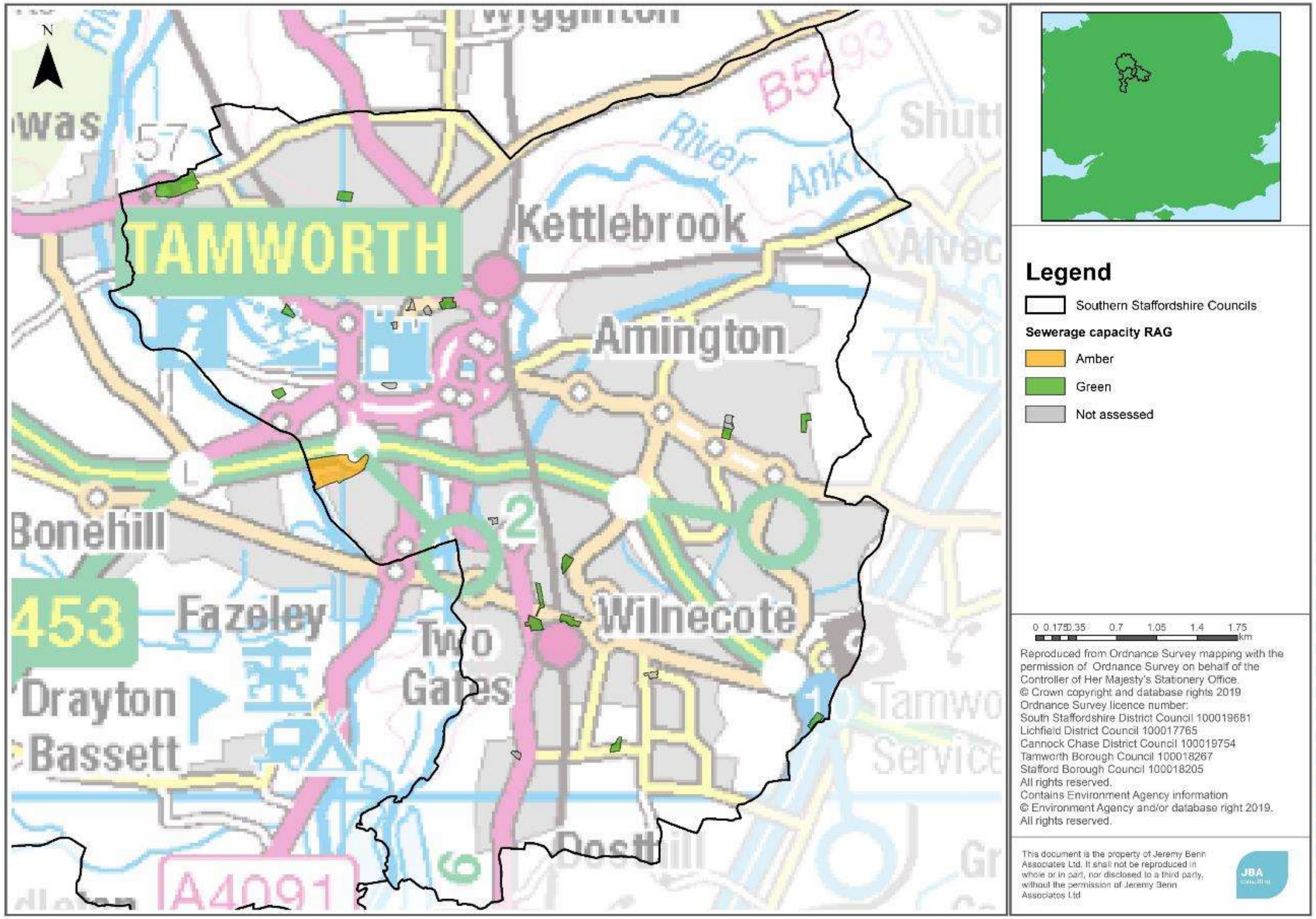
6.5.4 Tamworth Borough

The majority of Tamworth's sites were given a green rating. Engagement between the Council and STW would be needed to determine where infrastructure upgrades could be possible to accommodate the necessary growth from amber rated sites, if required.

Table 6-5 Tamworth Borough sewerage capacity RAG results

RAG rating	Total potential number of houses	Total potential employment floorspace (m^2)
Red	0	0
Amber	0	59,107
Green	435	24,439
Not assessed	143	7,058

Figure 6-4 Tamworth Borough sewerage capacity RAG results



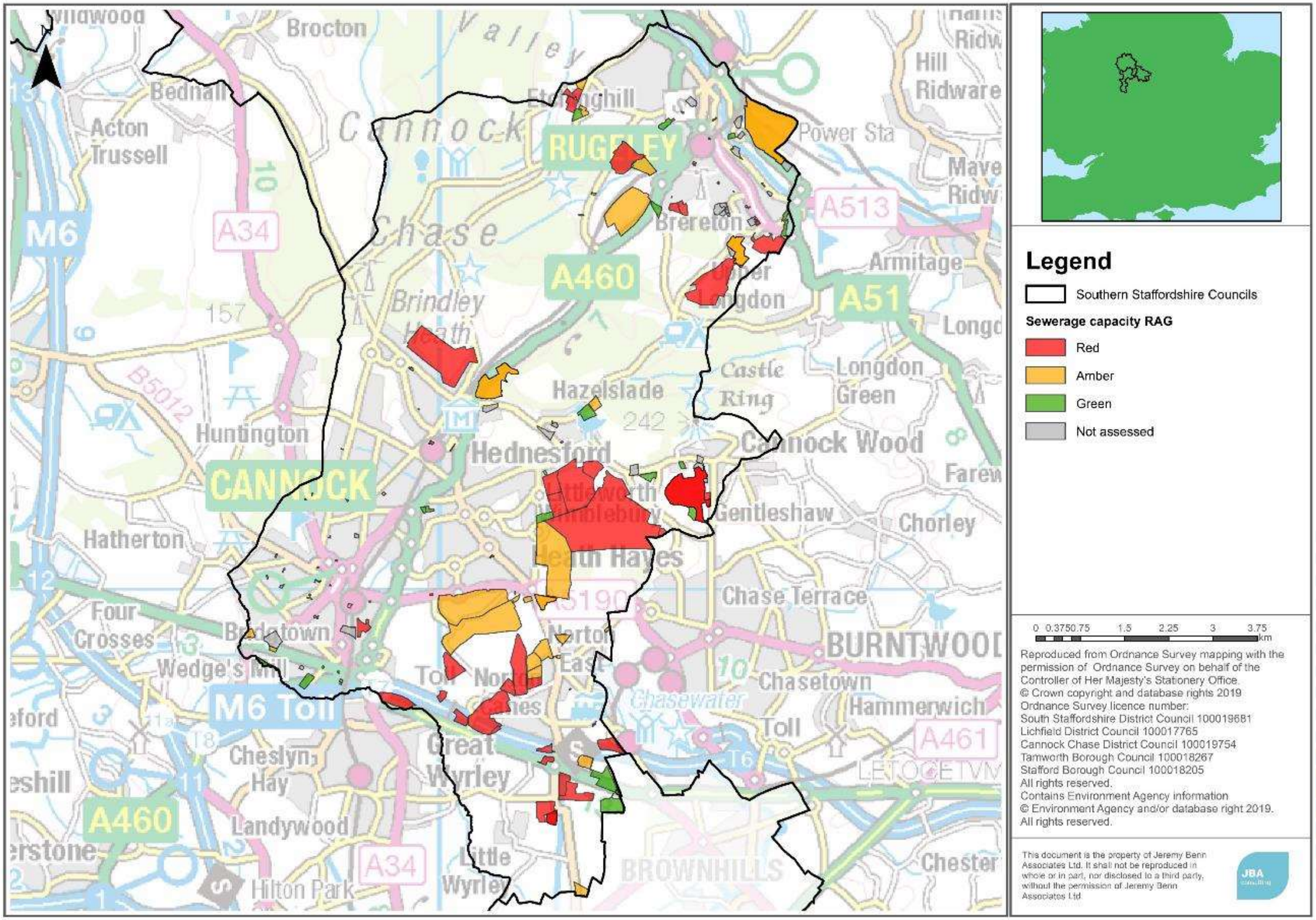
6.5.5 Cannock Chase District

A red rating was given by STW to the majority of sites in Cannock Chase District. This reflects the large number of houses in a limited area that does not currently have the wastewater infrastructure to accommodate the additional flows. Further analysis would be required by Severn Trent for all sites to confirm their feasibility. 4,187 houses need to come forwards from Cannock Chase District's "sites to assess" to meet the maximum OAN, therefore not all of Cannock Chase District's housing need could be met by green sites only. Engagement between the Council and STW would therefore be needed to determine where infrastructure upgrades could be possible to accommodate the necessary growth from amber and red rated sites, if required.

Table 6-6 Cannock Chase District sewerage capacity RAG results

RAG rating	Total potential number of houses	Total potential employment floorspace (m^2)
Red	8,553	715,974
Amber	3,983	93,001
Green	761	36,352
Not assessed	889	33,804

Figure 6-5 Cannock Chase District sewerage capacity RAG results



6.6 Conclusions

Development in areas where there is limited wastewater network capacity will increase pressure on the network, increasing the risk of a detrimental impact on existing customers, and increasing the likelihood of CSO operation. Early engagement with Severn Trent Water is required, and further modelling of the network may be required at the planning application stage. Furthermore, in STW networks, there are areas where the current network is a combined sewer system, and further separation of foul and surface water may be required, as well as suitably design SuDS.

The results show that some of each Council's housing need can be met by sites rated as green, however the Councils should consult with STW to understand whether infrastructure upgrades would be possible for amber and red rated sites, to accommodate the required growth.

Further study of the wastewater network is recommended as part of a Phase 2 Outline as the Local Plans develop and the SSCs have greater certainty over which sites will be brought forward for development.

6.7 Recommendations

Table 6-7 Recommendations from wastewater network assessment

Action	Responsibility	Timescale
Early engagement between the SSCs and STW is required to ensure that where strategic infrastructure is required, it can be planned in by STW.	SSCs STW	Ongoing
Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker	SSCs STW	Ongoing
Developers will be expected to work with the sewerage undertaker closely and early in the planning promotion process to develop an outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets/upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. 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 demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA.	Developers LLFA	Ongoing

7 Wastewater Treatment

7.1 Wastewater Treatment Works in Southern Staffordshire

The WwTW serving Southern Staffordshire are all operated by STW and are shown in Figure 7-2. Some of these WwTW serve neighbouring authorities as well as Southern Staffordshire and WwTWs not located in Southern Staffordshire may serve the study area.

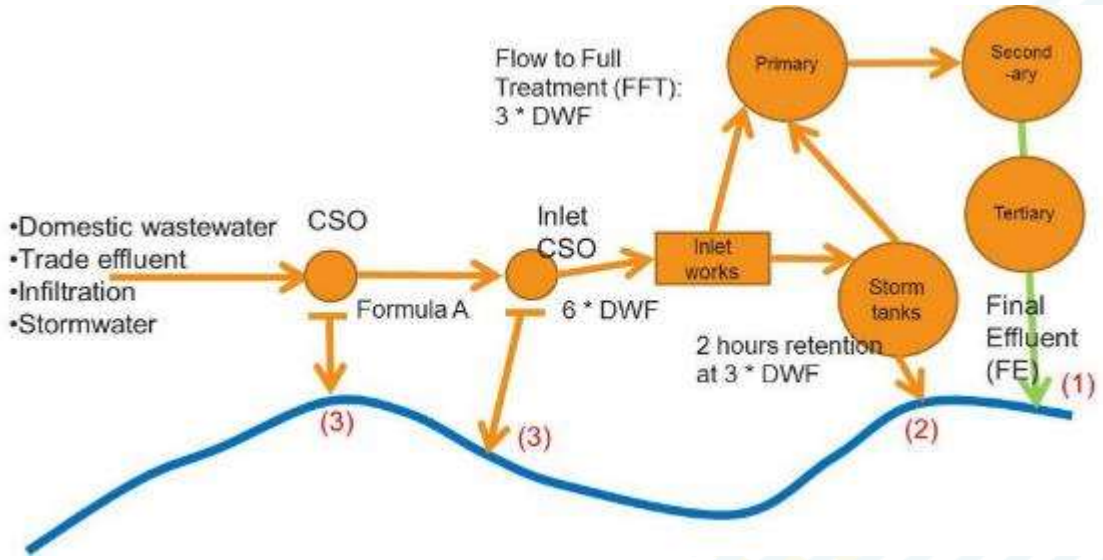
7.2 Wastewater Treatment Works Flow Permit Assessment

7.2.1 Introduction

The Environment Agency 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 7-1 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.

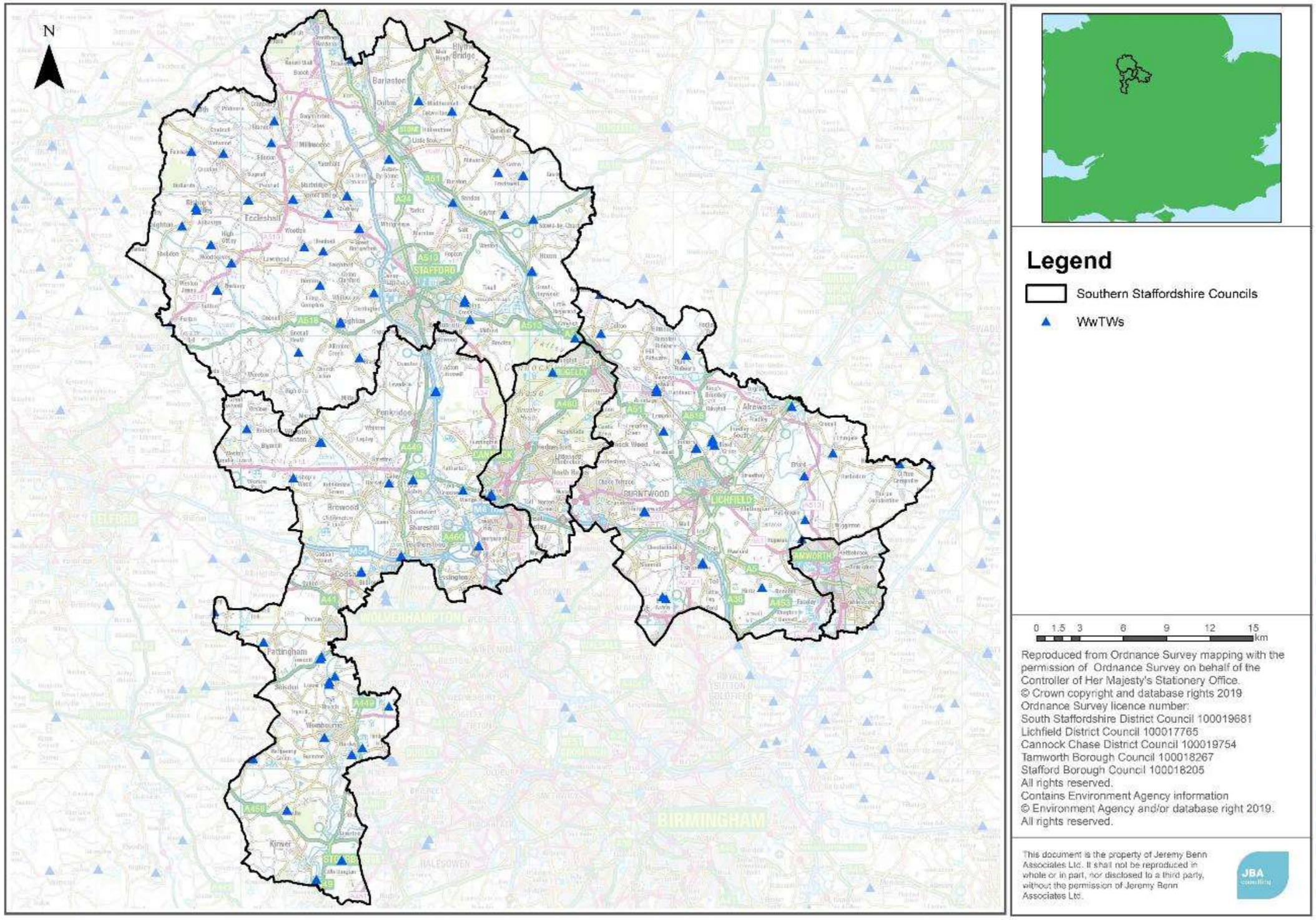
Figure 7-1 Overview of typical combined sewerage system and WwTW discharges



Environmental permits are used alongside water quality limits as a means of controlling the pollutant load discharged from a water recycling centre 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 WwTW 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).

Figure 7-2 Location of WwTWs



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

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

7.3 Methodology

Severn Trent were provided with the proposed sites and the potential housing numbers and employment space for each site (see Appendix A). STW were then invited to provide an assessment of the receiving WwTW and provide any additional comments about the impacts of development.

The STW assessment consists of two factors, the hydraulic capacity of the WwTW (consented flow vs current flow) and the capacity of the WwTW to treat a given load. The assessment may also reflect upgrades already planned at WwTW.

The following red/amber/green traffic light definition was used by Severn Trent Water to score each WwTW:

Capacity available to serve the proposed growth	Infrastructure and/or treatment upgrades will be required to serve proposed growth, but no significant constraints to the provision of this infrastructure have been identified	Infrastructure and/or treatment upgrades will be required to serve proposed growth. Major constraints have been identified.

It should be noted that STW's assessment was conducted assuming 100% of growth at each WwTW as a worst-case scenario. For this reason, STW's results should be considered in conjunction with the results of JBA's WwTW capacity assessment set out below.

A parallel assessment of WwTW capacity was carried out by JBA using measured flow data supplied by the water companies. The process was as follows:

- STW provided their Dry Weather Flow (DWF) statistics calculated as the 20th percentile (80% exceedance flow) for 2015-2018. The flow data was cleaned to remove zero values and low outlier values which would bring the measured DWF down.
- Growth scenarios, potential development sites and existing commitments were assigned to a WwTW using the sewerage drainage area boundaries.
- For each site, the future DWF was calculated using the occupancy rates and per-capita consumption values obtained from the Water Resource Management Plans (Table 7-1), and the assumption that 95% of water used is returned to sewer. Permitted headroom was used as a substitute for actual designed hydraulic capacity for each WwTW being assessed.
- As the capacity of sites proposed by each of the Council's far exceeded their individual OANs, different percentages of growth of the "sites to assess" were analysed, to see what level of growth each WwTW could accommodate.

Table 7-1 Values used in water demand calculations

Water Company	Water Resource Zone	Occupancy rate (persons per dwelling)	Per capita consumption (m^3/person/day)
Severn Trent	Stafford	2.3	0.115
	Wolverhampton	2.1	0.120
	North Staffs	2.2	0.112
	Shelton	2.2	0.116
South Staffs	South Staffs	2.3	0.123

7.4 Results

Table 7-2 below show a summary of the results JBA's assessment as well as any comments from Severn Trent for each WwTW serving potential future growth in Southern Staffordshire. Individual graphs for each WwTW showing the additional DWF from JBA's assessment of WwTW capacity is contained in Appendix B, and a map of the WwTW RAG is shown in

Table 7-2 Summary of WwTW flow assessment

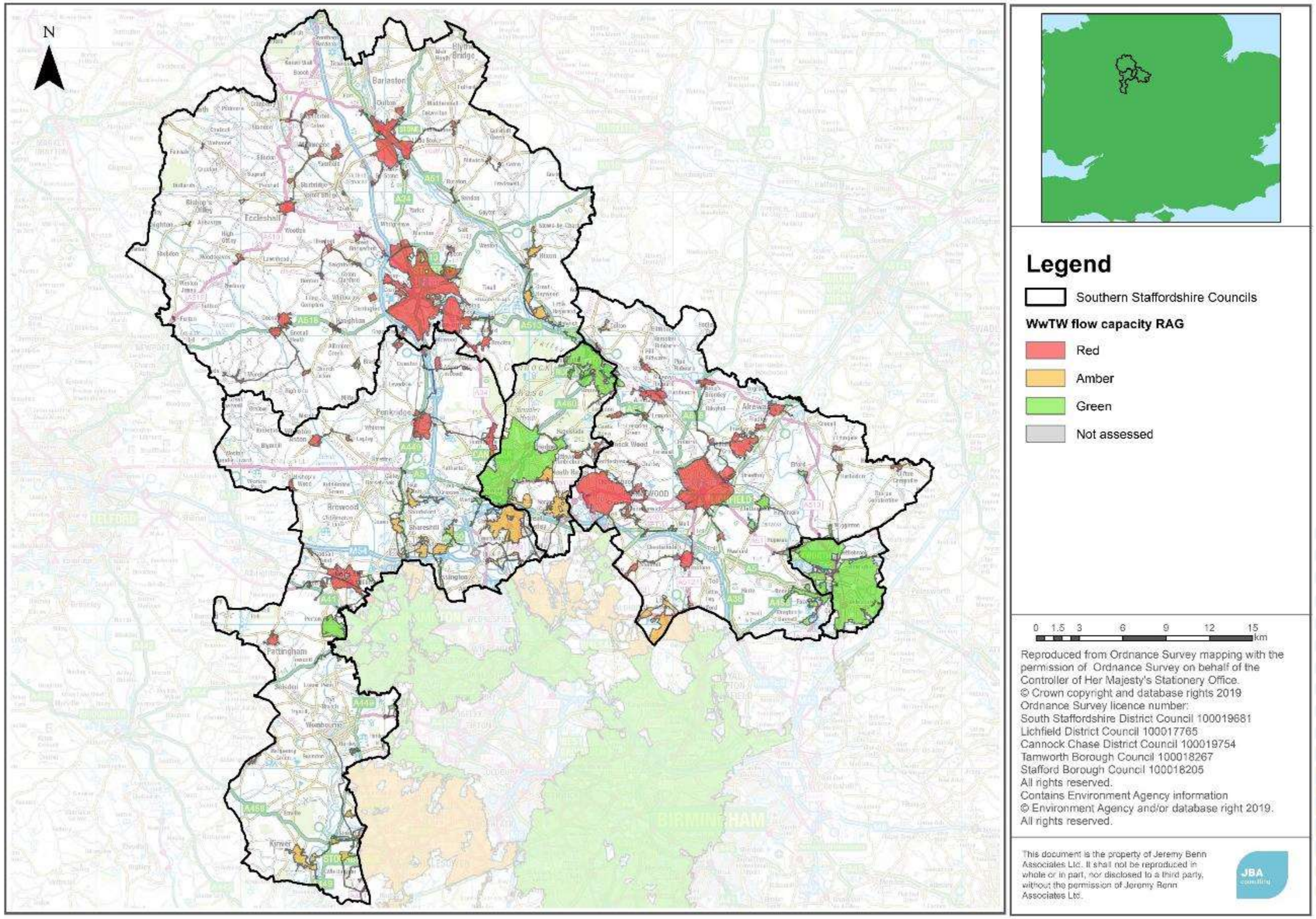
WwTW	Southern Staffordshire Councils that WwTW serves	STW RAG	STW comments	Does DWF flow exceed permitted flow before 2045? (JBA assessment)
Adbaston	Stafford	Not assessed		No
Alrewas	Lichfield	Red		Yes, for 40% and above growth scenarios
Armitage	Lichfield	Red		Yes, for 10% and above growth scenarios
Barnhurst	South Staffordshire	Green		No
Bassetts Pole	Lichfield	Red		Yes, for all growth scenarios
Bishopswood	South Staffordshire	Red		Yes, for 20% and above growth scenarios
Bobbington	South Staffordshire	Red		Yes, for 10% and above growth scenarios
Bradley	Stafford	Green		No
Brancote	South Staffordshire Stafford	Red		Yes, for all growth scenarios
Burntwood	Lichfield Cannock Chase	Red		Yes, for 40% and above growth scenarios
Cannock	South Staffordshire Cannock Chase	Green		No
Chebsey – The Green	Stafford	Amber	Site to be reviewed for flow monitoring when population is >250	Yes, for 80% and above growth scenarios
Clifton Campville	Lichfield	Red		Yes, for 40% and above growth scenarios
Codsall	South Staffordshire	Red		Yes, for 40% and above growth scenarios

WwTW	Southern Staffordshire Councils that WwTW serves	STW RAG	STW comments	Does DWF flow exceed permitted flow before 2045? (JBA assessment)
Colton	Lichfield	Amber		Yes, for 80% and above growth scenarios
Copmere	Stafford	Not assessed		Not assessed – flow statistics not available
Coven Heath	South Staffordshire	Amber		Yes, for 60% and above growth scenarios
Derrington	Stafford	Red		Yes, for 60% and above growth scenarios
Eccleshall and Sturbridge	Stafford	Red		Yes, for 20% and above growth scenarios
Edingale	Lichfield	Red		Yes, for all growth scenarios
Elford	Lichfield	Green		No
Forton	Stafford	Green	Site to be reviewed for flow monitoring when population is >250	No
Gayton – Cherry Lane	Stafford	Green	Site to be reviewed for flow monitoring when population is >250	No
Goscote	Lichfield South Staffordshire Cannock Chase	Amber		Yes, for all growth scenarios
Gospel End	South Staffordshire	Green		No
Great Bridgeford	Stafford	Red		Yes, for 10% and above growth scenarios
Haughton	Stafford	Red		Yes, for all growth scenarios
Himley	South Staffordshire	Green		No
Hixon	Stafford	Amber	AMP7 quality upgrade scheme planned – may address some capacity pressures	Yes, for 80% and above growth scenarios
Kinver	South Staffordshire	Amber		Yes, for 100% growth scenario
Ladfordfields	Stafford	Red		Yes, for 40% and above growth scenarios
Lichfield	Lichfield	Red		Yes, for all scenarios
Little Aston	Lichfield	Amber		Yes, for 100% growth scenario
Lower Gornal	South Staffordshire	Green	AMP7 quality upgrade scheme planned – may address some capacity pressures	No

WwTW	Southern Staffordshire Councils that WwTW serves	STW RAG	STW comments	Does DWF flow exceed permitted flow before 2045? (JBA assessment)
Lysways Lane	Lichfield	Red	Site to be reviewed for flow monitoring when population is >250	Yes, for all scenarios
Milwich	Stafford	Amber	Site to be reviewed for flow monitoring when population is >250	Yes, for 100% growth scenario
Minworth	Lichfield South Staffordshire	Green		No
Norton Bridge	Stafford	Green		No
Pattingham	South Staffordshire	Red		Yes, for 20% and above growth scenarios
Penkridge	South Staffordshire	Red		Yes, for 10% and above growth scenarios
Pirehill	Stafford	Red	AMP7 quality upgrade scheme planned – may address some capacity pressures	Yes, for all growth scenarios
Ranton	Stafford	Red	Site to be reviewed for flow monitoring when population is >250	Yes, for 40% and above growth scenarios
Roundhill	South Staffordshire	Amber	AMP7 quality upgrade scheme planned – may address some capacity pressures	Yes, for 60% and above growth scenarios
Rugeley	Lichfield Cannock Chase	Green		No
Sandon	Stafford	Red	Site to be reviewed for flow monitoring when population is >250	Yes, for 40% and above growth scenario
Shenstone	Lichfield	Red		Yes, for all growth scenarios
Tamworth	Lichfield Tamworth	Green	AMP7 quality upgrade scheme planned – may address some capacity pressures	No
Trescott	South Staffordshire	Green		No
Walsall Wood	Lichfield Cannock Chase	Green		No
Wetwood	Stafford	Not assessed		Not assessed – flow statistics not available
Wheaton Aston	South Staffordshire Stafford	Red		Yes, for 20% and above growth scenarios
Wood Eaton	Stafford	Red		Yes, for 20% and above growth scenarios

WwTW	Southern Staffordshire Councils that WwTW serves	STW RAG	STW comments	Does DWF flow exceed permitted flow before 2045? (JBA assessment)
Woodseaves	Stafford	Amber	AMP7 quality upgrade scheme planned – may address some capacity pressures	Yes, for 100% growth scenario

Figure 7-3 WwTW flow capacity RAG results



7.5 Preferred growth areas in Lichfield District

As Lichfield have defined potential growth areas, JBA conducted an additional assessment at each of the WwTW serving the growth areas, assuming an additional 100, 500, 1,000 and 5,000 houses at each WwTW. Regardless of the number of potential growth areas served by the WwTW, the number of additional houses were kept constant. The WwTW served by each preferred growth area are:

- Armitage WwTW (Armitage with Handsacre)
- Lichfield WwTW (Kings Bromley and Lichfield)
- Alrewas WwTW (Fradley and Alrewas)
- Tamworth WwTW (Whittington, Fazeley, Mile Oak and Bonehill and Hopwas)
- Shenstone WwTW (Stonnal and Shenstone)
- Little Aston WwTW (Little Aston)
- Burntwood WwTW (Burntwood)

Where a WwTW served more than one of the Southern Staffordshire authorities (Tamworth WwTW also serving Tamworth Borough and Burntwood WwTW also serving Cannock District), Table 2-7 was used to determine the contributing number of houses from the "sites to assess" from Cannock and Tamworth. As 30% of the total number of houses from all of Cannock's sites to assess are needed to come forwards to meet Cannock's OAN, 30% of the total number of houses from Cannock's sites to assess to be served by Burntwood WwTW was assumed for this assessment. The same was applied for Tamworth WwTW, however 0% of Tamworth's houses from sites to assess are needed to come forwards to meet their OAN. A dotted line has been added to the figures for Burntwood and Tamworth WwTW, to show how the flows would shift if 100% of Cannock/Tamworth's "sites to assess" houses came forward.

7.5.1 Alrewas WwTW

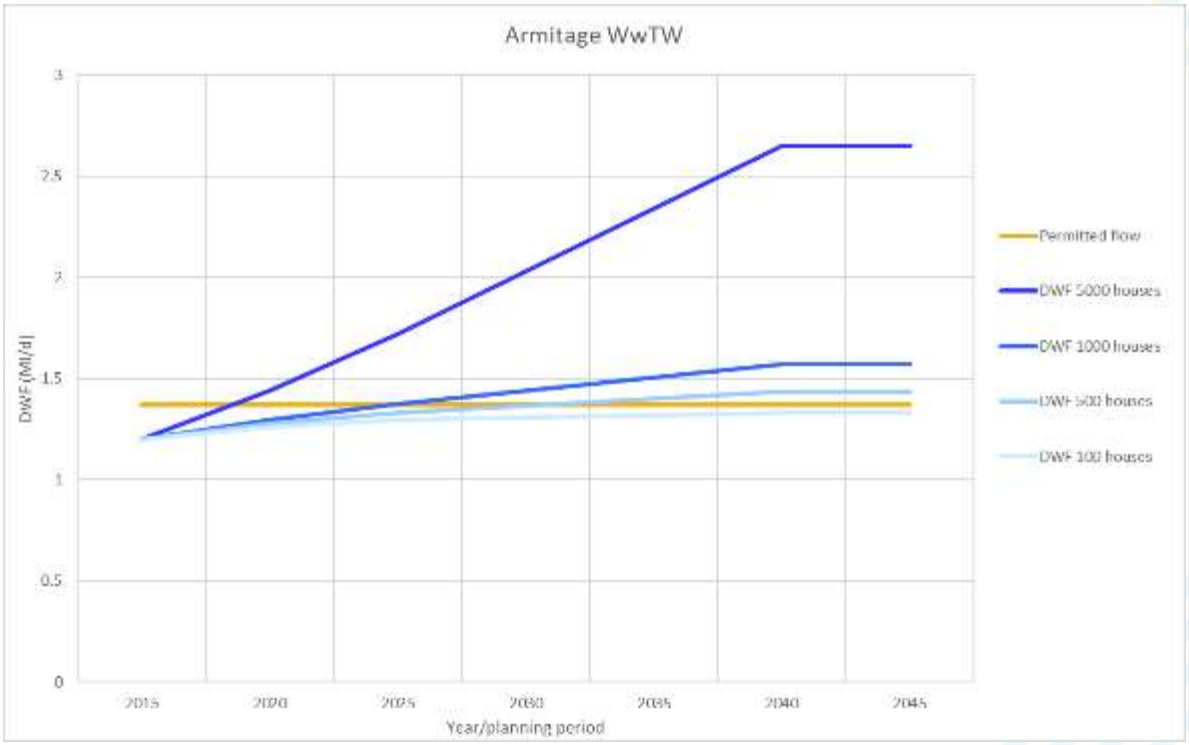
Figure 7-4 shows that Alrewas WwTW could accommodate up to 1,000 houses from the Alrewas and Fradley preferred growth areas, without significant infrastructure upgrades.

Figure 7-4 Flow permit assessment for Alrewas WwTW (Lichfield preferred growth areas)

7.5.2 Armitage WwTW

Figure 7-5 shows that Armitage WwTW could accommodate between 100 and 500 houses from the Armitage with Handsacre preferred growth area, without significant infrastructure upgrades.

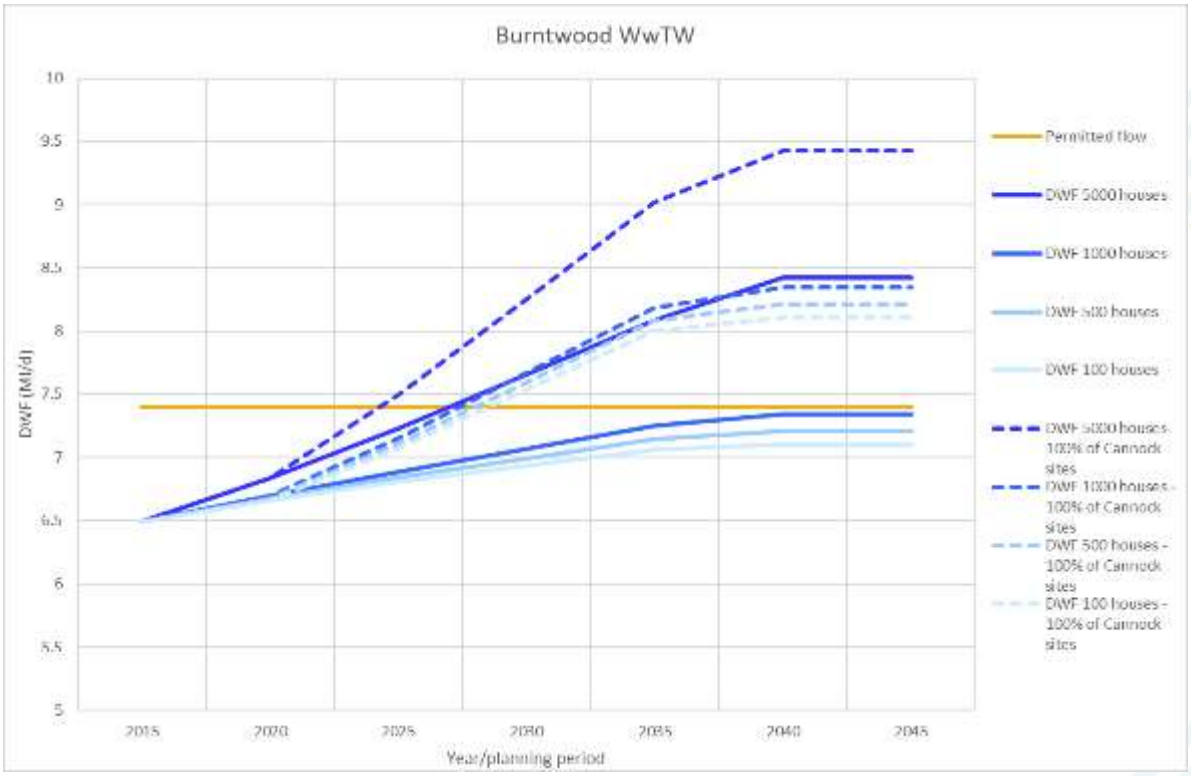
Figure 7-5 Flow permit assessment for Armitage WwTW (Lichfield preferred growth areas)



7.5.3 Burntwood WwTW

Figure 7-6 shows that Burntwood WwTW could accommodate around 1,000 houses from the Burntwood preferred growth area, without significant infrastructure upgrades - assuming that 30% of Cannock's potential housing sites to be served by Burntwood WwTW come forward. If more than 30% of Cannock's sites served by Burntwood WwTW came forward, this could impact the number of houses the WwTW could accommodate from Lichfield.

Figure 7-6 Flow permit assessment for Burntwood WwTW (Lichfield preferred growth areas)



7.5.4 Lichfield WwTW

Figure 7-7 shows that Lichfield WwTW could not accommodate a significant number of new houses from the Kings Bromley and Lichfield preferred growth areas without significant infrastructure upgrades early in the plan period.

Figure 7-7 Flow permit assessment for Lichfield WwTW (Lichfield preferred growth areas)

7.5.5 Little Aston WwTW

Figure 7-8 shows that Little Aston WwTW has significant headroom to accommodate more than 5,000 houses from the Little Aston preferred growth area without significant infrastructure upgrades.

Figure 7-8 Flow permit assessment for Little Aston WwTW (Lichfield preferred growth areas)

7.5.6 Shenstone WwTW

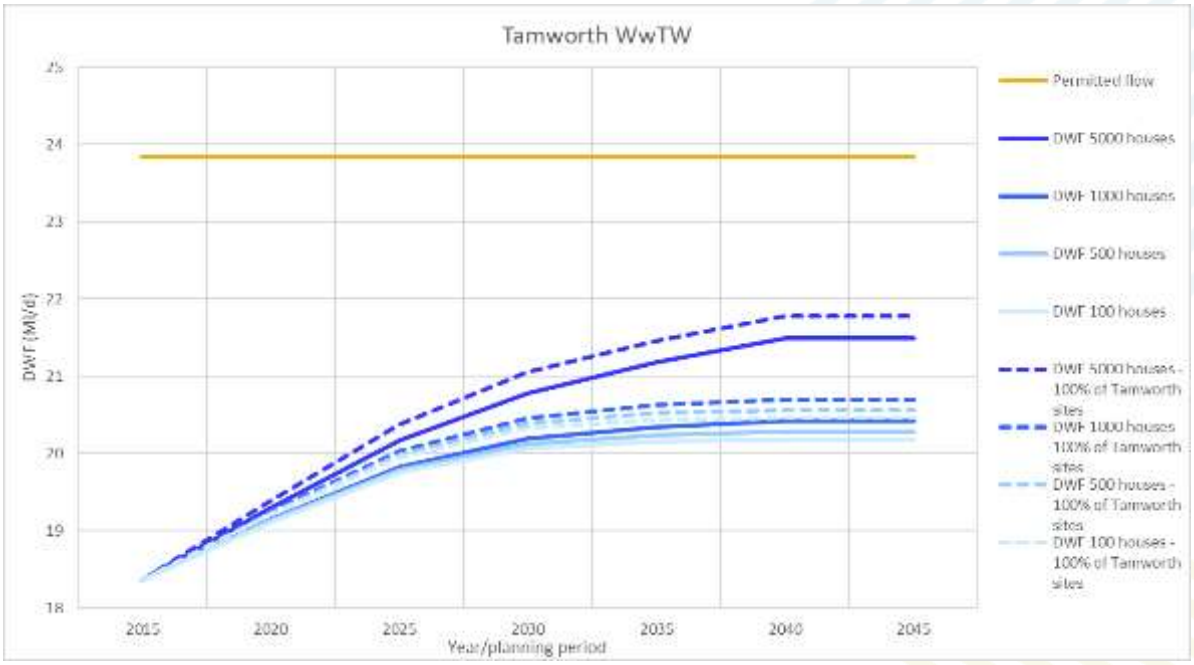
Figure 7-9 shows that Shenstone WwTW is currently exceeding the maximum permitted DWF and therefore significant infrastructure upgrades will be required to accommodate any growth in the Stonnall and Shenstone preferred growth areas.

Figure 7-9 Flow permit assessment for Shenstone WwTW (Lichfield preferred growth areas)

7.5.7 Tamworth WwTW

Figure 7-10 shows that Tamworth WwTW has significant headroom to accommodate more than 5,000 houses from the Whittington, Hopwas and Mile Oak, Fazeley and Bonehill preferred growth areas without significant infrastructure upgrades, regardless of the potential growth in Tamworth.

Figure 7-10 Flow permit assessment for Tamworth WwTW (Lichfield preferred growth areas)



7.6 Conclusions

The results show that the majority of WwTWs can accommodate some level of growth and not exceed their permitted DWF, however there are a small number of WwTW which have already exceeded their permitted DWF or would exceed it with any growth in Southern Staffordshire before 2045. These are Bassets Pole, Brancote, Edingale, Goscote, Haughton, Lichfield, Lysways Lane, Pirehill and Shenstone WwTWs.

Severn Trent scored a large number of WwTW red as part of the WwTW flow capacity RAG assessment, however this was based on 100% of sites coming forward at each WwTW, which is likely to be an overestimate of growth. The RAG results should therefore be used in conjunction with JBA's flow capacity assessment to determine the level of growth that can be accommodated at each WwTW.

Upgrades are currently planned at a number of WwTW, and early engagement with STW is required to ensure that opportunities to accommodate this growth within existing upgrade schemes can be realised.

Once the SSCs have confirmed which sites will be developed**,** and STW have modelled the additional demand, where capacity is not currently available, STW will complete necessary improvements to provide the capacity. They will ensure that their assets have no adverse effect on the environment and that appropriate levels of treatment are provided at each of their sewage treatment works.

A number of sites could not be assigned to a WwTW, where there was no existing public sewerage apparent in the vicinity of the site. A total of 26 houses in Stafford, and 9,930 houses in Lichfield could not be assigned to a treatment works. This again can be considered by Severn Trent Water once the SSCs have confirmed which sites will be developed.

Further study of the wastewater treatment capacity is recommended as part of a Phase 2 Outline study as the Local Plans develop and the SSCs have greater certainty over which sites will be brought forward for development.

7.7 Recommendations

Table 7-3 recommendations for wastewater treatment

Action	Responsibility	Timescale
Consider the available WwTW capacity when phasing development going to the same WwTW.	SSCs STW	Ongoing
Provide Annual Monitoring Reports to STW detailing projected housing growth in each of the Local Authorities.	SSCs	Ongoing
STW to assess growth demands as part of their wastewater asset planning activities and feedback to the Councils if concerns arise.	STW SSCs	Ongoing

8 Odour Assessment

8.1 Introduction

Where new developments encroach upon an existing Wastewater Treatment Works (WwTW), odour from that site may become a cause for nuisance and complaints from residents. Managing odour at WwTWs can add considerable capital and operational costs, particularly when retrofitted to existing WwTWs. National Planning Policy Guidance recommends that plan-makers consider whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, due to the risk of nuisance odour.

8.2 Methodology

Sewerage undertakers recommend that an odour assessment may be required if the site of a proposed development is close to a WwTW and is encroaching closer to the WwTW than existing urban areas. The closest WwTW to each site is determined, along with the distance and direction of the WwTW to that site. The actual odour experienced is dependent on the size of the works, the type of treatment processes present, and the age and condition of the site. There is also significant variation due to current weather conditions.

To take into account the size of the works, the dry weather flow (DWF) was used to calculate an approximate population served by each WwTW and this was used to assign a "trigger" distance. Where the distance between the site and the WwTW is less than the trigger distance, an odour assessment is recommended. The trigger distances used are outlined in Table 8-1.

Table 8-1 Trigger distance assignment

Population served by WwTW	Trigger distance (m)
0-1,000	0
1,001-2,500	50
2,501-5,000	100
5,001-10,000	150
10,001-50,000	300
50,001-100,000	400
>100,000	800

Another important aspect is the location of the site in respect to the WwTW. Historic wind direction records for sites around Southern Staffordshire indicate that the prevailing wind is from west (Cosford Royal Air Force Base) to north northwest (Shawbury) recorded at METAR weather stations[54].

A red/amber/green assessment was applied by JBA:

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

Note that only proximity to WwTWs has been considered; other land uses could potentially cause odour nuisance to new housing, for example some forms of agriculture, industry and waste management.

8.3 Data Collection

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

- Site location in GIS format (provided by SSCs)

54 RenSMART website http://www.rensmart.com/Weather/WindArchive#monthlyLayer accessed on: 14/08/2019

- WwTW locations (from "Consented discharges to controlled waters with conditions" database)
- Site tracker spreadsheet (see Appendix A)

8.4 Results

There are 40 potential development sites throughout Southern Staffordshire that may require an odour assessment. A full list of sites is contained in Table 8-2 to Table 8-6, and shown graphically in Figure 8-1 to Figure 8-6.

Figure 8-1 Sites and odour buffer zones surrounding each WwTW

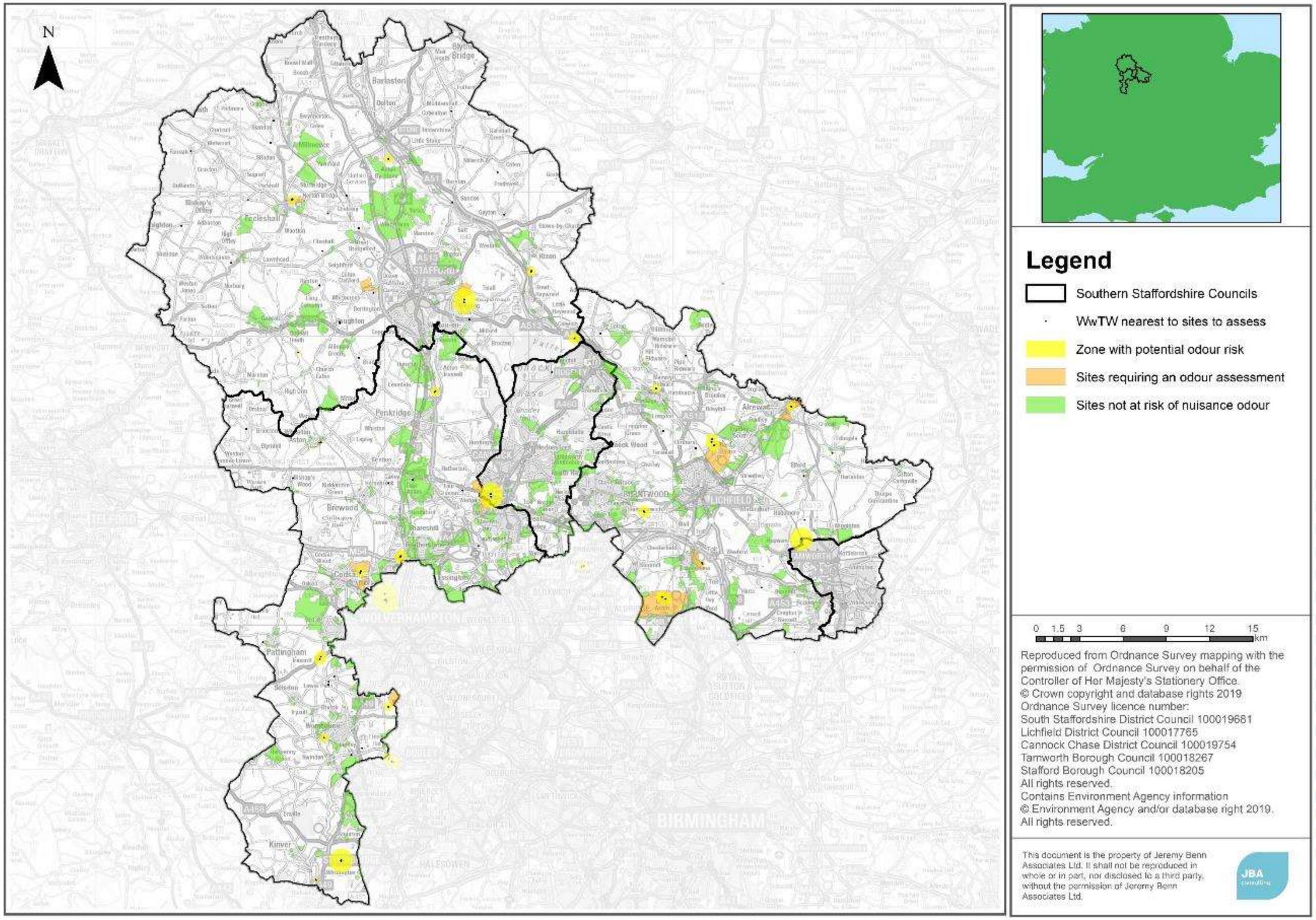


Figure 8-2 Stafford odour assessment

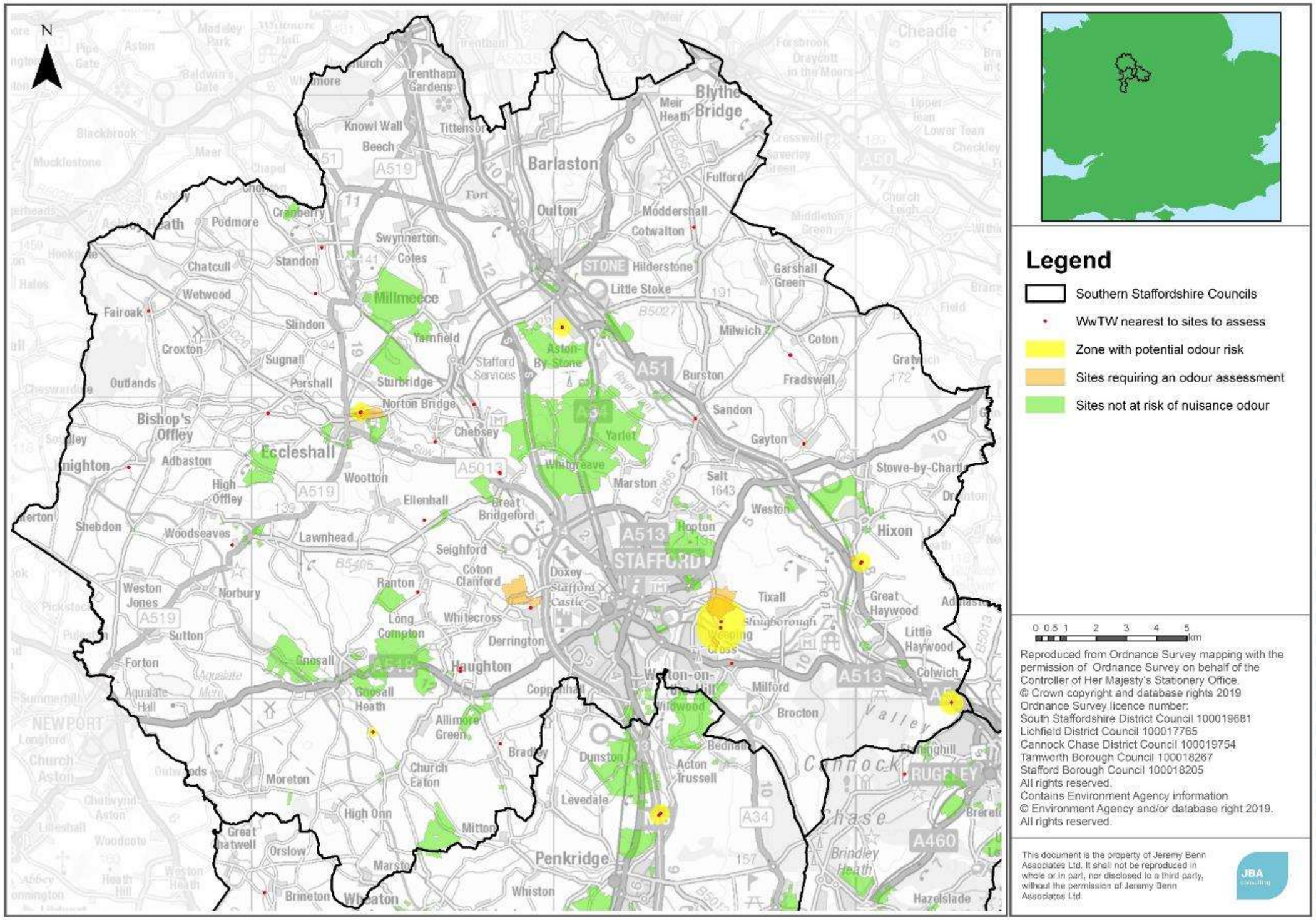


Figure 8-3 South Staffordshire odour assessment

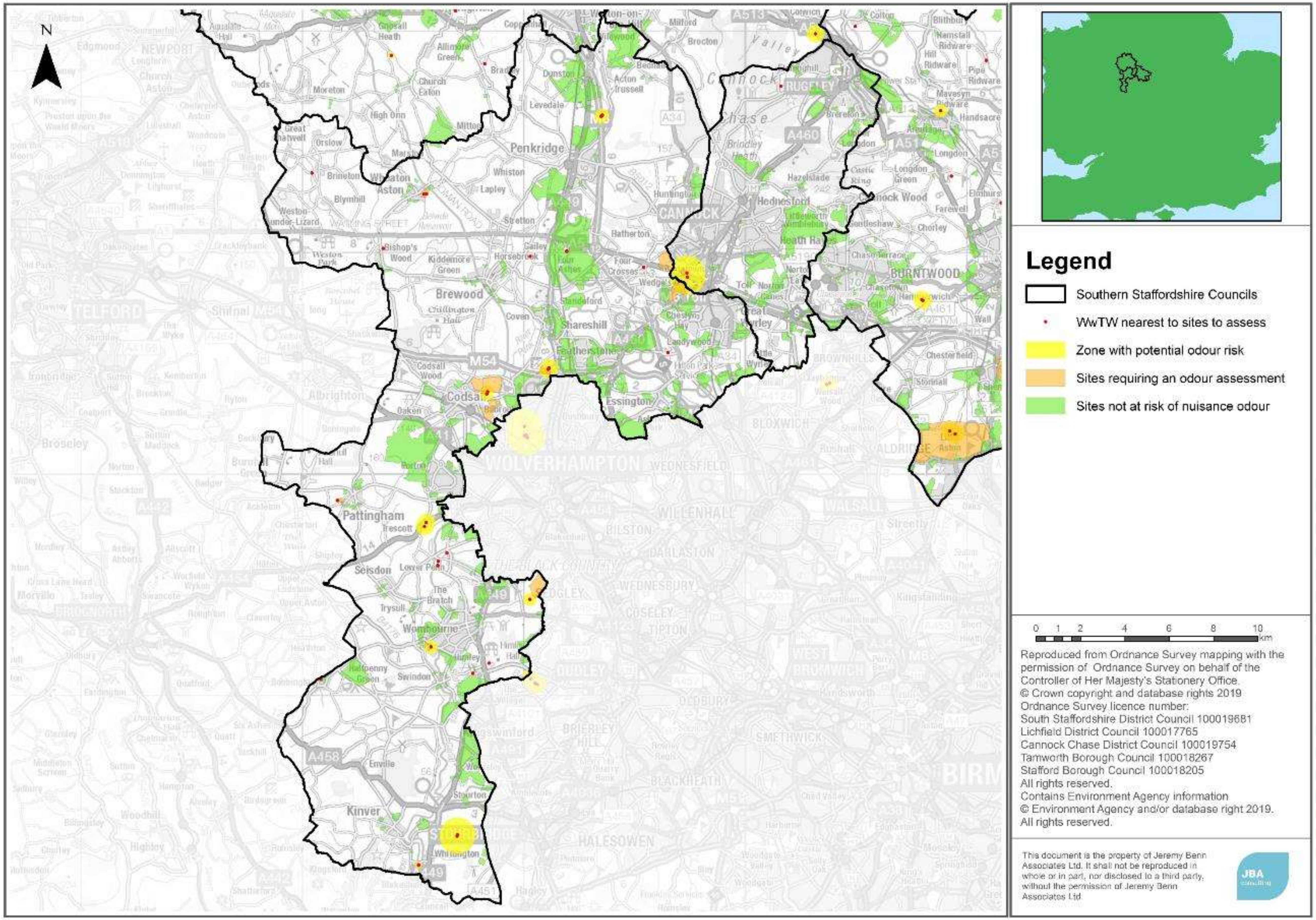


Figure 8-4 Lichfield odour assessment

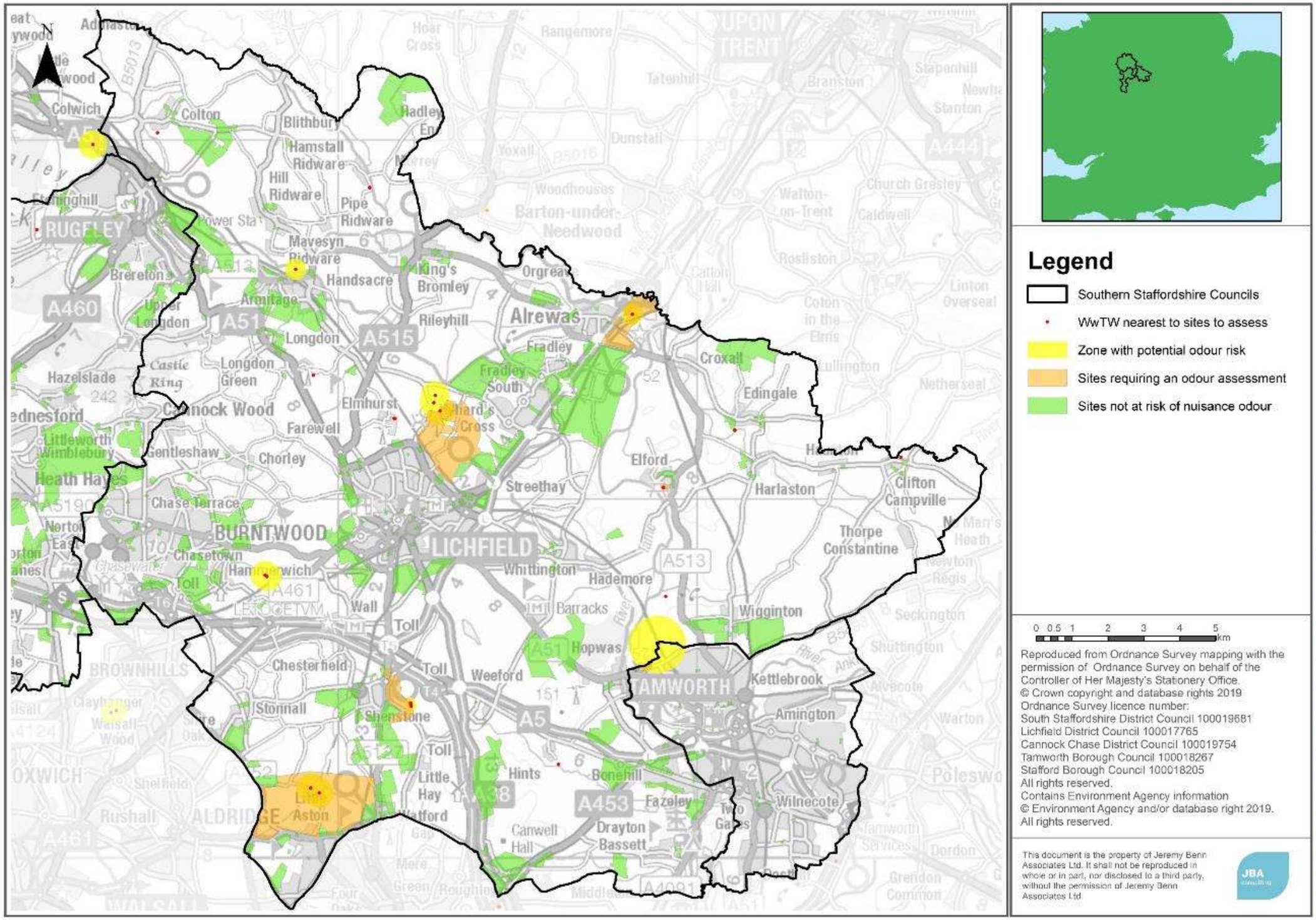


Figure 8-5 Tamworth odour assessment

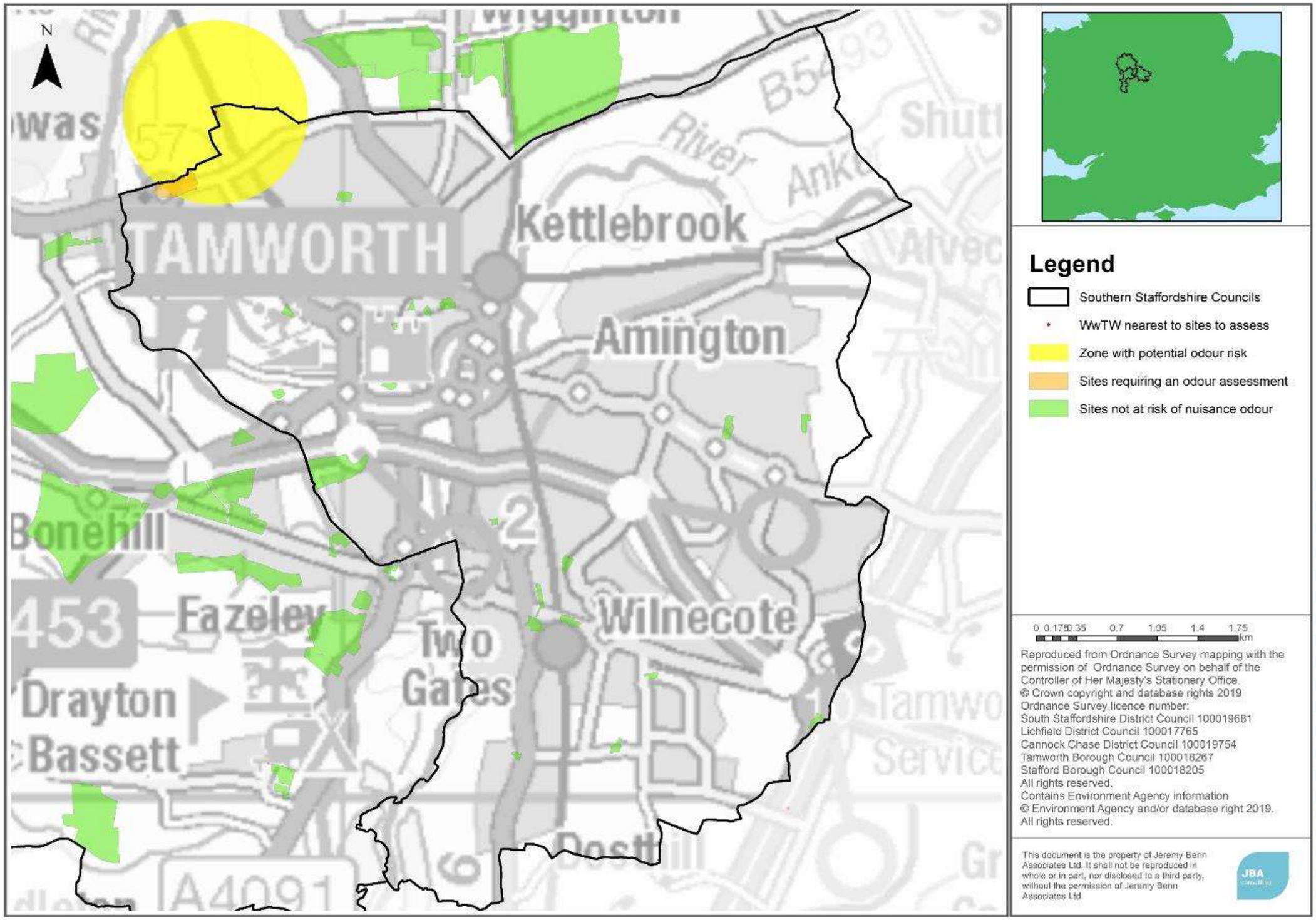


Figure 8-6 Cannock odour assessment

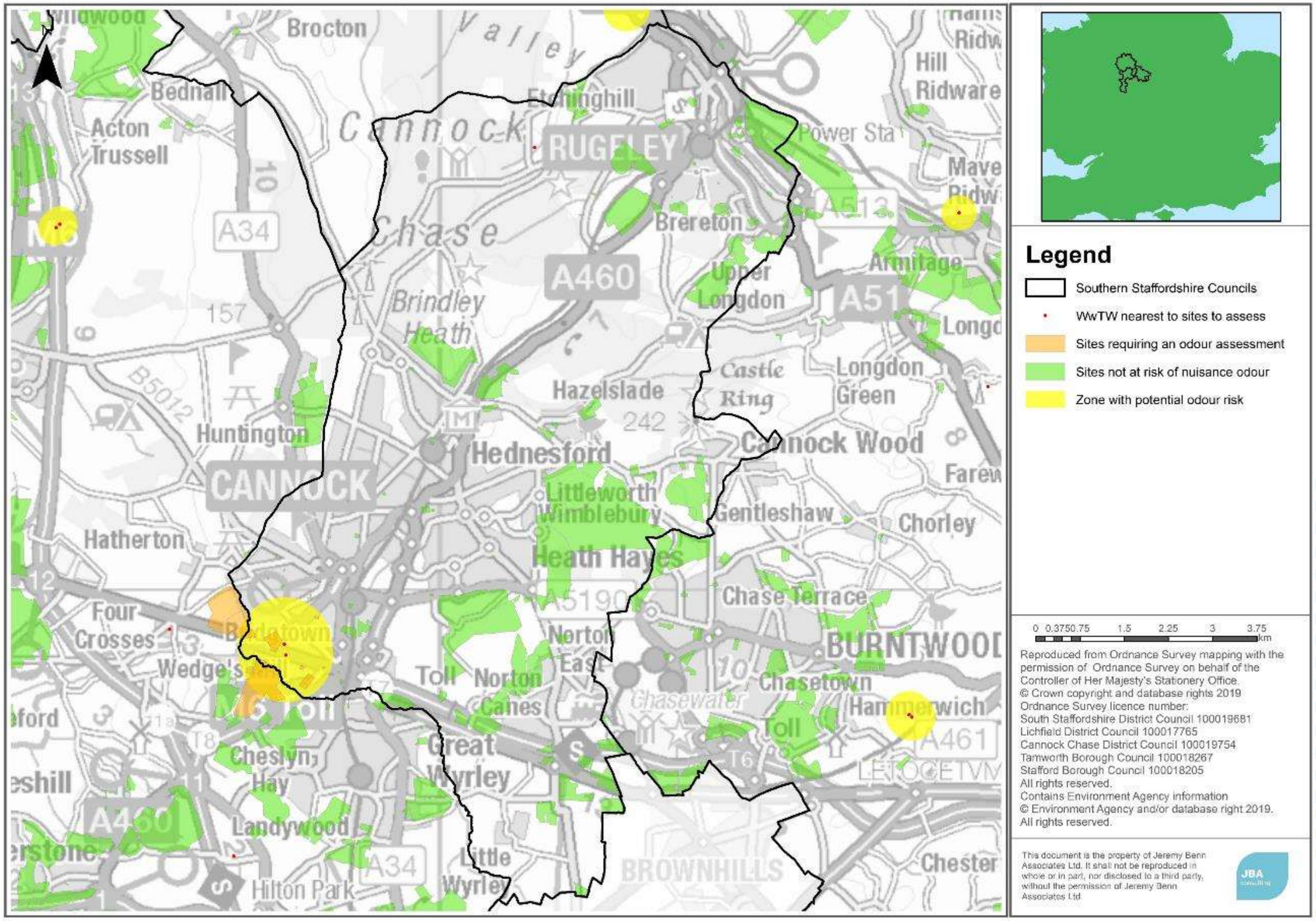


Table 8-2 Stafford sites with potential risk of nuisance odour

WwTW	Site Ref.	Distance from WwTW (m)	Direction to WwTW	Encroaches closer than existing urban area (Y/N)
Eccleshall and Sturbridge	ECC07	82	NW	Y
	ECC12	13	ESE	Y
	ECC18	159	E	Y
Brancote	STAFMB08	384	NE	N
	TIX02	100	SSE	Y
Hixon	HIX11	172	ESE	Y
Derrington	SEI13	14	W	Y

Table 8-3 South Staffordshire sites with potential risk of nuisance odour

WwTW	Site Ref.	Distance from WwTW (m)	Direction to WwTW	Encroaches closer than existing urban area (Y/N)
Codsall	217	293	ESE	N
	218	21	S	Y
	211	85	ESE	Y
	519	280	NNW	N
Cannock	202	368	NNE	N
	474	663	ESE	N
	624	608	ENE	N
	650/E42	267	NE	N
	E54	368	NNE	N
Pattingham	249	61	WSW	Y
Wheaton Aston	382	37	E	Y
	090	58	N	Y
	426b	43	SSW	Y
Gospel End	548	205	SW	Y
Coven Heath	653	0	N	Y

Table 8-4 Lichfield sites with potential risk of nuisance odour

WwTW	Site Ref.	Distance from WwTW (m)	Direction to WwTW	Encroaches closer than existing urban area (Y/N)
Elford	29	8	ESE	Y
Alrewas	373	0	-	Y
Armitage	92/ELAA 29	71	ENE	N
	93	21	NNE	N
Shenstone	378	29	N	Y
Little Aston	379	0	-	Y
	215	158	ENE	Y
Lichfield	32	5	NW	Y
	249	14	N	Y

Table 8-5 Tamworth sites with potential risk of nuisance odour

WwTW	Site Ref.	Distance from WwTW (m)	Direction to WwTW	Encroaches closer than existing urban area (Y/N)
Tamworth	387	554	NNE	N

Table 8-6 Cannock sites with potential risk of nuisance odour

WwTW	Site Ref.	Distance from WwTW (m)	Direction to WwTW	Encroaches closer than existing urban area (Y/N)
Cannock	C270/CE6	492	NW	N
	C121	509	ESE	N
	C119/CE54	267	NNE	N
	C432	44	SE	Y
	C221	654	WNW	N
	C103	678	SW	N
	CE61	142	NE	N
	CE7(f)	313	NW	N

8.5 Conclusions

40 sites are identified as being at risk of nuisance odour and given a RAG rating of amber throughout Southern Staffordshire; 7 in Stafford, 15 in South Staffordshire, 9 in Lichfield, 1 in Tamworth and 8 in Cannock. An odour assessment is recommended as part of the planning process, paid for by developers. The remaining sites have been given a rating of green.

Guidance on the assessment of odour for planning is provided by the Institute of Air Quality Management[55].

No further assessment of odour is recommended as part of a phase 2 WCS. Any future assessment should be carried out as part of the planning process.

8.6 Recommendations

Table 8-7 Recommendations from the odour section

Action	Responsibility	Timescale
Consider odour risk in the sites identified to be potentially at risk from nuisance odour	SSCs	Ongoing
Carry out an odour assessment for 'amber' assessed sites.	Site Developers	Ongoing

[55] Guidance on the assessment of odour for planning, Institute of Air Quality Management, (2014). Accessed online at: http://www.iaqm.co.uk/text/guidance/odour-guidance-2014.pdf on: 06/12/2019

9 Water Quality

9.1 Introduction

An increase in the discharge of effluent from Wastewater Treatment Works (WwTW) as a result of development and growth in the area in which they serve can lead to a negative impact on the quality of the receiving watercourse. Under the Water Framework Directive (WFD), a watercourse is not allowed to deteriorate from its current WFD classification (either as an overall watercourse or for individual elements assessed).

It is Environment Agency (EA) policy to model the impact of increasing effluent volumes on the receiving watercourses. Where the scale of development is such that a deterioration is predicted, a variation to the Environmental Permit (EP) may be required for the WwTW to improve the quality of the final effluent, so that the increased pollution load will not result in a deterioration in the water quality of the watercourse. This is known as "no deterioration" or "load standstill". The need to meet river quality targets is also taken into consideration when setting or varying a permit.

The Environment Agency operational instructions on water quality planning and no-deterioration are currently being reviewed. Previous operational instructions[56] (now withdrawn) set out a hierarchy for how the no-deterioration requirements of the WFD should be implemented on inland waters. The potential impact of development should be assessed in relation to the following objectives:

- **Could the development cause a greater than 10% deterioration in water quality?** This objective is to ensure that all the environmental capacity is not taken up by one stage of development and there is sufficient capacity for future growth.
- **Could the development cause a deterioration in WFD class of any element assessed?** This is a requirement of the Water Framework Directive to prevent a deterioration in class of individual contaminants. The "Weser Ruling"[57] by the European Court of Justice in 2015 specified that individual projects should not be permitted where they may cause a deterioration of the status of a water body. If a water body is already at the lowest status ("bad"), any impairment of a quality element was considered to be a deterioration. Emerging practice is that a 3% limit of deterioration is applied.
- **Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) or Potential?** Is GES possible with current technology or is GES technically possible after development with any potential WwTW upgrades.

9.2 Methodology

A sensitivity analysis is appropriate for the current stage the Local Plan process, indicating wastewater catchments that are sensitive to growth, and providing information to help guide the selection of sites.

The sensitivity of water quality in Southern Staffordshire has therefore been investigated with reference to three key determinands: ammonia, BOD and phosphate. This has been examined at wastewater treatment works across the area to determine the effects of increased effluent flows using the following methodology:

- Run the Environment Agency SIMCAT water quality model as a baseline to assess the current water quality at WwTW
- Increase effluent flows from WwTW by 10% and re-run the model

56 Water Quality Planning: no deterioration and the Water Framework Directive, Environment Agency (2012). Accessed online at: http://www.fwr.org/WQreg/Appendices/No_deterioration_and_the_WFD_50_12.pdf on: 29/10/2018

57 PRESS RELEASE No 74/15, European Court of Justice (2015). Accessed online at: https://curia.europa.eu/jcms/upload/docs/application/pdf/2015-07/cp150074en.pdf on: 23/01/2019

- Compare the water quality indicators and establish the percentage change caused by the increased flows at each sewer catchment

Where a 10% increase in effluent flow results in a high percentage deterioration in water quality, it can be said that the receiving watercourse is sensitive to growth within that wastewater catchment. Where the percentage deterioration in water quality is low in response to the same increase in effluent discharge, it can be said that the receiving watercourse is less sensitive to growth within its wastewater catchment.

Some wastewater catchments do not appear in either of the two water quality models, and so have not been assessed. These are shown as "uncategorised" in the mapping in section 9.3 below.

9.3 Results

9.3.1 Sensitivity analysis

Figure 9-1 below shows the deterioration in ammonia concentration in response to a 10% increase in effluent flows. Six wastewater catchments (coloured red) experience a greater than 10% deterioration in ammonia concentration suggesting they are highly sensitive to growth within those catchments. Eighteen catchments experience a less than 1% deterioration suggesting that these catchments may have environmental capacity for a higher level of development without experiencing a deterioration in water quality.

Figure 9-2 shows the deterioration in BOD resulting from a 10% in effluent flow. It can be seen that in thirteen catchments BOD is actually improved (coloured dark green). This is likely to be where a WwTW is providing a high level of treatment, and the upstream water quality is poor. The remaining assessed catchments do deteriorate, though this never exceeds 10%.

Figure 9-3 shows the deterioration in phosphate concentration in response to an increase in effluent flow. The watercourses in Southern Staffordshire are moderately sensitive to an increased effluent flow with only nine of the categorised catchments experiencing a less than 1% increase in concentration, however none show a deterioration of greater than 10%.

Figure 9-1 Deterioration in ammonia concentration in response to 10% increase in effluent flow

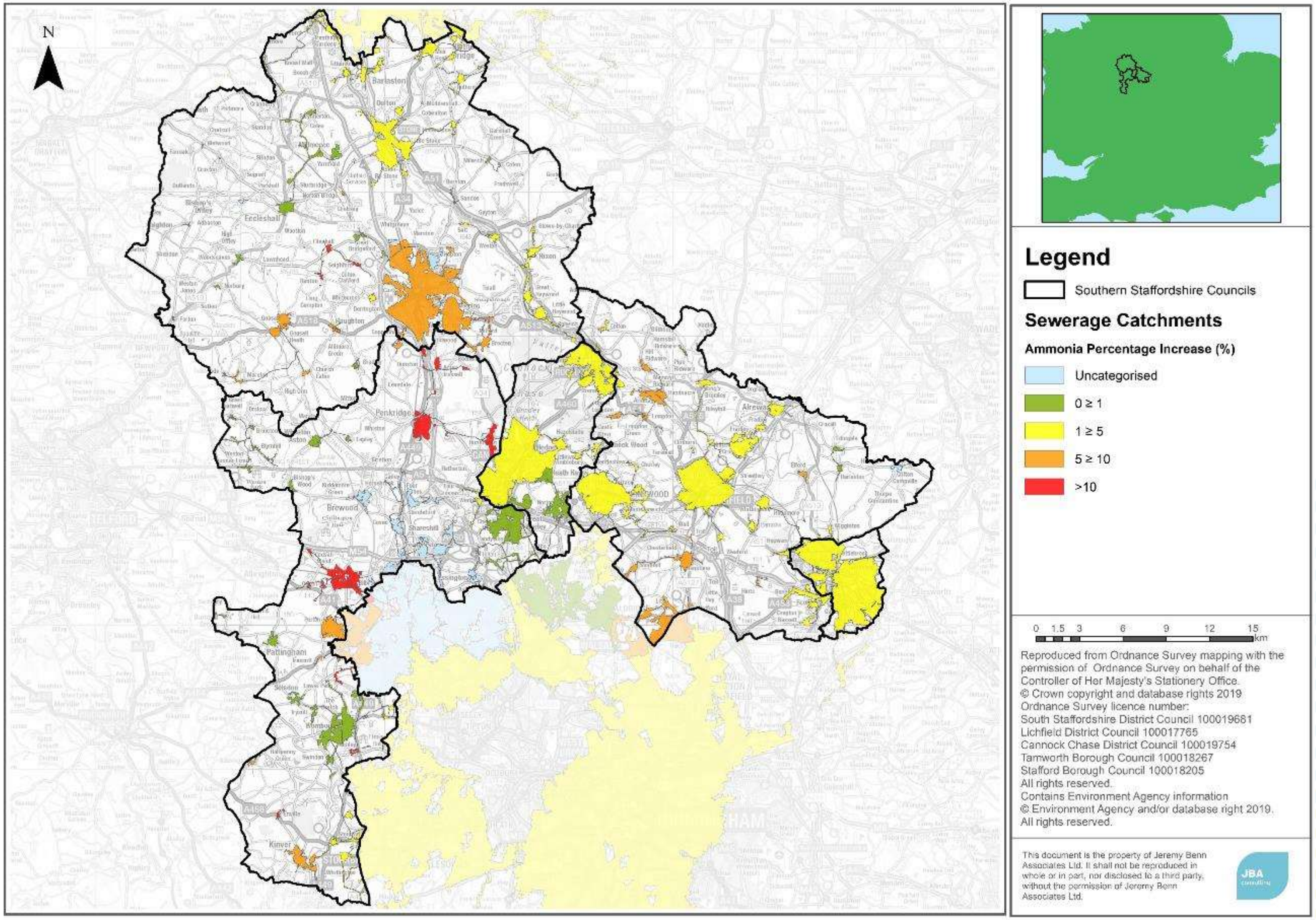


Figure 9-2 Deterioration in BOD concentration in response to 10% increase in effluent flow

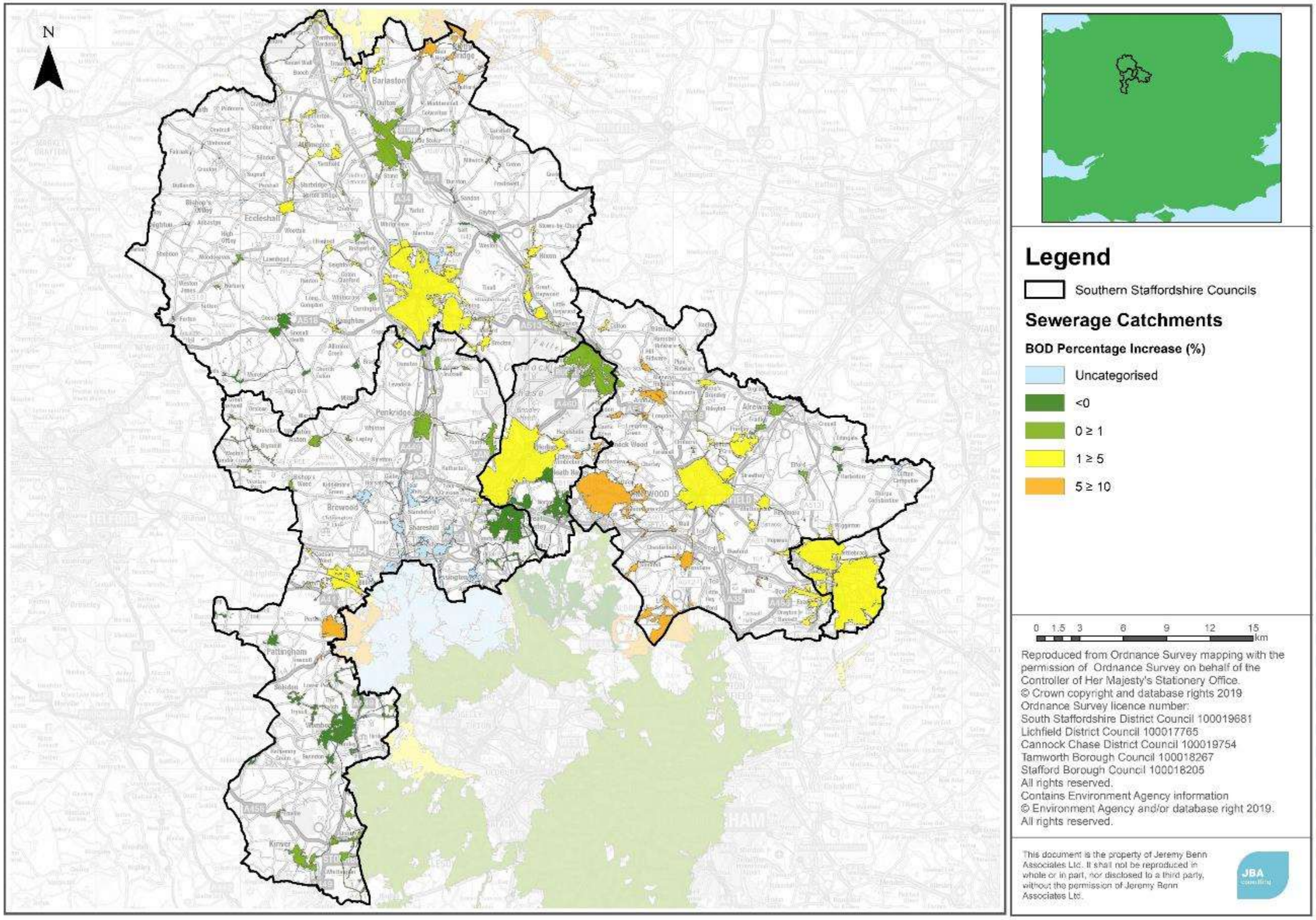
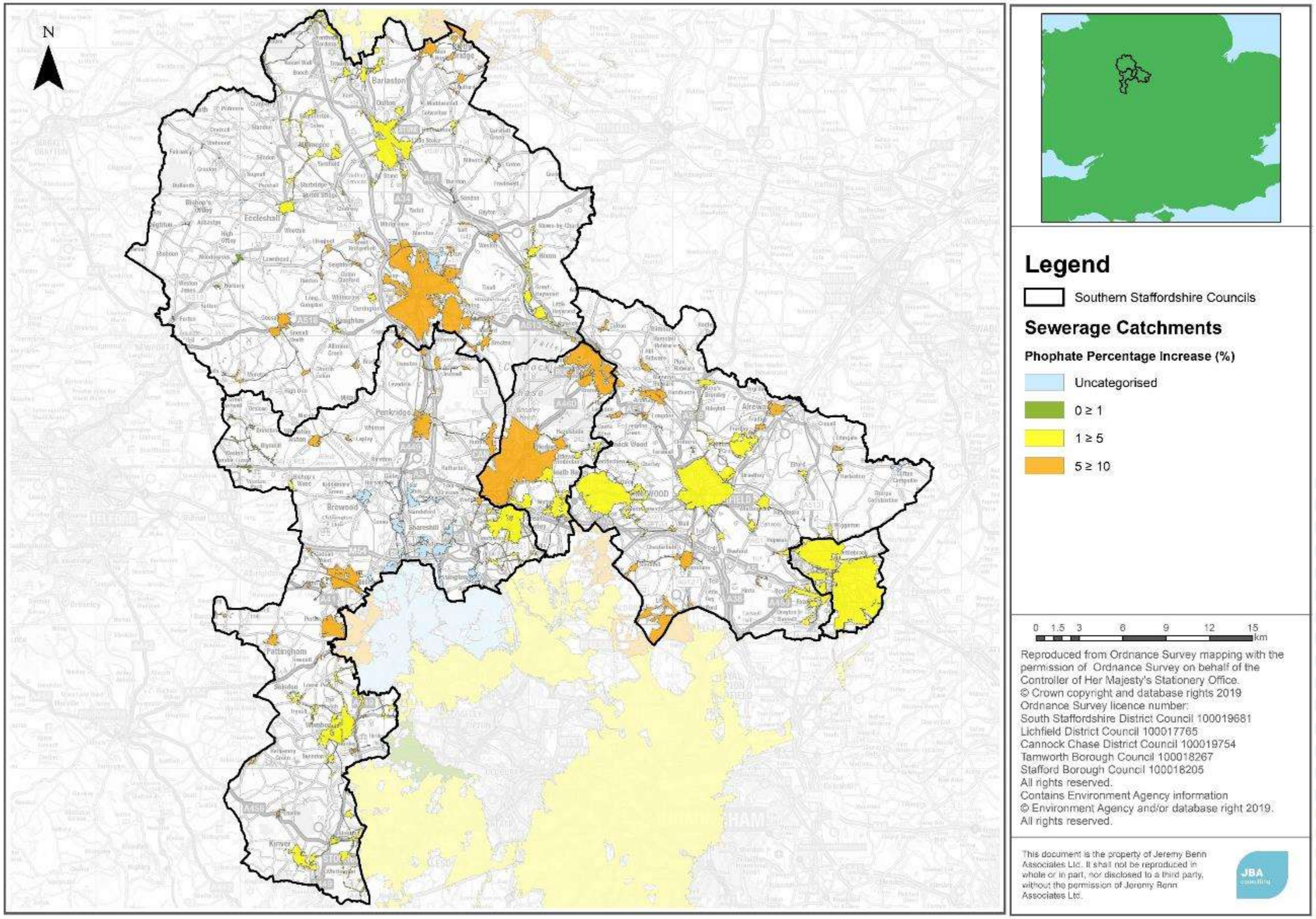


Figure 9-3 Deterioration in phosphate concentration in response to 10% increase in effluent flow



9.3.2 Overview

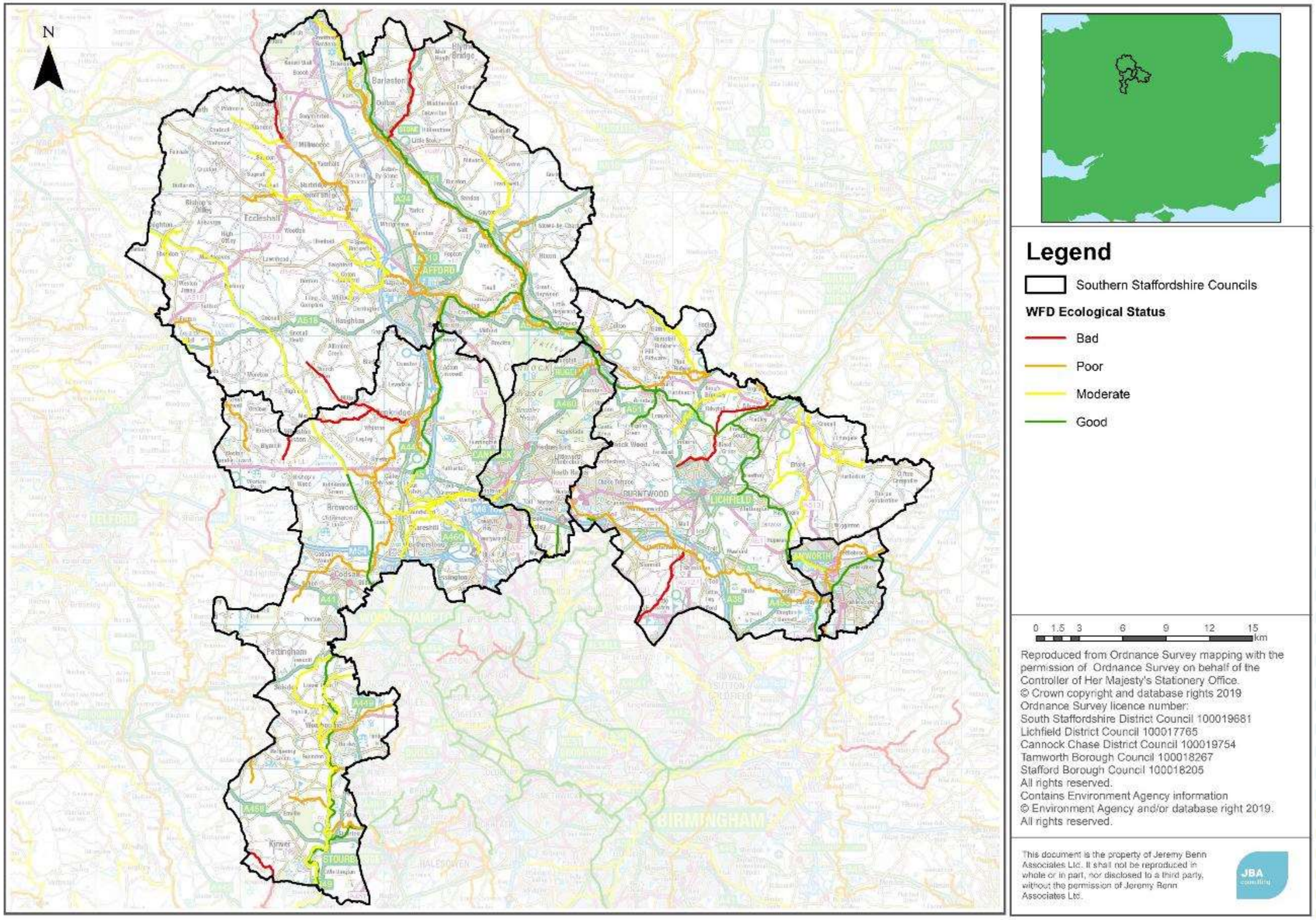
The response to a 10% increase in effluent flows at each of the WwTW in Southern Staffordshire has been modelled for three determinands: ammonia, BOD and phosphate. The largest impact is on ammonia, with some wastewater catchments showing a greater than 10% deterioration, however there are also some areas with a very low response suggesting a water quality impact could be avoided by careful choice of site location. This is a similar response in BOD, albeit for different catchments, and no deterioration is greater than 10%.

Phosphate concentration shows a consistent moderate deterioration across Southern Staffordshire suggesting that no location is more or less sensitive to increased effluent flow from development in this particular determinand.

9.3.3 Water Framework Directive Status

The results above should be read in conjunction with the WFD status of watercourses in the area which are presented in Figure 9-4. This shows the Cycle 2 Water Framework Directive overall waterbody classifications for watercourse in the study area, and the location of WwTW that are likely to be serving growth. The majority of the waterbodies have a moderate or poor ecological status, with many of the canal waterbodies having a good ecological status or potential. Within this catchment, sewage discharge was cited as one of the "reasons for not achieving good status" alongside diffuse agricultural pollution (livestock and poor nutrient management) and in some cases urban and transport sources.

Figure 9-4 WFD status of waterbodies in Southern Staffordshire



9.3.4 Other WwTWs within Southern Staffordshire

There are a number of treatment works and associated sewer catchments in the study area which have been left uncategorised. This is due to a lack of representation in the SIMCAT water quality model. There are also treatment works that are located outside of the Southern Staffordshire boundary that if subject to growth, are likely to have a cumulative impact on the water quality of the watercourses considered here, but which have not been considered.

9.4 Priority substances

As well as the general chemical and physicochemical water quality elements (BOD, Ammonia, Phosphate etc.) addressed above, a watercourse can fail to achieve Good Ecological Status due to exceeding permissible concentrations of hazardous substances. Currently 33 substances are defined as hazardous or priority hazardous substances, with others under review. Such substances may pose risks both to humans (when contained in drinking water) and to aquatic life and animals feeding in aquatic life. These substances are managed by a range of different approaches, including EU and international bans on manufacturing and use, targeted bans, selection of safer alternatives and end-of-pipe treatment solutions. There is considerable concern within the UK water industry that regulation of these substances by setting permit values which require their removal at wastewater treatment works will place a huge cost burden upon the industry and its customers, and that this approach would be out of keeping with the "polluter pays" principle.

We also consider how the planning system might be used to manage priority substances:

- Industrial sources – whilst the WCS covers potential employment sites, it doesn't consider the type of industry and therefore likely sources of priority substances are unknown. It is recommended that developers should discuss potential uses which may be sources of priority substances from planned industrial facilities at an early stage with the EA and, where they are seeking a trade effluent consent, with the sewerage undertaker.
- Agricultural sources - There is limited scope for the planning system to change or regulate agricultural practices.
- Surface water runoff sources - some priority substances e.g. heavy metals, are present in urban surface water runoff. It is recommended that future developments would manage these sources by using SuDS that provide water quality treatment, designed following the CIRIA SuDS Manual. This is covered in more detail in sections 11.6 and 11.6.1.
- Domestic wastewater sources - some priority substances are found in domestic wastewater as a result of domestic cleaning chemicals, detergents, pharmaceuticals, pesticides or materials used within the home. Whilst an increase in the population due to housing growth could increase the total volumes of such substances being discharged to the environment, it would seem more appropriate to be managing these substances through regulation at source, rather than through restricting housing growth through the planning system.

No further analysis of priority substances will be undertaken as part of the Water Cycle Study.

9.5 Conclusions

The increased wastewater discharges at the WwTWs serving growth in Southern Staffordshire have the potential to impact downstream water quality in the receiving watercourses. Ammonia is the water quality indicator that appears to be most sensitive to increased effluent flows. The distribution of sensitivity has no clear spatial pattern and so development should be considered on a catchment by catchment scale.

9.5.1 Recommendations

Table 9-1 Water quality recommendations

Action	Responsibility	Timescale
Take into account spatial variation in sensitivity to increased effluent flow when selecting sites.	SSCs	During next stage of Local Plan
Undertake modelling of water quality impacts once preferred options are known	SSCs	Before submission of Local Plan

9.6 Proposed methodology for Phase 2

Water Quality is a cross-boundary issue, and the impacts of growth can be cumulative where wastewater treatment works receiving growth from several local authorities, discharge to a river system. The Environment Agency advised that, where several treatment works discharge into the same river system, it is their preference that the impacts are assessed using catchment scale modelling. The EA provided four SIMCAT models covering the River Severn River Basin District, and River Trent River Basin District (one for ammonia and BOD and one for phosphate). These were calibrated to a 2010 baseline and no updates to this model are currently planned by the EA. An updated base model will be prepared as part of a Phase 2 study.

The existing model will be updated with guidance from the EA and may include:

- Latest river flow data from the National River Flow Archive for waterbodies within the study area
- WwTW expected to serve growth within the study area will be updated using data supplied by STW
- WQ data at selected sampling points in the model will be updated using data obtained from the EA Water Quality Data Archive

Manual calibration of the model will be carried out to ensure a fit to observed data. It is not anticipated that this will result in significant changes to the model.

The model will then be re-run using estimated future flows for the WwTW expected to serve growth.

Spot checks will be performed on the major WwTWs using the EA's RQP (single site) assessment tool.

10 Flood Risk Management

10.1 Assessment of additional flood risk from increased WwTW discharges

In catchments with a large planned growth in population and which 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 to quantify such an effect.

10.2 Methodology

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

- Calculate the increase in DWF attributable to planned growth;
- Identify the point of discharge of these WwTWs;
- At each outfall point, use the FEH v1.0 to extract the catchment descriptors;
- Use FEH Statistical 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

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

- Current and predicted future DWF for each WwTW
- Location of WwTW outfalls
- Catchment descriptors from FEH v1.0

The hydrological assessment of river flows was applied using a simplified approach, appropriate to this type of screening assessment. The Q30 and Q100 flows quoted should not be used for other purposes, e.g. flood modelling or flood risk assessments.

10.3 Results

Table 10-1 reports the additional flow from each WwTW as a percentage of the Q30 and Q100 FEH Statistical peak flow. The results show that additional flows from the WwTW post development would have a negligible effect on the predicted peak flow events with return periods of 30 and 100 years, with the exception of Little Aston WwTW. This assessment was conducted assuming 100% of sites would be allocated for development which is unlikely to be the case.

Table 10-1 Summary of DWF as a % of Q30 and Q100 peak flows

WwTW	FEH Stat Q30 (m^3/s)	FEH Stat Q100 (m^3/s)	Additional Flow (m^3/s)	Flow increase as % of Q30	Flow increase as % of Q100
Adbaston	1.58	2.14	<0.001	0.01%	0.00%
Alrewas	453.8	530.9	0.012	0.00%	0.00%
Armitage	4.29	5.49	0.011	0.25%	0.20%
Barnhurst	7.78	10.48	0.005	0.06%	0.05%
Bassetts Pole	1.37	1.79	0.001	0.09%	0.07%

WwTW	FEH Stat Q30 (m^3/s)	FEH Stat Q100 (m^3/s)	Additional Flow (m^3/s)	Flow increase as % of Q30	Flow increase as % of Q100
Bishopswood	2.20	2.88	0.249	0.13%	0.10%
Bobbington	1.46	1.92	0.006	0.43%	0.33%
Bradley	2.35	3.12	<0.001	0.01%	0.00%
Brancote	137.07	186.67	0.042	0.03%	0.02%
Burntwood	7.26	9.19	0.035	0.48%	0.38%
Cannock	21.92	26.53	0.034	0.15%	0.13%
Chebsey – The Green	12.72	16.57	<0.001	0.00%	0.00%
Clifton Campville	21.35	26.58	<0.001	0.00%	0.00%
Codsall	9.96	12.9	0.023	0.23%	0.18%
Colton	10.09	13.33	<0.001	0.00%	0.00%
Copmere	2.51	3.31	0.005	0.19%	0.15%
Coven Heath	4.50	5.69	0.052	1.16%	0.92%
Derrington	3.33	4.37	0.004	0.11%	0.08%
Eccleshall and Sturbridge	10.02	12.88	0.025	0.25%	0.19%
Edingale	28.47	35.53	0.002	0.01%	0.00%
Elford	1.87	2.45	<0.001	0.03%	0.02%
Forton	15.45	19.64	<0.001	0.00%	0.00%
Gayton Cherry Lane	15.54	20.65	<0.001	0.00%	0.00%
Goscote	4.70	5.79	0.037	0.78%	0.64%
Gospel End	2.96	3.75	0.003	0.12%	0.09%
Great Bridgeford	3.77	4.96	0.007	0.19%	0.14%
Haughton	2.09	2.77	0.013	0.63%	0.48%
Himley	1.89	2.39	<0.001	0.01%	0.01%
Hixon	1.26	1.69	0.01	0.77%	0.57%
Kinver	48.15	58.57	0.002	0.00%	0.00%
Ladfordfields	5.28	6.95	0.002	0.04%	0.03%
Lichfield	3.93	4.98	0.056	1.41%	1.12%
Little Aston	0.17	0.23	0.024	14.33%	10.59%
Lower Gornal	4.38	5.4	0.002	0.04%	0.04%
Lysways Lane	2.01	2.63	<0.001	0.00%	0.00%
Milwich	10.21	13.71	<0.001	0.00%	0.00%
Minworth	152.39	179.59	0.02	0.01%	0.01%
Norton Bridge	25.03	32.71	<0.001	0.00%	0.00%
Pattingham	6.58	8.39	0.001	0.02%	0.02%
Penkridge	94.37	122.89	0.029	0.01%	0.01%
Pirehill	131.2	175.59	0.055	0.04%	0.03%
Ranton	3.36	4.44	0.003	0.08%	0.06%
Roundhill	1.49	1.87	0.033	2.22%	1.77%
Rugeley	215.17	267.82	0.024	0.01%	0.01%

WwTW	FEH Stat Q30 (m^3/s)	FEH Stat Q100 (m^3/s)	Additional Flow (m^3/s)	Flow increase as % of Q30	Flow increase as % of Q100
Sandon	129.08	169.01	<0.001	0.00%	0.00%
Shenstone	10.3	12.58	0.012	0.11%	0.09%
Tamworth	289.13	346.95	0.030	0.01%	0.01%
Trescott	15.33	17.73	0.015	0.10%	0.08%
Walsall Wood	3.92	4.96	0.003	0.08%	0.06%
Wetwood	0.61	0.82	<0.001	0.01%	0.01%
Wheaton Aston	4.29	5.62	0.008	0.19%	0.14%
Wood Eaton	5.3	6.84	0.014	0.27%	0.21%
Woodseaves	2.02	2.66	0.001	0.05%	0.04%

10.4 Conclusions

A detailed assessment of flood risk can be found within the Southern Staffordshire Level 1 Strategic Flood Risk Assessment (at the time of writing this was in the process of being updated).

Increased effluent flows at Little Aston are predicted to make up approximately 10% of the flows in a 1 in 100-year flood event. There is therefore a risk that effluent flow from growth may increase flood risk on the receiving watercourse. 67% of the proposed housing that would be served by Little Aston WwTW would originate from one site (379, North of Little Aston). If this site was not allocated, the flood risk would be decreased to a "green" RAG rating.

10.5 Recommendations

Table 10-2 Recommendations from flood risk assessment

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
If site 379 is allocated, decisions regarding treatment of wastewater flows should consider how the increased effluent will impact flood risk. Should a new works be required the location of the discharge should be located to minimise the flood risk impact of the works.	STW	

11 Environmental Opportunities and Constraints

11.1 Introduction

Development has the potential to cause an adverse impact on the environment through a number of routes such as worsening of air quality, pollution to the aquatic environment, or disturbance to wildlife. Of relevance in the context of a Water Cycle Study is the impact of development on the aquatic environment.

Water pollution is usually categorised as either diffuse or point source. Point sources come from a single well-defined point, an example being the discharge from a WwTW.

Diffuse pollution is defined as "unplanned and unlicensed pollution from farming, old mine workings, homes and roads. It includes urban and rural activity and arises from industry, commerce, agriculture and civil functions and the way we live our lives."

Examples of diffuse sources of water pollution include:

- Contaminated runoff from roads – this can include metals and chemicals
- Drainage from housing estates
- Misconnected sewers (foul drains to surface water drains)
- Accidental chemical/oil spills from commercial sites
- Surplus nutrients, pesticides and eroded soils from farmland
- Septic tanks and non-mains sewer systems

After or during heavy rainfall, the first flush of water carrying accumulated dust and dirt is often highly polluting. Development has the potential to increase the diffuse pollution by providing additional sources from roads and housing estates.

Potential impacts on receiving surface waters include the blanketing of riverbeds with sediment, a reduction in light penetration from suspended solids, and a reduction in natural oxygen levels, all of which can lead to a loss in biodiversity.

11.2 Sites with Environmental Designation

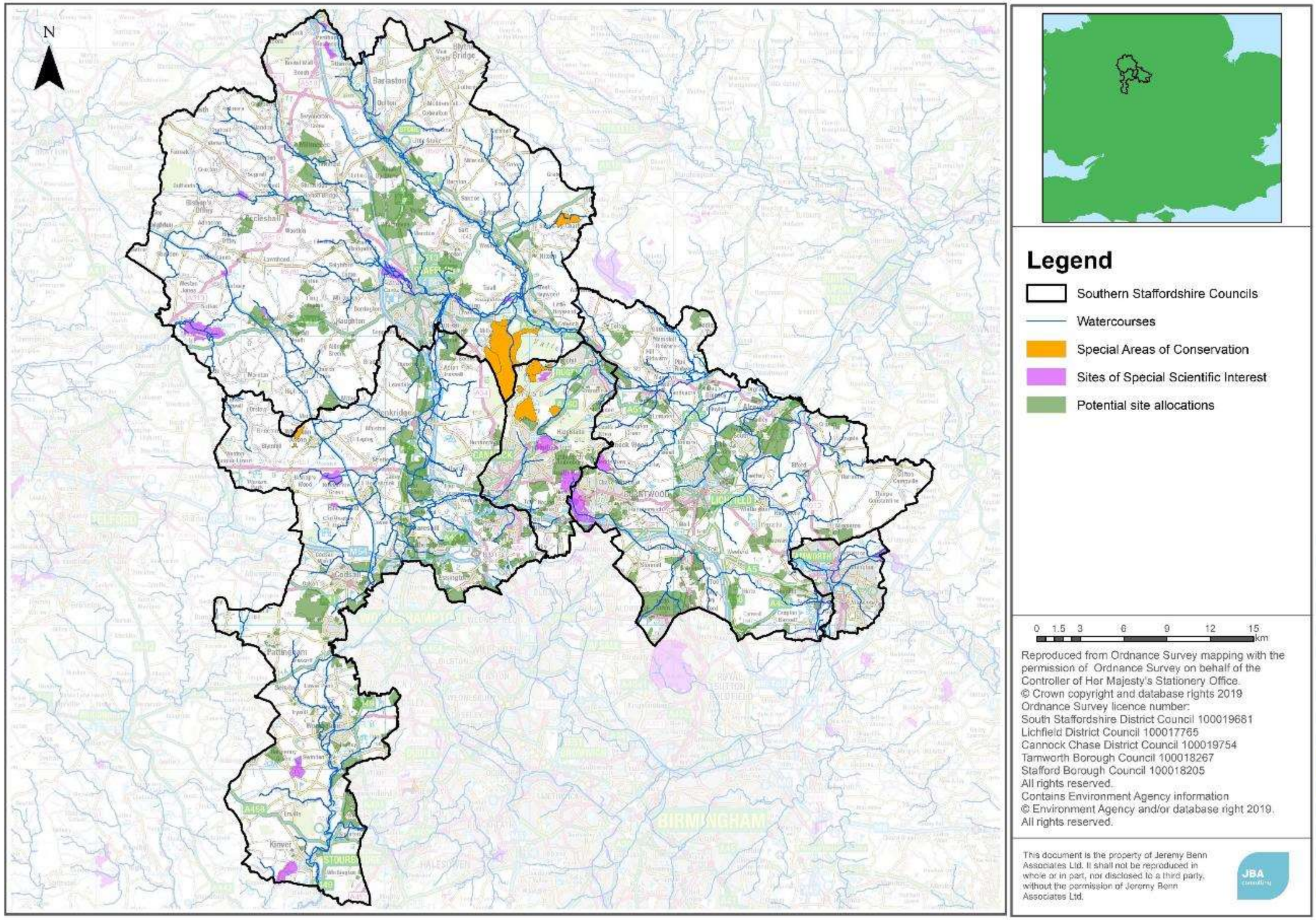
11.2.1 Sites protected by European designations

The Habitats Regulations Assessment process is designed to ensure that consideration is given within planning policy to sites protected by European Directives, namely Special Areas of Conservation (SAC) or Special Protection Areas (SPA). There are no SPAs in Southern Staffordshire, however the Pasturefields Salt Marsh, Cannock Extension Canal, River Mease, Mottey Meadows, West Midlands Mosses and Cannock Chase SACs fall within the study area. These SACs are also designated as SSSIs.

11.2.2 Sites of Special Scientific Interest

SSSIs are not subject to the HRA process, but are protected under the Wildlife and Countryside Act, and the impact of development on these sites must also be considered. There are several SSSIs within the study area boundary, as well as many outside which could be affected by the effects of development upstream. 92 SSSIs lie in or within 2km of Southern Staffordshire and are shown in Figure 11-1 below.

Figure 11-1 Sites with environmental designations



11.3 Point source pollution

The main potential sources of point source water pollution in Southern Staffordshire are the WwTWs. The effect of additional wastewater flows on water quality is assessed in section 9, and a summary of their potential impact following a source-pathway-receptor approach is presented in Table 11-1. The SSSIs within 20km of each WwTW have been assessed. In many cases, deterioration in water quality from additional wastewater flow could be prevented by treatment at technically achievable limit (TAL), but this needs to be verified through a water quality assessment.

11.4 Diffuse sources of water pollution

The most likely sources of diffuse pollution from new developments include drainage from housing estates, runoff from roads and discharges from commercial and industrial premises. Potential development sites within Southern Staffordshire could be considered as sources of additional runoff. The pollution risk posed by a site will depend on the sensitivity of the receiving environment, the pathway between the source of the runoff and the receiving waters, and the level of dilution available.

Table 11-1 WwTW serving growth in Southern Staffordshire relative to sites with environmental designations

Source	Pathway	Receptor	Distance downstream (km)	Potential Impact
Bassetts Pole	Collets Brook, Langley Brook	Middleton Pool (SP189982)	6km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Bishopswood	Whiston Brook	Belvide Reservoir (SJ863102)	2.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Blymhill	Dawford Brook, Wyndford Brook, Moreton Brook, Back Brook, Coley Brook	Aqualate Mere (SJ773204)	9km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Bradley	Doley Brook, Whiston Brook, River Penk, River Sow	Baswich Meadows (SJ9950226)	20km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Brancote	River Sow	Rawbones Meadow (SJ984225)	4km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Chebsey – The Green	River Sow	Doxey and Tillington Marshes (SJ906243)	8km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
		Baswich Meadows (SJ9950226)	14.5km	
		Rawbones Meadow (SJ984225)	20km	
Clifton Campville	River Mease	River Mease (SK264113)	0km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Derrington	Derrington Brook, Doxey Brook, River Sow	Doxey and Tillington Marshes (SJ906243)	2km	Water quality deterioration possible. WQ assessment

Source	Pathway	Receptor	Distance downstream (km)	Potential Impact
		Baswich Meadows (SJ9950226)	8.5km	required as part of Phase 2 Study
		Rawbones Meadow (SJ984225)	14km	
Eccleshall and Sturbridge	River Sow	Doxey and Tillington Marshes (SJ906243)	12.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
		Baswich Meadows (SJ9950226)	18km	
Edingdale	River Mease	River Mease (SK264113)	0km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Fairoak – Copsy Dale	River Sow	Cop Mere (SJ800298)	6km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Gayton – Cherry Lane	Gayton Brook, River Trent	Pasturefields Salt Marsh (SJ991248)	5.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Gospel End	Penn Brook, Wom Brook, Smestow Brook	Checkhill Bogs (SO851879)	12km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Great Bridgeford	River Sow	Doxey and Tillington Marshes (SJ906243)	5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
		Baswich Meadows (SJ9950226)	11.5km	
		Rawbones Meadow (SJ984225)	17km	
Haughton	Butterbank Brook, Doxey Brook	Doxey and Tillington Marshes (SJ906243)	6km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
	Butterbank Brook, Doxey Brook, River Sow	Baswich Meadows (SJ9950226)	13km	

Source	Pathway	Receptor	Distance downstream (km)	Potential Impact
		Rawbones Meadow (SJ984225)	18.5km	
Himley	Himley Brook, Smestow Brook	Checkhill Bogs (SO851879)	5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Kinver	River Stour	Stourvale Marsh (SO831781)	7km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
		Puxton Marshes (SO827775)	7.5km	
		Wilden Marsh and Meadows (SO827738)	13km	
		River Stour floodplain (SO824730)	14.5km	
Ladfordfields	Gamesley Brook, Millian Brook, River Sow	Doxey and Tillington Marshes (SJ906243)	5.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
		Baswich Meadows (SJ9950226)	12km	
		Rawbones Meadow (SJ984225)	17.5km	
Lower Gornal	Bobs-Holbeche Brook, Smestow Brook	Checkhill Bogs (SO851879)	7km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Milwich	Grimble Brook, Gayton Brook, River Trent	Pasturefields Salt Marsh (SJ991248)	10km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Minworth	River Tame	Whitacre Heath (SP209927)	7.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Norton Bridge	Meece Brook, River Sow	Doxey and Tillington Marshes (SJ906243)	8.5km	Water quality deterioration possible. WQ assessment

Source	Pathway	Receptor	Distance downstream (km)	Potential Impact
		Baswich Meadows (SJ9950226)	15km	required as part of Phase 2 Study
Penkridge	River Penk, River Sow	Baswich Meadows (SJ9950226)	8.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
		Rawbones Meadow (SJ984225)	14km	
Pirehill	River Trent	Pasturefields Salt Marsh (SJ991248)	14.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Ranton	Tributary of the Clanford Brook, Clanford Brook, Doxey Brook	Doxey and Tillington Marshes (SJ906243)	7.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
	Tributary of the Clanford Brook, Clanford Brook, Doxey Brook, River Sow	Baswich Meadows (SJ9950226)	14km	
		Rawbones Meadow (SJ984225)	19.5km	
Roundhill	River Stour	Stourvale Marsh (SO831781)	10km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
		Puxton Marshes (SO827775)	10.5km	
		Wilden Marsh and Meadows (SO827738)	16km	
		River Stour floodplain (SO824730)	17.5km	
Sandon	River Trent	Pasturefields Salt Marsh (SJ991248)	7.5km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Trescott	Smestow Brook	Checkhill Bogs (SO851879)	16km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study

Source	Pathway	Receptor	Distance downstream (km)	Potential Impact
Weston	River Trent	Pasturefields Salt Marsh (SJ991248)	3km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study
Wheaton Aston	River Penk, River Sow	Baswich Meadows (SJ9950226)	20km	Water quality deterioration possible. WQ assessment required as part of Phase 2 Study

11.5 Groundwater Protection

Groundwater is an important source of water in England and Wales.

The Environment Agency is responsible for the protection of "controlled waters" from pollution under the Water Resources Act 1991. These controlled waters include all watercourses and groundwater contained in underground strata.

The zones are based on an estimate of the time it would take for a pollutant which enters the saturated zone of an aquifer to reach the source of abstraction or discharge point (Zone 1 = 50 days, Zone 2 = 400 days, Zone 3 is the total catchment area). The Environment Agency will use SPZs (alongside other datasets such as the Drinking Water Protected Areas (DrWPAs) and aquifer designations as a screening tool to show:

- areas where is would object in principle to certain potentially polluting activities, or other activities that could damage groundwater,
- areas where additional controls or restrictions on activities may be needed to protect water intended for human consumption,
- how it prioritises responses to incidents.

The EA have published a position paper[58] outlining its approach to groundwater protection which includes direct discharges to groundwater, discharges of effluents to ground and surface water runoff. This is of relevance to this water cycle study where a development may manage surface water through SuDS.

Sewage and trade effluent

Discharge of treated sewage of 2m^3 per day or less to ground are called small sewage discharges (SSDs). The majority of SSDs do not require an environmental permit if they comply with certain qualifying conditions. A permit will be required for all SSDs in source protection zone 1 (SPZ1).

For treated sewage effluent discharges, the EA encourages the use of shallow infiltration systems, which maximise the attenuation within the drainage blanket and the underlying unsaturated zone. Whilst some sewage effluent discharges may not pose a risk to groundwater quality individually, the cumulative risk of pollution from aggregations of discharges can be significant. Improvement or pre-operational conditions may be imposed before granting an environmental permit. The EA will only agree to developments where the addition of new sewage effluent discharges to ground in an area of existing discharges is unlikely to lead to an unacceptable cumulative impact.

Generally, the Environment Agency will only agree to developments involving release of sewage effluent, trade effluent or other contaminated discharges to ground if it is satisfied that it is not reasonable to make a connection to the public foul sewer. The EA would normally expect to only permit new private discharges where the distance to connect to the nearest public sewer exceeds the number of dwellings * 30m. So, for example, a development of 100 dwellings would need to be more than 3km from a public sewer. The developer would have to provide evidence of why the proposed development cannot connect to the foul sewer in the planning application. This position will not normally apply to surface water run-off via sustainable drainage systems and discharges from sewage treatment works operated by sewerage undertakers with appropriate treatment and discharge controls.

Deep infiltration systems (such as boreholes and shafts) are not generally accepted by the EA for discharge of sewage effluent as they bypass soil layers and reduce the opportunity for attenuation of pollutants.

Discharges of surface water run-off to ground at sites affected by land contamination, or from sites for the storage of potential pollutants are likely to require an environmental

58 The Environment Agency's approach to groundwater protection, Environment Agency (2018). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/692989/Environment-Agency-approach-to-groundwater-protection.pdf on: 08/11/2019

permit. This could include sites such as garage forecourts and coach and lorry parks. These sites would be subject to a risk assessment with acceptable effluent treatment provided.

Discharge of clean water

"Clean water" discharges such as runoff from roofs or from roads, may not require a permit. However, they are still a potential source of groundwater pollution if they are not appropriately designed and maintained.

Where infiltration SuDS schemes are proposed to manage surface runoff they should:

- be suitably designed
- meet Government non-statutory technical standards[59] for sustainable drainage systems – these should be used in conjunction with the NPPF and PPG
- and use a SuDS management treatment train (see sections 11.6 to 11.6.2)

A hydrogeological risk assessment is required where infiltration SuDS is proposed for anything other than clean roof drainage in SPZ1.

Source Protection Zones in Southern Staffordshire

The SPZs that are present in the study area are shown in Figure 11-2. Large areas of Southern Staffordshire are within Zone 3, including Lichfield, Burntwood and the surrounding areas, and areas covering the south of South Staffordshire District, south-west of Lichfield District, north of Cannock District and to the north and west of Stafford Borough. There are also many smaller areas covered by Zones 1 and 2 within Zone 3, notably along the Smestow Brook and River Stour, west of Rugeley, Cannock Chase AONB and around Lichfield Trent Valley station. Tamworth is not covered by any GSPZs.

59 Sustainable Drainage Systems: non-statutory technical standards, Department for Environment, Food & Rural Affairs (2015). Accessed online at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards on: 08/11/2019

Figure 11-2 Source protection zones in the study area

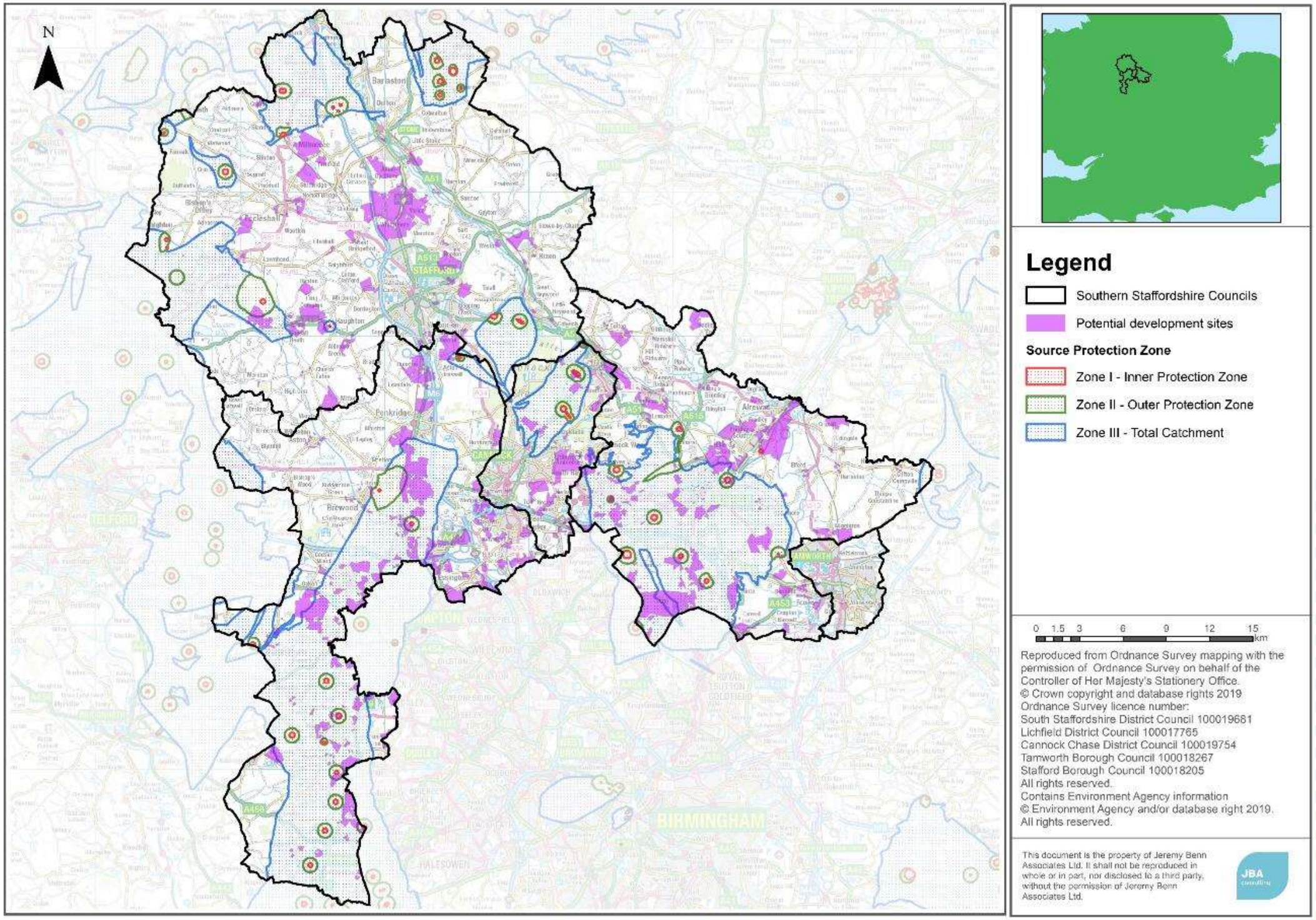


Table 11-2 Development sites within Source Protection Zones

Source Protection Zone	Sites	Management advice/EA position statement
Zone 1 – Inner Protection Zone	**Cannock:** R33, R38 **South Staffordshire:** 280, 298, 364, 438, 577, 613 **Lichfield:** P25 (ELAA 42), 24, 79, 91, 129, 159, 177, 178, 217, 241	G2 – Inside SPZ1 all sewage effluent discharges to ground must have an environmental permit. G4 – Inside SPZ1 the EA will object to any new trade effluent, storm overflow from sewage system or other significantly contaminated discharges to ground where the risk of groundwater pollution is high and cannot be adequately mitigated. G12 – Discharge of clean roof water to ground is acceptable both within and outside SPZ1, provided all roof water down-pipes are sealed against pollutants entering the system from surface runoff, effluent disposal or other forms of discharge. The method of discharge must not create new pathways for pollutants to groundwater or mobilise contaminant already in the ground. No permit is required if these criteria are met. G13 – Where infiltration SuDS are proposed for anything other than clean roof drainage in a SPZ1, a hydrogeological risk assessment should be undertaken, to ensure that the system does not pose an unacceptable risk to the source of supply. SuDS schemes must be suitably designed.
Zone 2 – Outer Protection Zone	**Cannock:** R33, R38 **South Staffordshire:** E46, E55, 272, 280, 296, 298, 343, 364, 368, 369, 370, 438, 542, 546, 554, 577, 585, 613, 633, 674, 684 **Stafford:** GNO10 **Lichfield:** P6 (ELAA 4), P25 (ELAA 43), P39 (ELAA 32), P40 (ELAA 33), P41 (ELAA 34), P48 (ELAA 44), 4, 19, 24, 79, 81, 91, 129, 133, 146, 159, 177, 178, 183, 195, 208, 217, 237, 247, 256, 272, 275, 294, 302	A hydrogeological risk assessment is not a requirement for SuDS schemes, however they should still be "suitably designed", for instance following best practice guidance in the CIRIA SuDS Design Manual.

Source Protection Zone	Sites	Management advice/EA position statement
Zone 3 – Total Catchment	**Cannock:** C373/CE55, C375/CE58, C63, R37, R39, R30, R33, C137, C176, C136, R106, R74, C342, R129, R38, C402, C403, C404, R112, R157, R156, R158, R159, R93, R172, C464 **South Staffordshire:** E31, E46, E55, 023, 024, 025, 026, 036a, 062, 067, 081, 082, 083, 084, 085, 087, 102, 210, 211, 213, 215, 217, 218, 221, 222, 224, 236, 237, 238a, 238b, 239, 240, 241, 243, 245, 246, 246a, 249, 250, 251, 252, 253, 254, 254, 255, 257, 260, 271, 272, 273, 274, 275, 276, 280, 281b, 283, 283, 285, 286, 290, 296, 298, 305, 306, 309, 310, 312a, 313, 314, 315, 325, 327, 328, 329, 330, 335a, 338, 343, 350a, 350a, 350b, 351, 358, 359, 364, 365, 368, 369, 370, 396, 401, 402, 407, 409, 412, 413, 415, 416, 417, 419, 421, 430, 437, 438, 447, 454, 458, 459, 460, 463a, 463b, 463c, 463d, 477, 479a, 493, 494, 495, 503, 504, 505, 506, 507, 510, 512, 513, 514, 515, 519, 537, 542, 544, 546, 547, 549, 554, 555, 556, 558, 559, 561, 563, 573, 576, 577, 582, 585, 613, 615, 618, 626, 627, 628, 629, 630, 633, 634, 641, 642, 643, 644, 646a, 646b ,646c, 646d, 647, 648, 652, 653, 654, 655, 657, 665, 666, 669, 670, 671, 672, 673, 674, 677, 682, 683a, 684 **Stafford:** BRO02, FOR01, GNO02, GNO03, GNO06, GNO08, GNO09, GNO10, HAU01, HAU03, HIG02, HIG03, HIG04, HIG07, HIG08, STAN01, STAN02, SWY20 **Lichfield:** P6 (ELAA 4), P25 (ELAA 43), P30 (ELAA 21), P31 (ELAA 26), P34 (ELAA 28), P39 (ELAA 32), P40 (ELAA 33), P41 (ELAA 34), P48 (ELAA 44), ELAA 25, ELAA 40, ELAA 41, ELAA 66, ELAA, 68, ELAA 72, 1, 2, 3, 4, 5, 7, 9, 10, 12, 13, 14, 16, 17, 19, 23, 24, 25, 26, 27, 32, 35, 43, 45, 48, 53, 55, 56, 57, 59, 63, 65, 75, 76, 77, 78, 79, 81, 85, 87, 88, 91, 95, 96, 98, 110, 111, 112, 113, 114, 115, 119, 121, 128, 129, 130, 132, 133, 134, 135, 136, 138, 142, 143, 144, 145, 146, 147, 153, 154, 155, 156, 157, 158, 159, 161, 162, 163, 163, 165,	A hydrogeological risk assessment is not a requirement for SuDS schemes, however they should still be "suitably designed", for instance following best practice guidance in the CIRIA SuDS Design Manual.

Source Protection Zone	Sites	Management advice/EA position statement
	166, 171, 172, 174, 177, 178, 179, 180, 183, 187, 188, 190, 193, 194, 195, 196, 199, 200, 201, 202, 203, 205, 206, 208, 209, 210, 211, 213, 214, 217, 218, 219, 221, 223, 224, 226, 229, 232, 233, 234, 236, 237, 238, 240, 247, 253, 255, 265, 266, 267, 269, 273, 274, 275, 277, 278, 284, 293, 294, 296, 299, 301, 302, 303, 304, 305, 306, 310, 315, 317, 319, 328, 331, 332, 339, 340, 344, 346, 349, 356, 357, 358, 368, 369, 372, 375, 376, 378, 379, 380, 381, 384	

11.6 Surface Water Drainage and SuDS

Since April 2015[60], management of the rate and volume of surface water has been a requirement for all major development sites, through the use of Sustainable Drainage Systems (SuDS).

Staffordshire County Council as Lead Local Flood Authority (LLFA), is a statutory consultee to the planning system for surface water management within major development, which covers the following development scenarios:

- 10 or more dwellings
- a site larger than 0.5 hectares, where the number of dwellings is unknown
- a building greater than 1,000 square metres
- a site larger than 1 hectare

SuDS are drainage features which attempt to replicate natural drainage patterns, through capturing rainwater at source, and releasing it slowly into the ground or a water body. They can help to manage flooding through controlling the quantity of surface water generated by a development and improve water quality by treating urban runoff. SuDS can also deliver multiple benefits, through creating habitats for wildlife and green spaces for the community.

National standards on the management of surface water are outlined within the Defra Non-statutory Standards for Sustainable Drainage Systems[61], with local guidance specified by Staffordshire County Council[62]. The CIRIA C753 SuDS Manual[63] and Guidance for the Construction of SuDS[64] provide the industry best practice guidance for design and management of SuDS.

11.6.1 Use of SuDS in Water Quality Management

SuDS allow the management of diffuse pollution generated by urban areas through the sequential treatment of surface water reducing the pollutants entering lakes and rivers, resulting in lower levels of water supply and wastewater treatment being required. This treatment of diffuse pollution at source can contribute to meeting WFD water quality targets, as well as national objectives for sustainable development.

This is usually facilitated via a SuDS Management Train of a number of components in series that provide a range of treatment processes delivering gradual improvement in water quality and providing an environmental buffer for accidental spills or unexpected high pollutant loadings from the site. Considerations for SuDS design for water quality are summarised in Figure 11-3 below.

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60 Department for Communities and Local Government (2014) House of Commons: Written Statement (HCWS161) Written Statement made by: The Secretary of State for Communities and Local Government (Mr Eric Pickles) on 18 Dec 2014. Available at: https://www.parliament.uk/documents/commons-vote-office/December%202014/18%20December/6.%20DCLG-sustainable-drainage-systems.pdf on: 08/11/2019

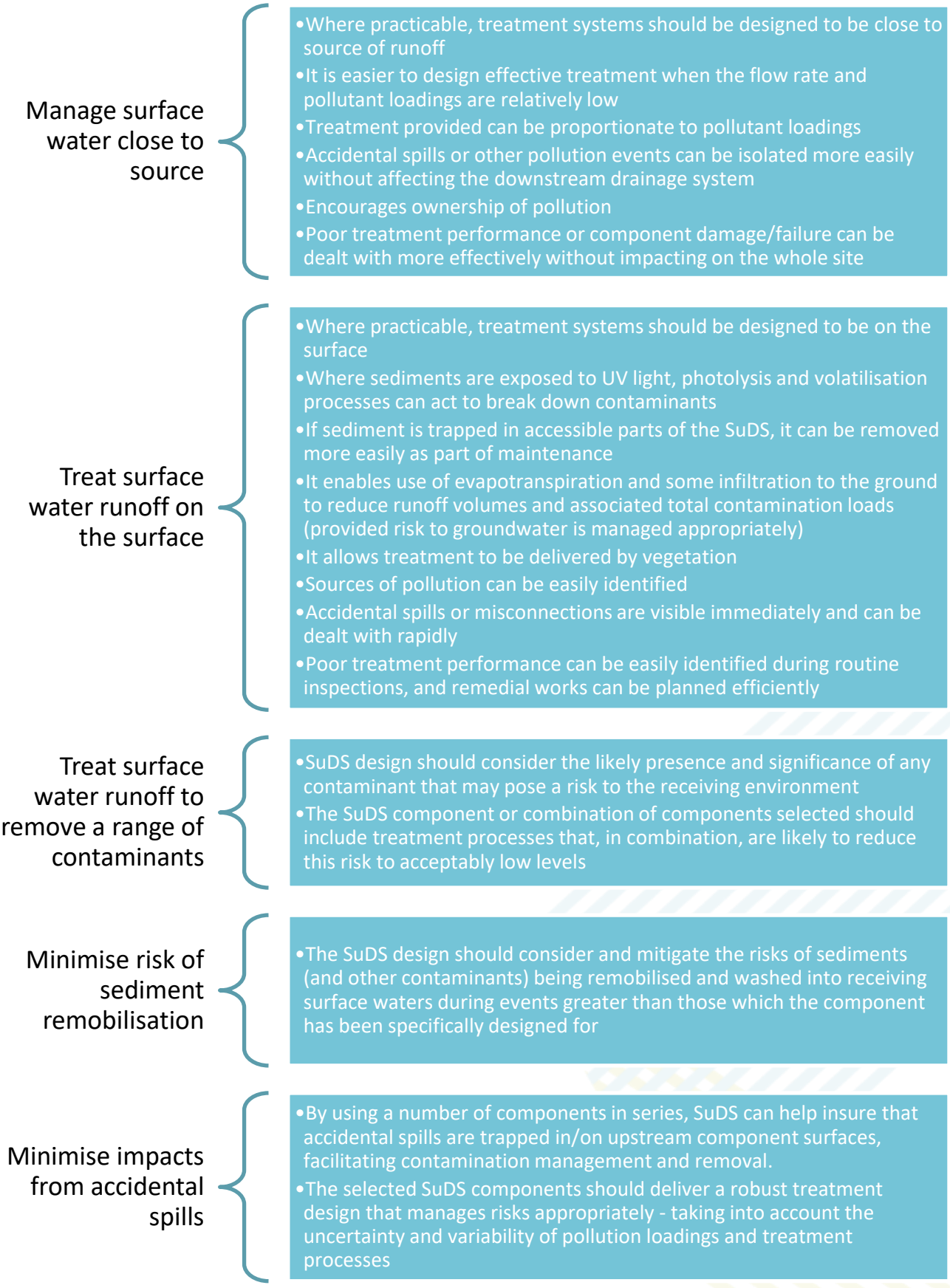
61 Sustainable Drainage Systems, Non-statutory technical standards for sustainable drainage systems, DEFRA (2015) Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf on: 08/11/2019

62 Staffordshire County Council SuDS Handbook (2017). Accessed online at: https://www.staffordshire.gov.uk/environment/Flood-Risk-Management/Documents/SuDS-Handbook.pdf on: 21/08/2019

63 CIRIA Report C753 The SuDS Manual, CIRIA (2015). Accessed online at: https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx on: 08/11/2019

64 Guidance on the Construction of SuDS (C768), CIRIA (2017), Accessed online at: https://www.ciria.org/ItemDetail?iProductcode=C768&Category=BOOK on: 08/11/2019

Figure 11-3 Considerations for SuDS design for water quality



Managing pollution close to its source can help keep pollutant levels and accumulation rates low, allowing natural processes to be more effective. Treatment can often be delivered within the same components that are delivering water quantity design criteria, requiring no additional cost or land-take.

SuDS designs should control the 'first flush' of pollutants (usually mobilised by the first 5mm of rainfall) at source, to ensure contaminants are not released from the site. Best practice is that no runoff should be discharged from the site to receiving watercourses or sewers for the majority of small (e.g. less than 5mm) rainfall events.

Infiltration techniques will need to consider Groundwater Source Protection Zones (GSPZs) and are likely to require consultation with the Environment Agency.

Early consideration of SuDS within master planning will typically allow a more effective scheme to be designed.

11.6.2 Additional benefits

Flood Risk

The Strategic Flood Risk Assessment contains recommendations for SuDS to manage surface water on development sites, with the primary aim of reducing flood risk.

SuDS are most effective at reducing flood risk for relatively high intensity, short and medium duration events, and are particularly important in mitigating potential increases in surface water flooding, sewer flooding and flooding from small and medium sized watercourses resulting from development.

Water Resources

A central principle of SuDS is the use of surface water as a resource. Traditionally, surface water drainage involved the rapid disposal of rainwater, by conveying it directly into a sewer or wastewater treatment works.

SuDS techniques such as rainwater harvesting, allow rainwater to be collected and re-used as non-potable water supply within homes and gardens, reducing the demand on water resources and supply infrastructure.

Climate Resilience

Climate projections for the UK suggest that winters may become milder and wetter and summers may become warmer, but with more frequent higher intensity rainfall events, particularly in the south east. This would be expected to increase the volume of runoff, and therefore the risk of flooding from surface water and diffuse pollution, and would reduce water availability.

SuDS offer a more adaptable way of draining surfaces, controlling the rate and volume of runoff leaving urban areas during high intensity rainfall, and reducing flood risk to downstream communities through storage and controlled release of rainwater from development sites.

Through allowing rainwater to soak into the ground, SuDS are effective at retaining soil moisture and groundwater levels, which allows the recharge of the watercourses and underlying aquifers. This is particularly important where water resource availability is limited, and likely to become increasingly scare under future drier climates.

Biodiversity

The water within a SuDS component is an essential resource for the growth and development of plants and animals, and biodiversity benefits can be delivered even by very small, isolated schemes. The greatest value can be achieved where SuDS are planned as part of a wider green landscape, providing important habitat, and wildlife connectivity. With careful design, SuDS can provide shelter, food, foraging and breeding opportunities for a variety of species including plants, amphibians, invertebrates, birds, bats and other animals.

Amenity

Designs using surface water management systems to help structure the urban landscape can enrich its aesthetic and recreational value, promoting health and well-being and supporting green infrastructure. Water managed on the surface rather than underground can help reduce summer temperatures, provide habitat for flora and fauna and act a resource for local environmental education programmes and working groups and directly influence the sense of community in an area.

11.7 Conclusions

- A number of SSSIs exist within Southern Staffordshire that should be carefully considered in future plan making.
- WwTW serving growth within Southern Staffordshire are significant point sources of pollution in the study area.
- There is potential for additional discharge from WwTW to impact sites with environmental designations (see Section 9). A water quality impact assessment is required in the Phase 2 water cycle study to understand this further.
- Development sites within Southern Staffordshire could be sources of diffuse pollution from surface runoff.
- Runoff from these sites should be managed through implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites
- Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity.
- SuDS for a single site could be demonstrated to have limited impact, but it is the cumulative impact of all development across the catchment (combined with the potential effects of climate change) that should be taken into account. For this reason, SuDS should be considered on sites that do not have a direct pathway to a SSSI.

Water quality modelling should be undertaken as part of a Phase 2 WCS. No further assessment of environmental constraints and opportunities is recommended in a phase 2 WCS.

11.8 Recommendations

Table 11-3 Recommendations from environmental constraints and opportunities section

Action	Responsibility	Timescale
The Local Plans should include policies that require development sites, where a pathway exists for surface water to a site with an environmental designation, to adopt SuDS to manage water quality of surface runoff.	SSCs	Ongoing
The Local Plans should include policies that encourage development sites, where no obvious pathway exists to a site with an environmental designation, to consider the adoption of SuDS to manage the cumulative impact of development within the catchment (unless it is not reasonably practicable to do so).	SSCs	Ongoing
In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	SSCs STW SSW EA	Ongoing
Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme	Developers	Ongoing
Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	SSCs Developers	Ongoing

12 Climate change impact assessment

12.1 Approach

A qualitative assessment was undertaken to assess the potential impacts of climate change on the assessments made in this water cycle study. This was done using a matrix which considered 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 assessment.

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

Table 12-1 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			

12.2 Severn Trent Water infrastructure

Severn Trent Water have published a risk assessment[65] for both water resources, wastewater treatment and wastewater sewerage networks that identifies the level of threat from climate change in key service areas. In the case of WwTW, the highest perceived risks are in asset performance and pollution incidents, both of which can be attributed to an increased risk of flooding. In the case of the wastewater network, sewer flooding, resulting from increased rainfall intensity overwhelming the sewer network is added to the risks of impacts on asset performance and pollution incidents.

Consideration of the impact of climate change on water resources is included in Severn Trent Water's WRMP, with the main risk being the increased likelihood of severe drought events. Allowance is made within the baseline supply forecast by adjusting the "Water Available for Use". Each WRZ is classified as "low", "medium" or "high" vulnerability, which is then used to determine the level of detail for climate change modelling. All WRZ within Southern Staffordshire were given a "low" vulnerability.

12.3 South Staffs Water

South Staffs Water Climate Change Adaptation Update Report[66] states that the vulnerability of water supply to climate change is low to medium for the South Staffs supply area.

65 Severn Trent Water's Climate Change Adaptation Report 2015-2020, Severn Trent Water (2015). Accessed online at: https://www.stwater.co.uk/content/dam/stw/about_us/documents/Full-Climate-change-adaptation-report-2015-2020.pdf on: 08/11/19

66 South Staffs Water's Climate Change Adaptation Report, South Staffs Water (2016). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/620923/climate-adrep-south-staffs-water.pdf on: 08/11/19

Table 12-2 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 Water Cycle Study (Phases 1 and 2)?	RAG
Water resources	High	Yes – quantitative assessment within the WRMPs. Climate change impacts on consumption have been calculated in accordance with UKWIR report "Impact of Climate Change on Water Demand" (2013).	
Water supply infrastructure	Medium - some increased demand in hot weather	Yes - quantitative assessment within the WRMPs.	
Wastewater Collection	High - Intense summer rainfall and higher winter rainfall increases flood risk	Yes – qualitative assessment in climate change adaptation reports by Severn Trent Water. This has not been considered in site by site assessments.	
Wastewater treatment	Medium - Increased winter flows and more extreme weather events reduces flow headroom	Yes – qualitative assessment in the Severn Trent Water climate change adaptation reports. This has not been considered in site by site assessments.	
WwTW odour	Medium – higher temperatures will exacerbate existing odour control issues.	Severn Trent Water have not considered odour in their climate adaptation plan.	
Water quality	Nutrients: High Sanitary determinands: Medium to High	Qualitative assessments have been included in the climate change adaptation policy papers from Severn Trent Water. Water quality impact modelling in phase 2 should include sensitivity to reductions in river flow.	
Flooding from increased WwTW discharge	Low	No - not considered	

12.4 Conclusions and Recommendations

The impact of climate change on water resources and water infrastructure are receiving increasing levels of attention by water companies and sewerage undertakers at a strategic level. This has not been included in assessments at a site level as detailed modelling has not been carried out by Severn Trent Water. Consideration of changes in water and wastewater demand should be considered when carrying out detailed site assessments in the future.

The impact of reduced river flows due to climate change on water quality should be included in the water quality assessment in Phase 2.

Action	Responsibility	Timescale
When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, STW, SSW SSCs	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.	SSCs and Developers	As required
Water quality modelling in Phase 2 should include sensitivity testing to a reduction in river flow.	JBA Consulting	In Phase 2

*"No-Regrets" Approach: "No-regrets" actions are actions by households, communities, and local/national/international institutions that can be justified from economic, and social, and environmental perspectives whether natural hazard events or climate change (or other hazards) take place or not. "No-regrets" actions increase resilience, which is the ability of a "system" to deal with different types of hazards in a timely, efficient, and equitable manner. Increasing resilience is the basis for sustainable growth in a world of multiple hazards (Heltberg, Siegel, Jorgensen, 2009; UNDP, 2010).

13 Summary and overall conclusions

13.1 Summary by Council

Table 13-1 summarises the results of the water resources, water supply and wastewater network RAG assessments. Where a "red" assessment has been given based on wastewater infrastructure it highlights a lack of capacity in the current system or the scale of new infrastructure required. It does not indicate that a site is unsuitable for development.

Table 13-1 Summary of results from the phase 1 scoping study

Council	Water resources and water supply RAG	Sewerage network RAG assessment by number of houses				WwTW flow capacity assessment by number of houses (assuming 100% growth)			
Stafford		51,852	3,442	1,462	378	52,295	3,005	91	1,743
South Staffordshire		48,396	8,491	3,997	164	23,107	25,256	12,685	0
Lichfield		26,747	14,692	9,062	11,768	33,556	7,981	10,802	9,930
Tamworth		0	0	435	143	0	0	578	0
Cannock		8,553	3,983	761	889	4,311	3,587	6,288	0
TOTAL		**135,548**	**30,608**	**15,717**	**13,342**	**113,269**	**39,829**	**30,444**	**11,673**

13.2 Summary of phase 1 scoping study

The Southern Staffordshire Councils are at differing stages in their Local Plan processes and are exploring potential sites to deliver their housing need. The aim of this water cycle study is to provide the evidence to inform the selection of these sites, taking into account the constraints in the water environment and in water and wastewater infrastructure.

The conclusions from each topic area are summarised in Table 13-2, alongside the recommendations for further study in a Phase 2 study where appropriate in Table 13-3.

STW and SSW have stated that there are no constraints to development across the study area for water supply and water resources.

South Staffordshire, Lichfield and Tamworth's housing need can be provided by sites rated "green" for sewerage network (in conjunction with existing commitments, recent completions and windfall), however this is not the case for Stafford and Cannock and to deliver their full OAN over the plan period sites will need to be adopted that have been rated amber or red in their network or WwTW assessment by STW. In these cases, additional infrastructure will need to be provided by STW and early engagement between the Southern Staffordshire Councils, STW and developers is required to ensure the correct infrastructure is in place prior to occupation, and that it is provided in a cost-effective manner.

A number of WwTWs have limited headroom in their environmental permit and additional growth would require upgrades to WwTW performance. The impact of multiple WwTWs using headroom in their permit is required to ensure that the overall WFD classification of that reach, does not deteriorate. A catchment level approach to modelling the impact of growth of water quality should therefore be undertaken as part of a Phase 2 Outline Study.

Table 13-2 Summary of conclusions and requirements for Phase 2 study

Assessment	Conclusion	Requirement for Phase 2 Study
Water resources	• The STW and SSW WRMPs shows a supply-demand deficit around 2024-2026 for the North Staffs and South Staffs WRZ if no action is taken. It goes on to define a number of actions that will address this. Severn Trent Water and South Staffs Water commented that they would have adequate water resource for all proposed development sites.	On the basis that there is a plan to address the supply-demand deficit, and sufficient time to adapt the long-term plan to include emerging trends in population, no further assessment is recommended as part of a Phase 2 Outline study.
Water supply infrastructure	• Severn Trent Water and South Staffs Water responded to the request to assess the impacts of development on water supply infrastructure. STW and SSW 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 study area, detailed modelling of water supply infrastructure will allow any upgrades to be completed without restricting the timing, location or scale of the planned development.	No further analysis of water supply infrastructure is recommended as part of a Phase 2 Outline study.
Wastewater collection	• Development in areas where there is limited wastewater network capacity will increase pressure on the network, increasing the risk of a detrimental impact on existing customers, and increasing the likelihood of CSO operation. • All of South Staffordshire, Lichfield and Tamworth's housing need could be met by sites given a green RAG rating for wastewater collection, however Stafford and Cannock Chase's cannot. • Early engagement with Severn Trent Water is required if development of amber and red rated sites is required, and further modelling of the network may be required at the planning application stage.	Further study of the wastewater network is recommended as part of a Phase 2 Outline as the Local Plans develop and the SSCs have greater certainty over which sites will be brought forward for development.
Wastewater Treatment Works Flow Permit assessment	• STW provided assessments of the WwTW serving growth in each scenario based on hydraulic capacity and headroom in the environmental permit. JBA performed a flow permit assessment in parallel to this,	Further study of the wastewater treatment capacity is recommended as part of a Phase 2 Outline study as the Local Plans develop and the SSCs have greater certainty over which sites will be

Assessment	Conclusion	Requirement for Phase 2 Study
	considering different percentage bands of growth. • Where a "red" assessment is given, it does not indicate that growth cannot take place in that area, just that significant infrastructure would be required to support it. • A large number of WwTW scored red from STW's RAG assessment, however this was based on the 100% growth scenario, which would far exceed each Councils OAN. The RAG results should therefore be considered in conjunction with JBA's flow capacity assessment.	brought forward for development.
Water quality impact assessment	• The increased wastewater discharges at the WwTWs serving growth in Southern Staffordshire have the potential to impact downstream water quality in the receiving watercourses. • Ammonia is the water quality indicator that appears most sensitive to increased effluent flows. • Catchment level modelling is required in order to assess the cumulative impact of growth on the overall WFD status across the study area	Further assessment of the impact upon water quality should be undertaken, for the WwTW serving growth as part of a Phase 2 Outline Water Cycle Study. In particular, consideration should be paid to those discharging to watercourses which already have a 'poor' or 'bad' status and are forecast for increased growth.
Odour Assessment	• 43 sites are identified as being at risk of nuisance odour across Southern Staffordshire; 7 in Stafford, 15 in South Staffordshire, 9 in Lichfield, 1 in Tamworth and 8 in Cannock. An odour assessment is recommended as part of the planning process, paid for by developers.	No further assessment of odour is recommended as part of a Phase 2 Outline study. Any future assessment should be carried out as part of the planning process.
Flood risk from additional WwTW flow	• The impact of increased effluent flows is predicted to have a significant impact on flood risk at the receiving watercourse of Little Aston WwTW; however, this is assuming 100% of the growth proposed at Little Aston will come forward, however this is unlikely to be the case. • The impact of increased effluent flows is predicted to have a minimal impact on the flood risk of receiving watercourses of all other WwTW serving growth.	Increases in discharges of treated wastewater effluent as a result of growth are not expected to significantly increase flood risk for the majority of development. The flood risk impact for the final arrangement of sites should be considered as part of a Phase 2 study.
Environmental Constraints and Opportunities	• There are numerous SSSIs within Southern Staffordshire which	Water Quality modelling should be undertaken as part of Phase 2 Outline Study.

Assessment	Conclusion	Requirement for Phase 2 Study
	should be carefully considered in future plan-making. • WwTWs serving growth within Southern Staffordshire are significant point sources of pollution in the study area. • There is potential for additional discharge from WwTW to impact sites with environmental designations (see Section 11.2). A water quality impact assessment is recommended in a Phase 2 water cycle study to understand this further. • Development sites within Southern Staffordshire could be sources of diffuse pollution from surface runoff. • Several of the proposed development sites could have a direct surface water pathway to a SSSI. • Runoff from these sites should be managed through implementation of a SuDS scheme with a focus on treating water quality of surface runoff from roads and development sites. • Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity. • SuDS for a single site could be demonstrated to have limited impact, but it is the cumulative impact of all development across the catchment (combined with the potential effects of climate change) that should be taken into account. For this reason, SuDS should be considered on sites that do not have a direct pathway to a SSSI.	No further assessment of Environmental Constraints is recommended as part of a Phase 2 study.

13.3 Recommendations

Table 13-3 below summarises the recommendations from each section of the report.

Table 13-3 Summary of recommendations

Aspect	Action	Responsibility	Timescale
Water resources	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. Take the latest growth forecasts into account in the latest WRMPs.	STW, SSW	Ongoing
	Provide yearly profiles of projected housing growth to water companies to inform the WRMP.	SSCs	Annually
	Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Practice Guidance[67] in water-stressed areas and use the BREEAM standard to require percentage improvement over baseline building water consumption of at least 12.5%.	SSCs	In emerging Local Plans
	Water companies should advise the SSCs of any strategic water resource infrastructure developments within the Authority, where these may require safeguarding of land to prevent other type of development occurring.	STW, SSW, SSCs	In emerging Local Plans
Water supply	Once a preferred options list of sites is developed, undertake network modelling to ensure adequate provision of water supply is feasible.	STW, SSW SSCs	As part of the planning process
	SSCs and Developers should engage early with STW and SSW to ensure infrastructure is in place prior to occupation.	SSCs STW, SSW Developers	Ongoing
Wastewater collection	Early engagement between the SSCs and STW is required to ensure that where strategic infrastructure is required, it can be planned in by STW.	SSCs STW	Ongoing
	Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker.	SSCs STW	Ongoing
	Developers will be expected to work with the sewerage undertaker	STW and Developers	Ongoing

67 Planning Practice Guidance, Housing: Optional Technical Standards, Paras 13, 14 & 15, MHCLG (2015)., Accessed online at: https://www.gov.uk/guidance/housing-optional-technical-standards on: 23/01/2019

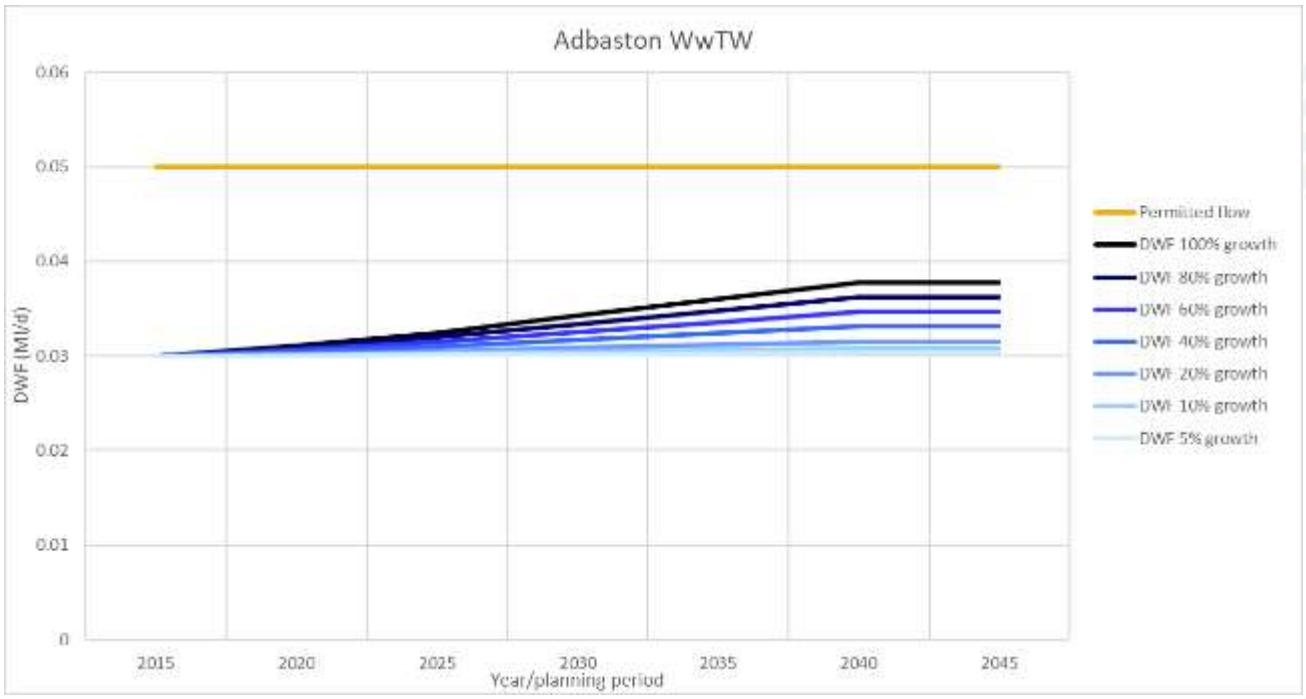
Aspect	Action	Responsibility	Timescale
	closely and early in the planning promotion process to develop an outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets/upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. 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.		
	Developers will be expected to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA.	Developers LLFA	Ongoing
Wastewater treatment	Consider the available WwTW capacity when phasing development going to the same WwTW.	SSCs STW	Ongoing
	Provide Annual Monitoring Reports to STW detailing projected housing growth in each of the Local Authorities.	SSCs	Ongoing
	STW to assess growth demands as part of their wastewater asset planning activities and feedback to the Councils if concerns arise.	STW SSCs	Ongoing
Odour	Consider odour risk in the sites identified to be potentially at risk from nuisance odour.	SSCs	Ongoing
	Carry out an odour assessment for sites at risk.	Site Developers	Ongoing
Water quality	Take into account spatial variation in sensitivity to increased effluent flow when selecting sites.	SSCs	During next stage of Local Plan.
	Update modelling of water quality impacts once preferred options are known.	SSCs	Before submission of Local Plans
Flood Risk Management	Proposals to increase discharges to a watercourse may also require a flood risk activities environmental	STW	During design of

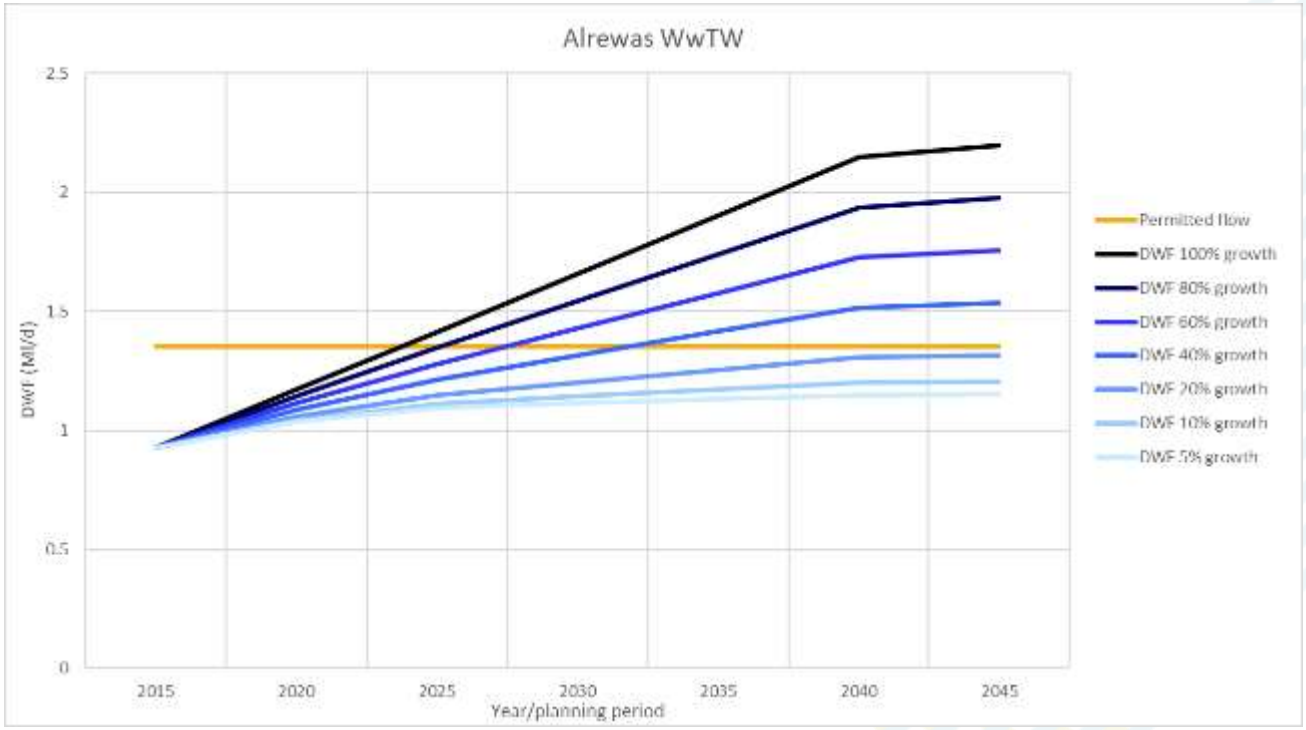
Aspect	Action	Responsibility	Timescale
	permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).		WwTW upgrades
Environment	The Local Plan should include policies that require development sites, where a pathway exists for surface water to a site with an environmental designation, to adopt SuDS to manage water quality of surface runoff.	SSCs	Ongoing
	The local plan should include policies that encourage development sites, where no obvious pathway exists to a site with an environmental designation, to consider the adoption of SuDS to manage the cumulative impact of development within the catchment (unless it is not reasonably practicable to do so).	SSCs	Ongoing
	In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	SSCs STW EA	Ongoing
	Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme.	Developers	Ongoing
	Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	SSCs Developers	Ongoing

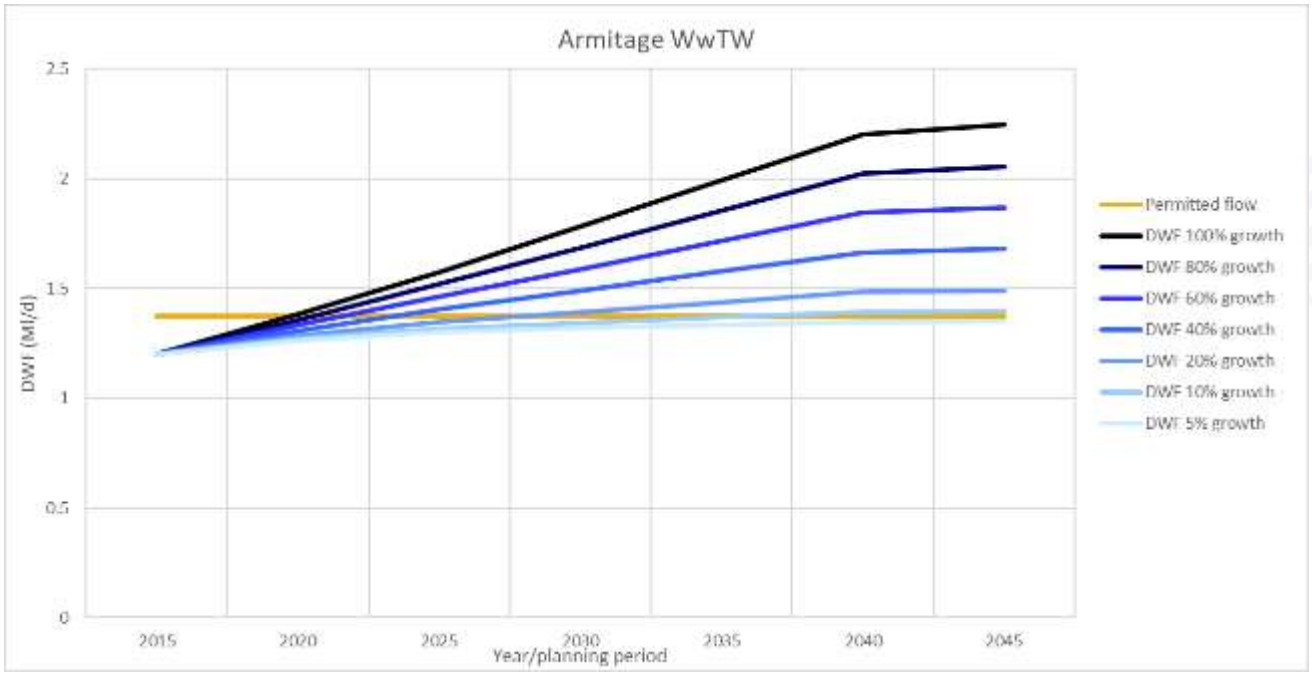
Appendices

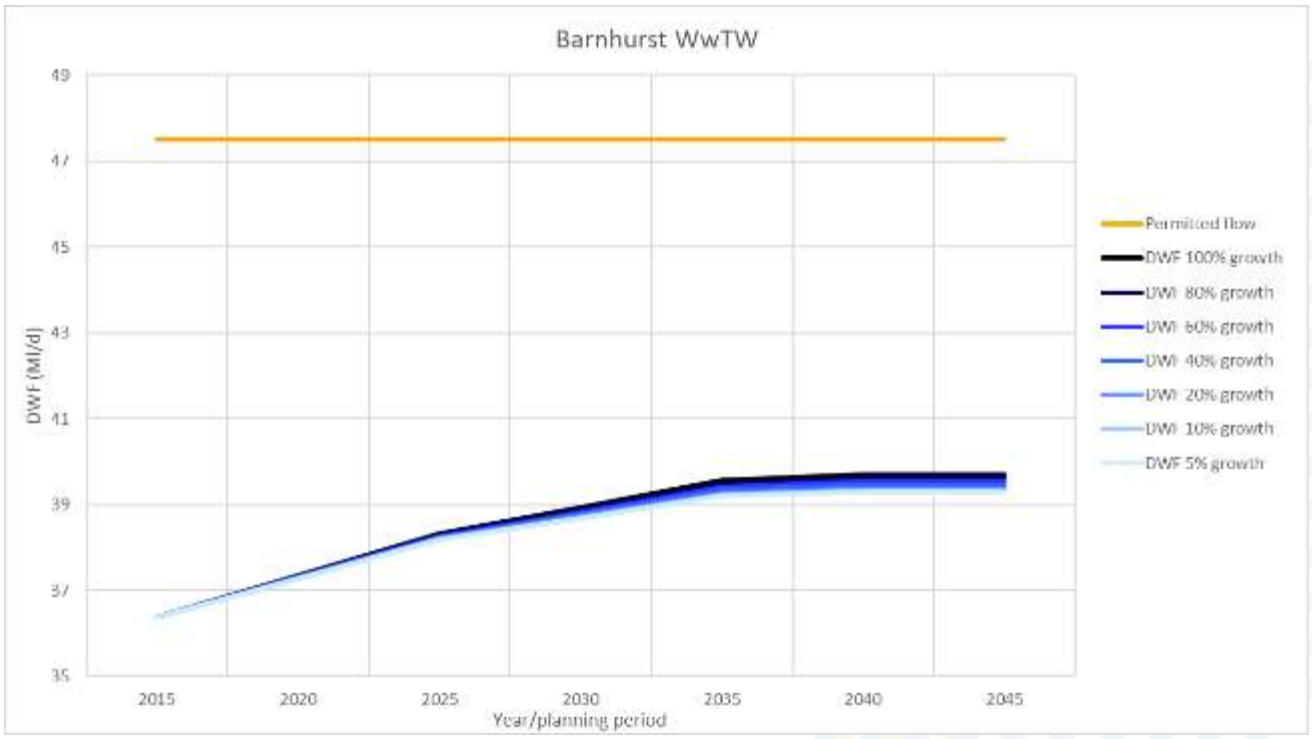
A Site Tracker Spreadsheet

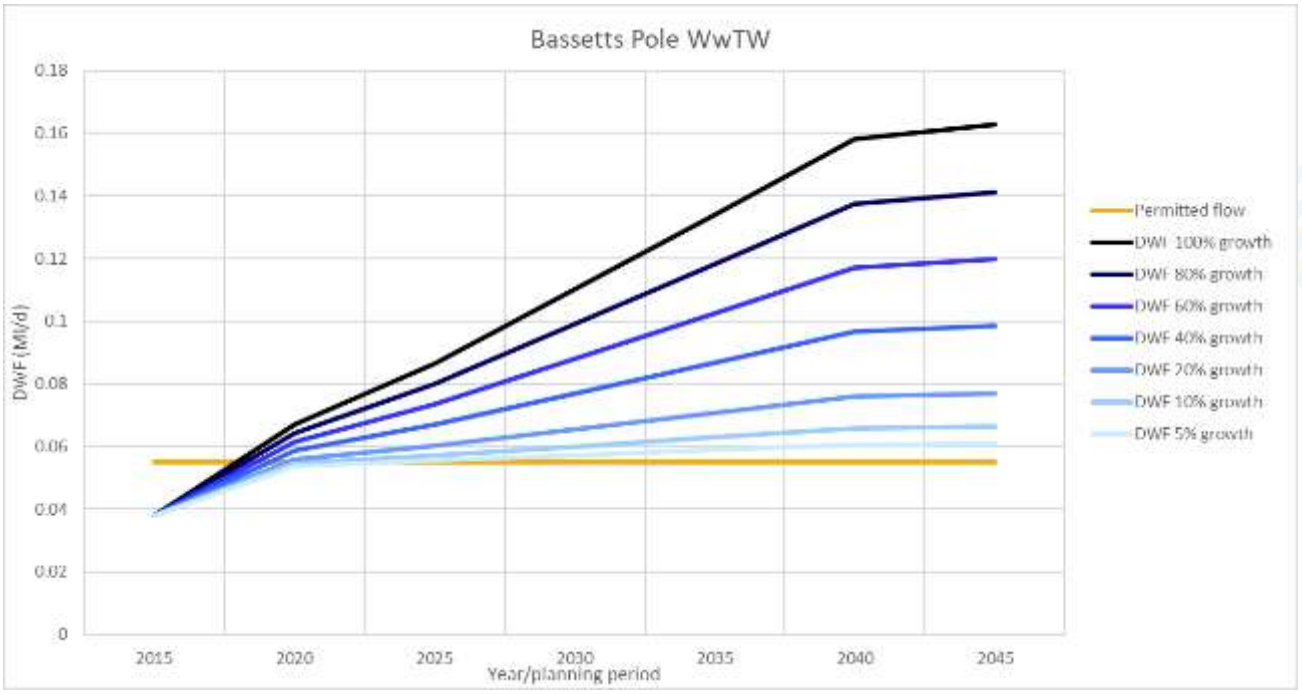
B WwTW Flow capacity assessments

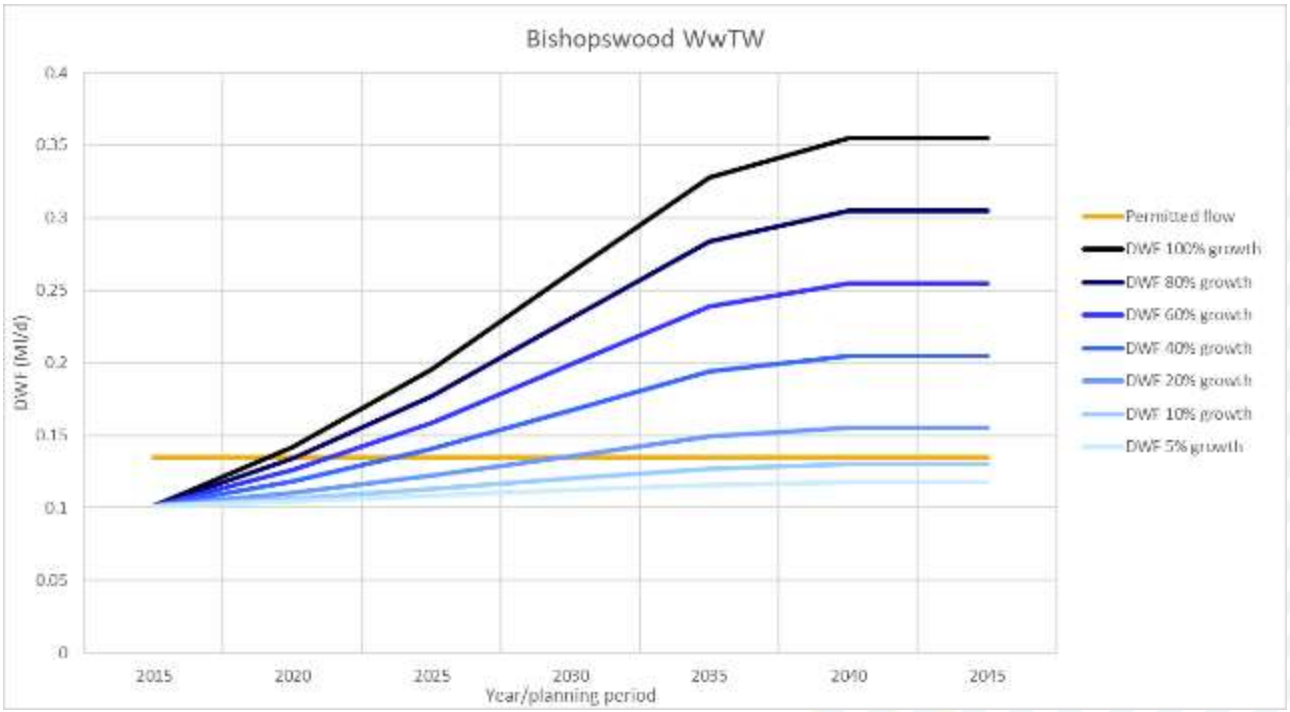


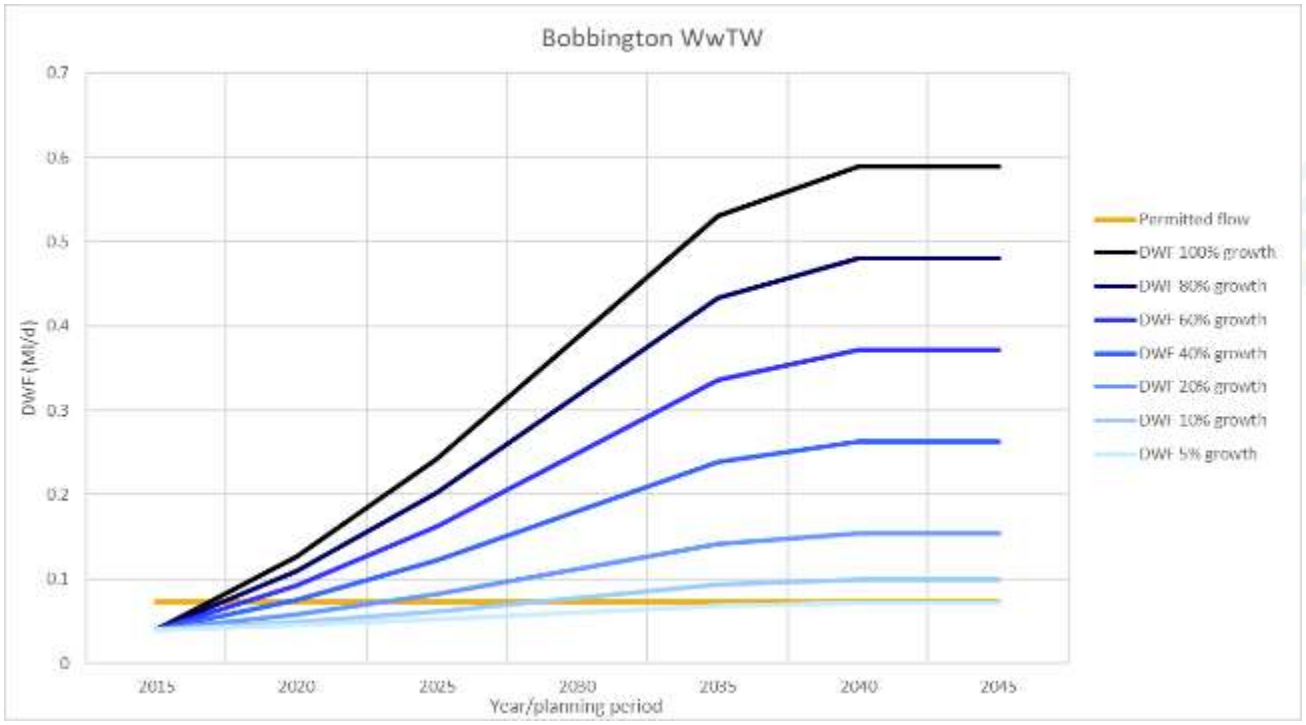


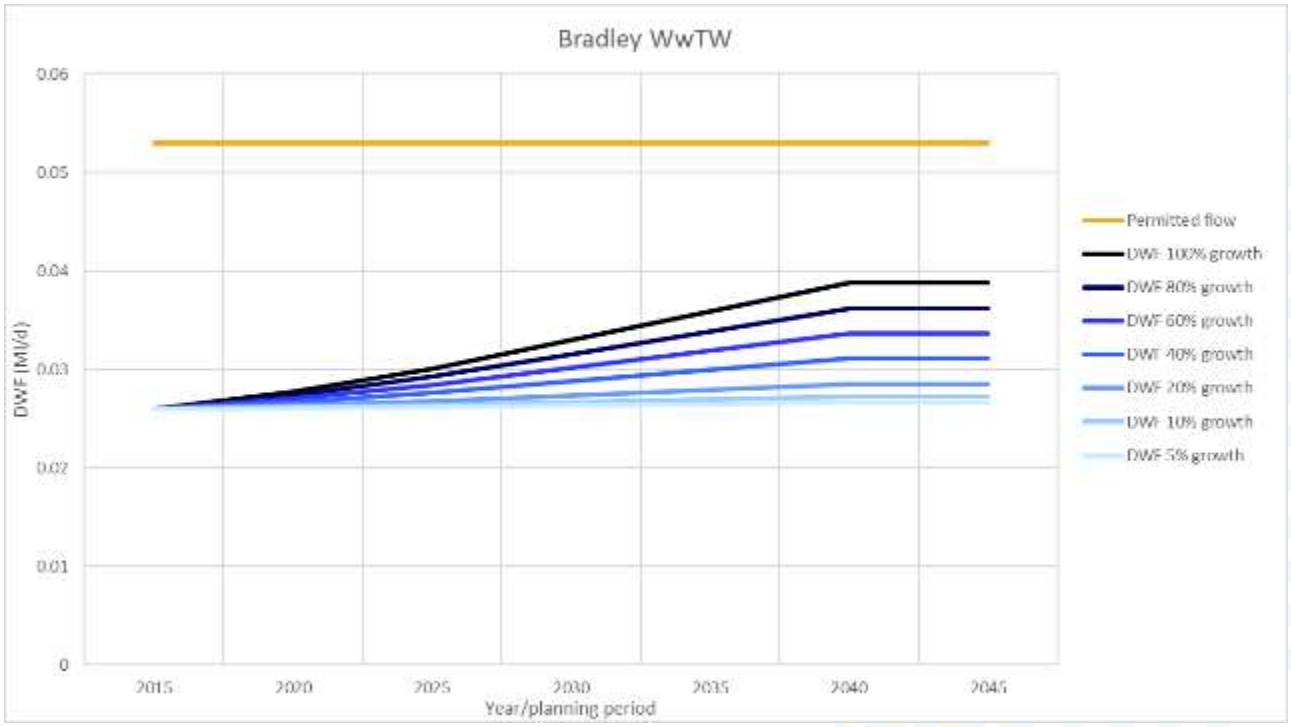

Armitage WwTW
DWF (Ml/d)
2.5
2
1.5
1
0.5
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

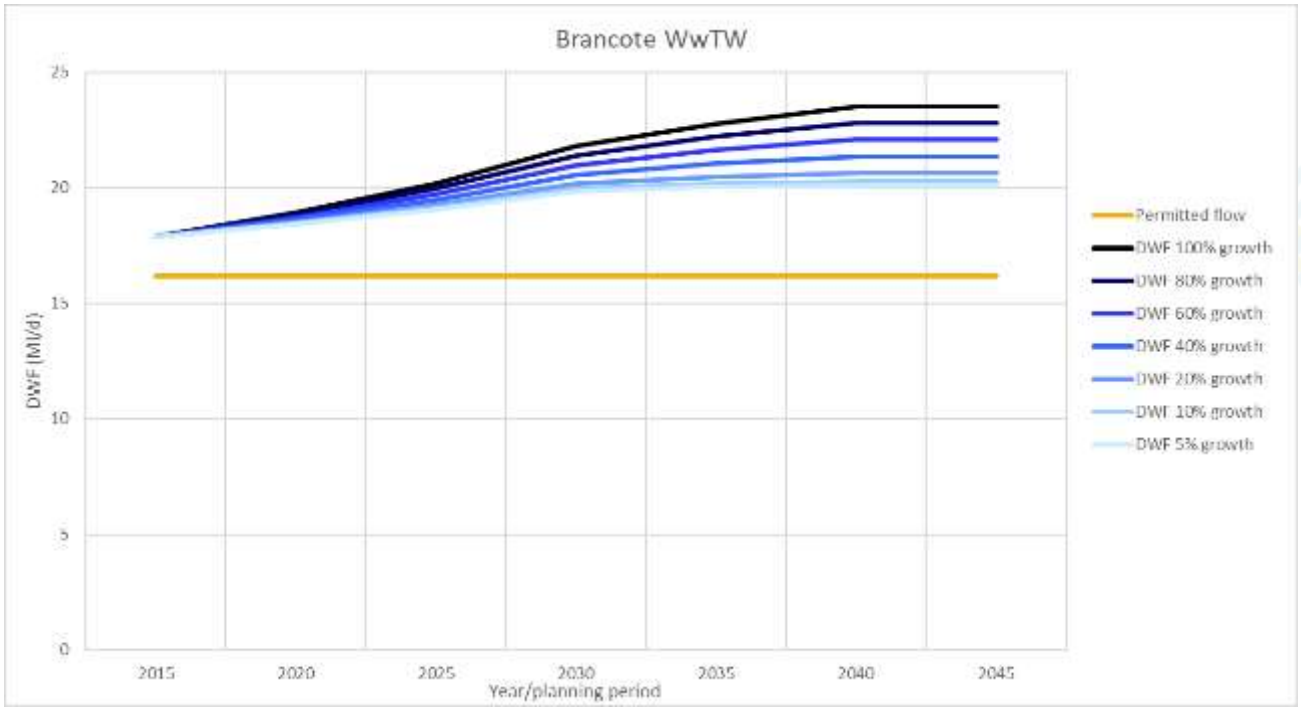

Barnhurst WwTW
DWF (Ml/d)
49
47
45
43
41
39
37
35
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

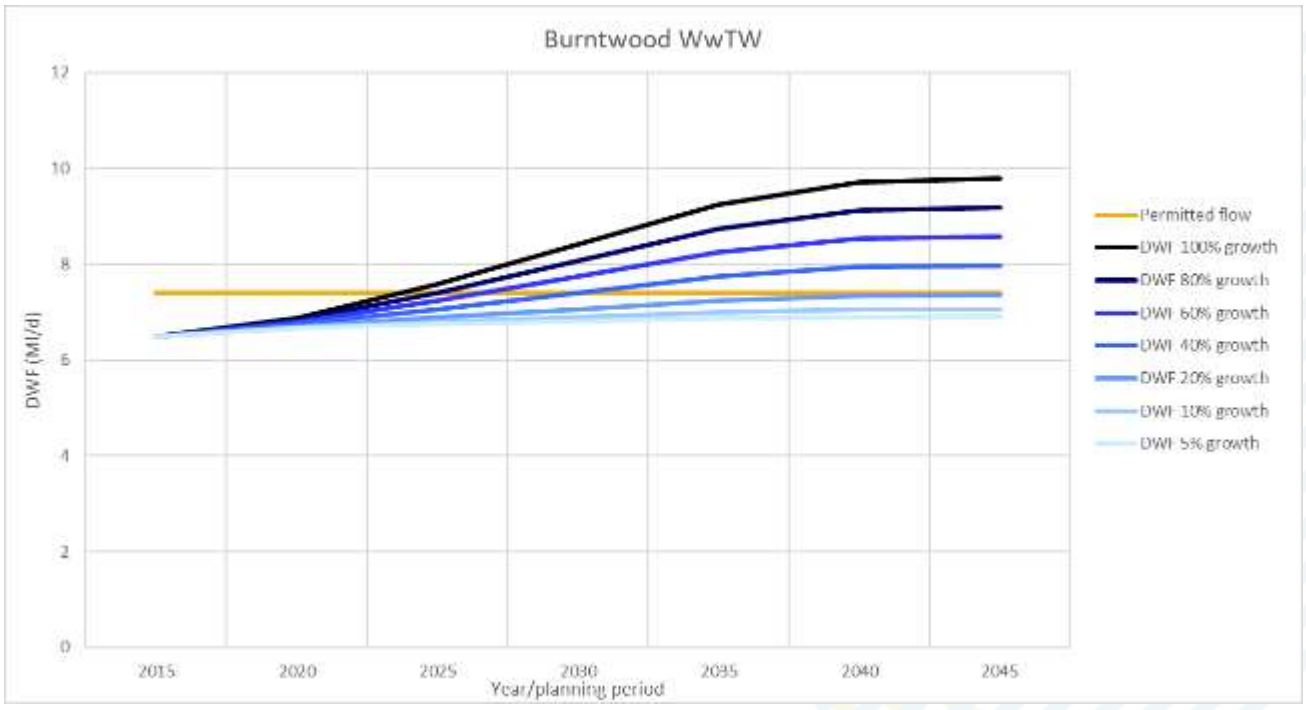

Bassetts Pole WwTW
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

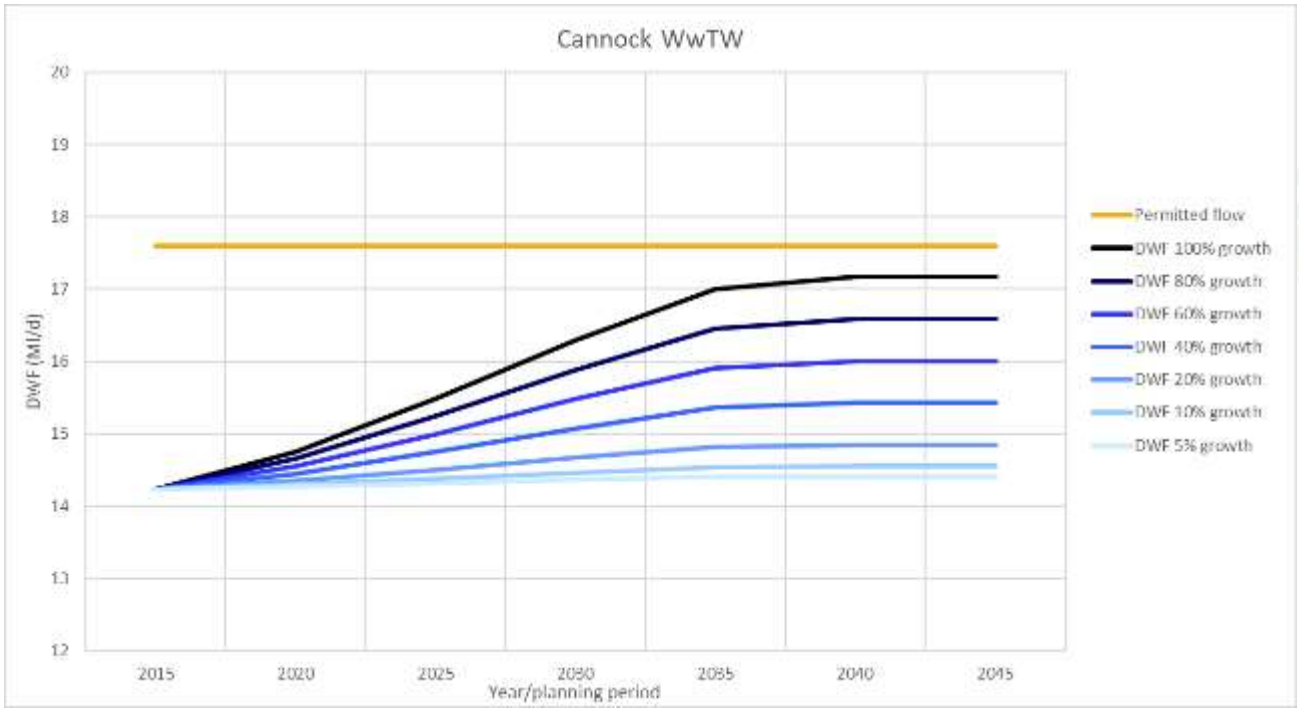

Bishopswood WwTW
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

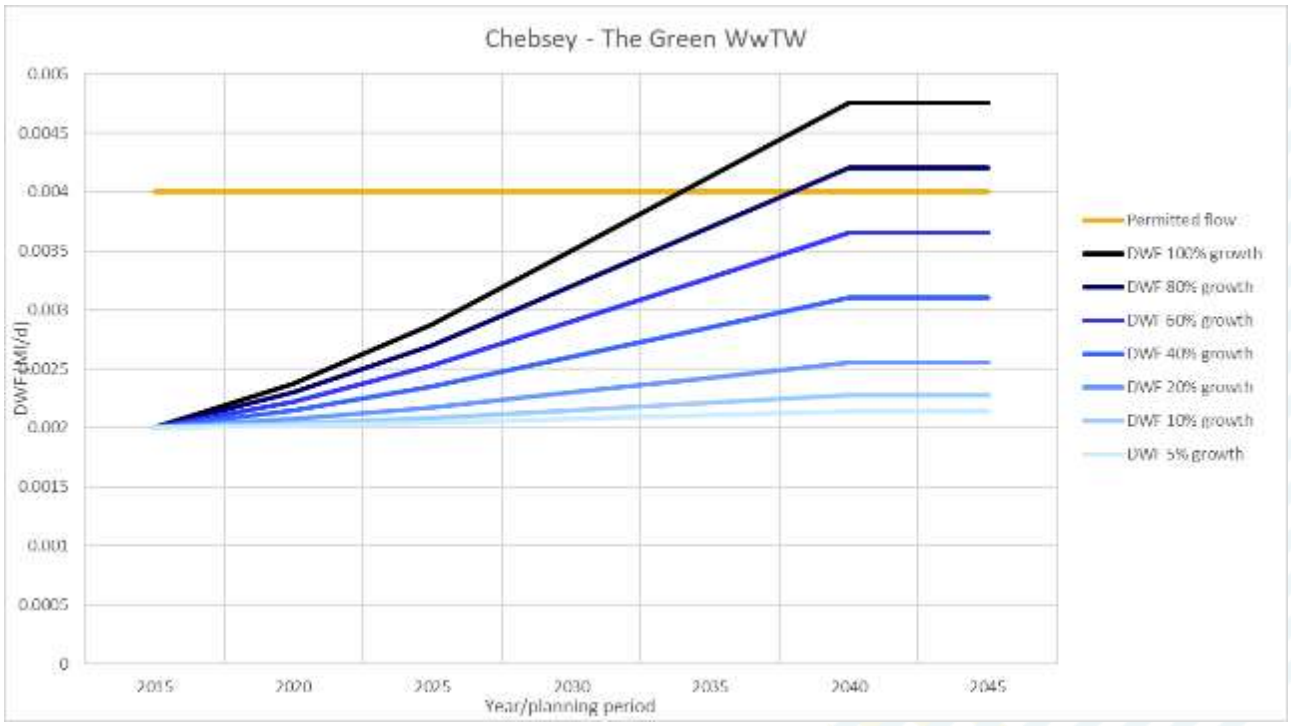

Bobbington WwTW
DWF (Ml/d)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

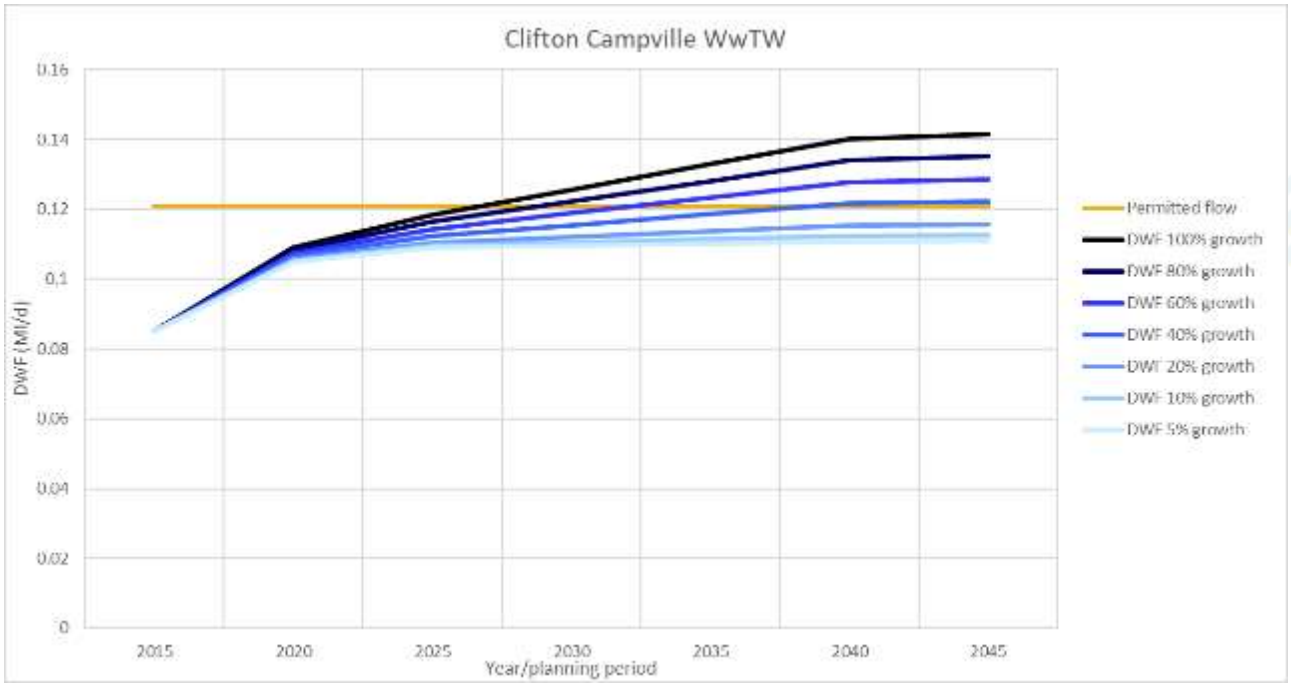

Bradley WwTW
DWF (Ml/d)
0.06
0.05
0.04
0.03
0.02
0.01
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

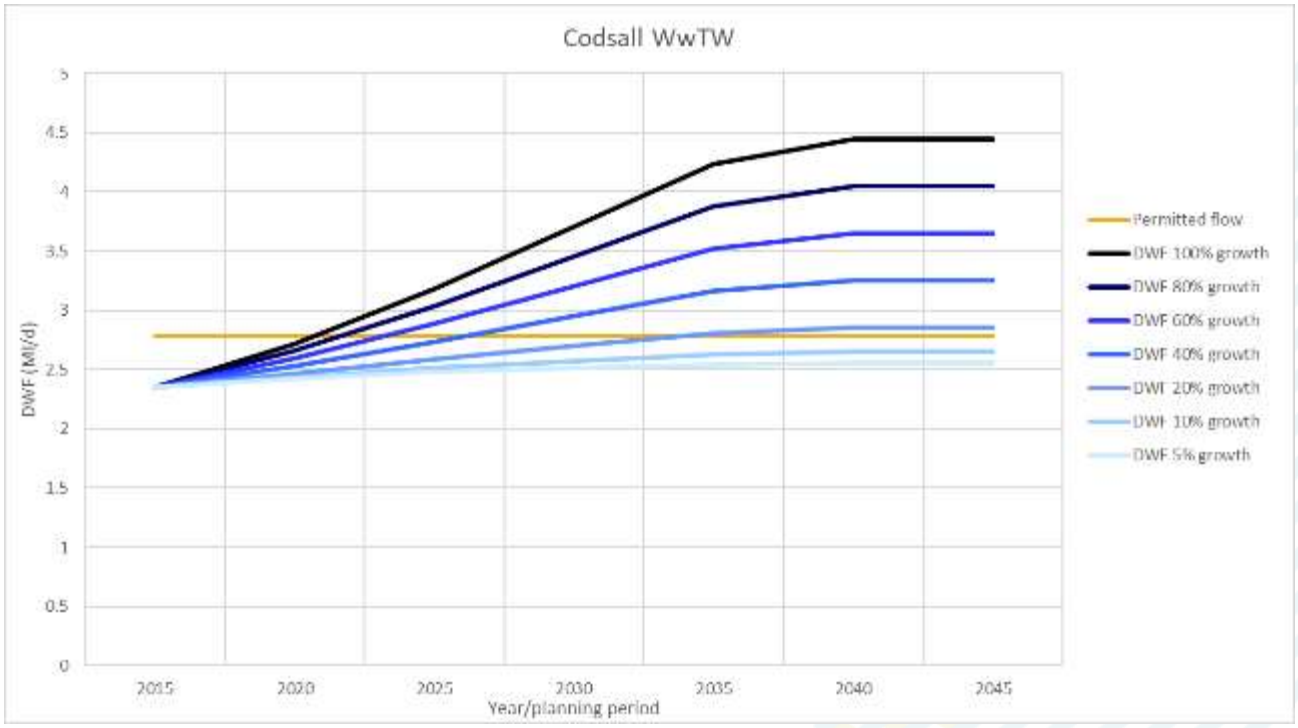

Brancote WwTW
DWF (Ml/d)
25
20
15
10
5
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

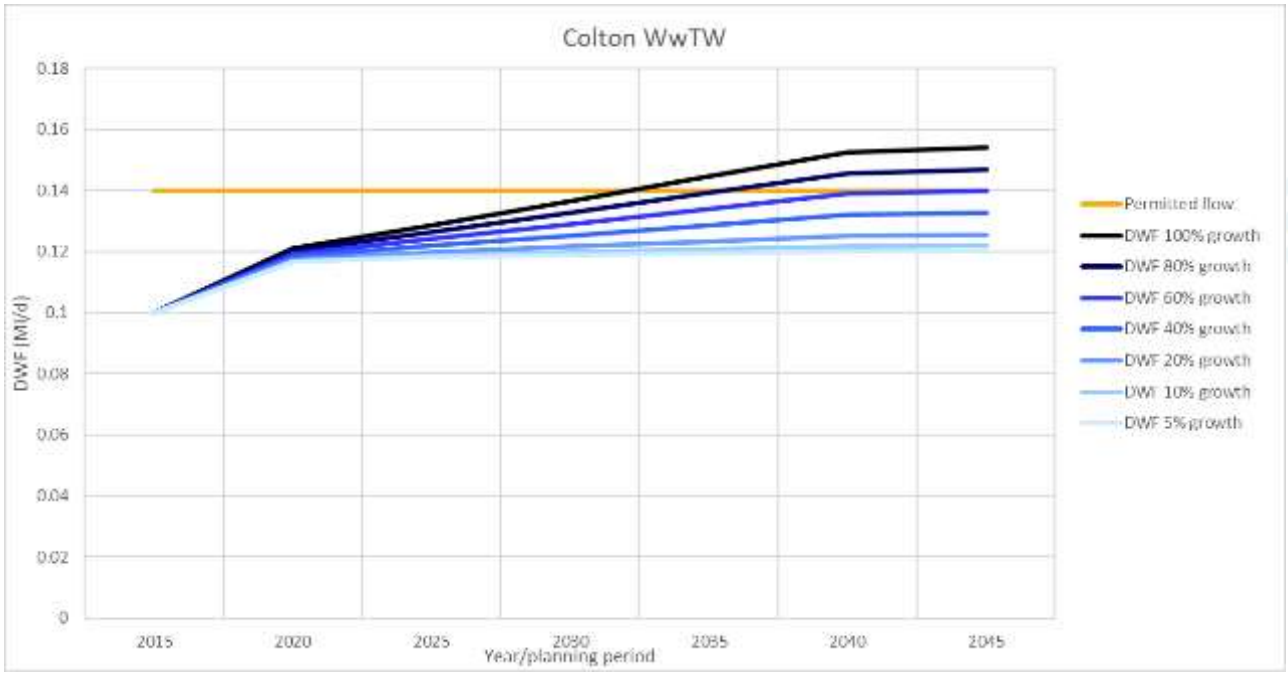

Burntwood WwTW
DWF (Ml/d)
12
10
8
6
4
2
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

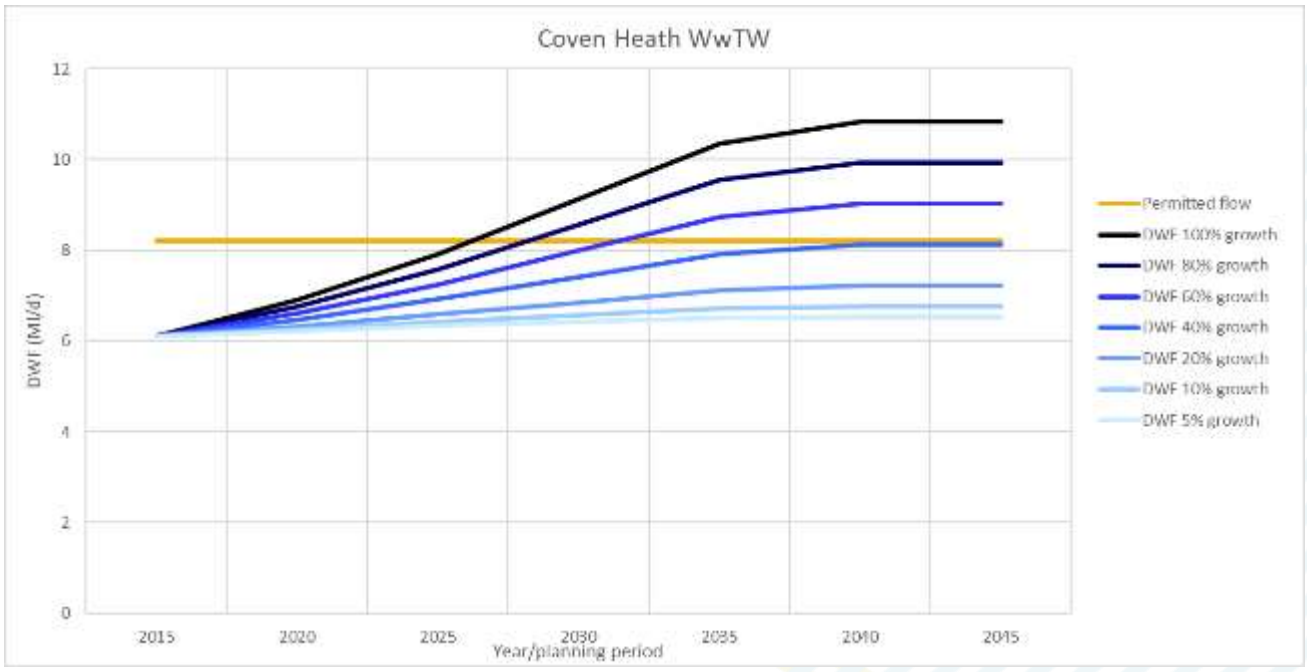

Cannock WwTW
DWF (Ml/d)
20
19
18
17
16
15
14
13
12
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

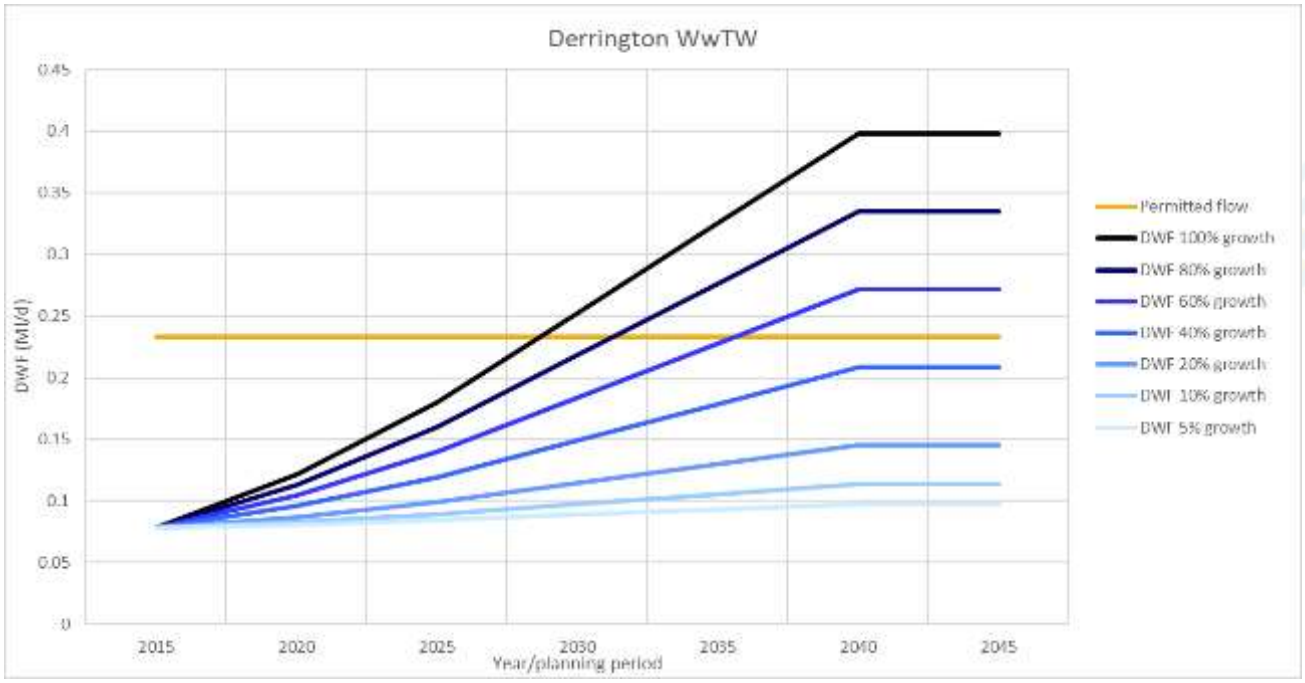

Chebsey - The Green WwTW
DWF (Ml/d)
0.005
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

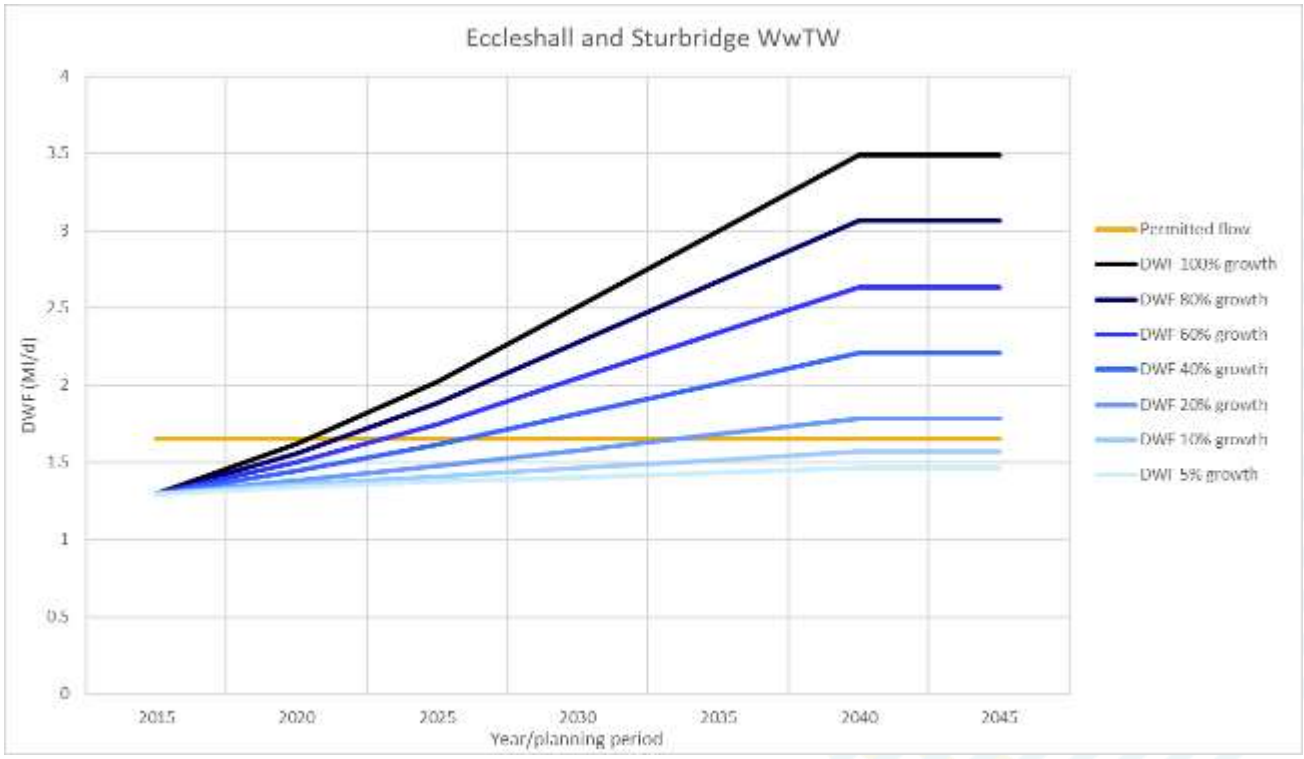

Clifton Campville WwTW
DWF (Ml/d)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

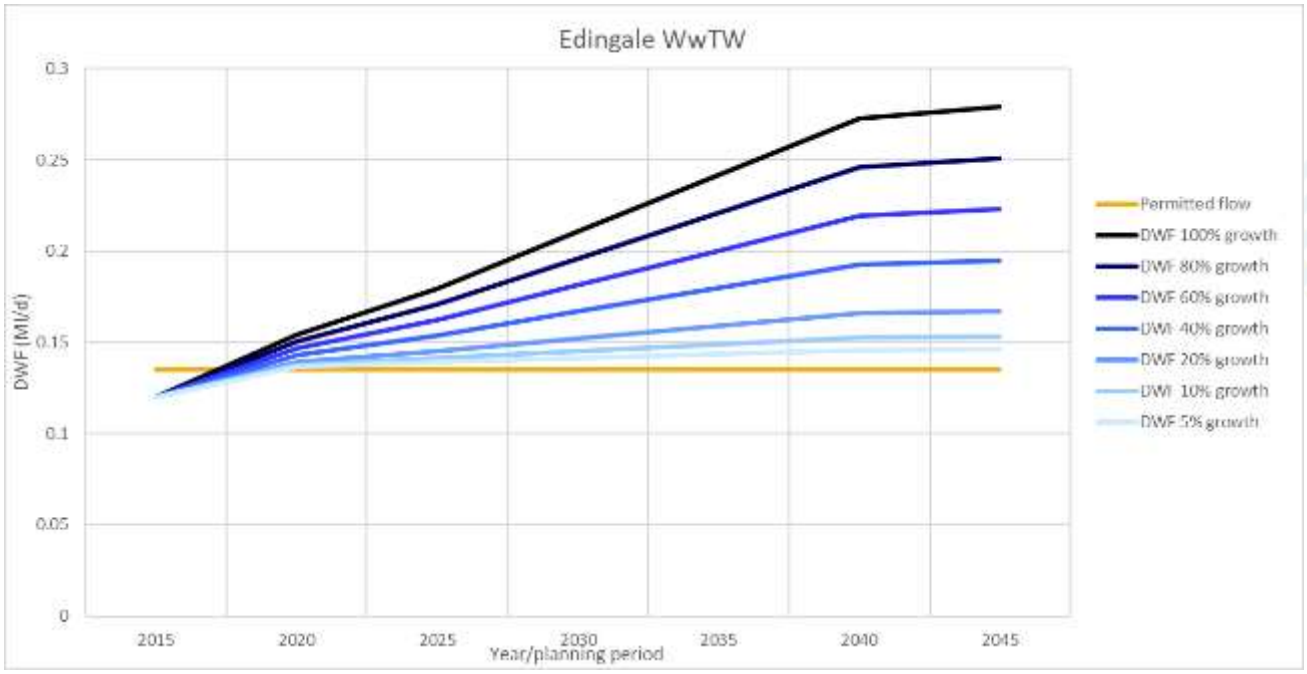

Codsall WwTW
DWF (Ml/d)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

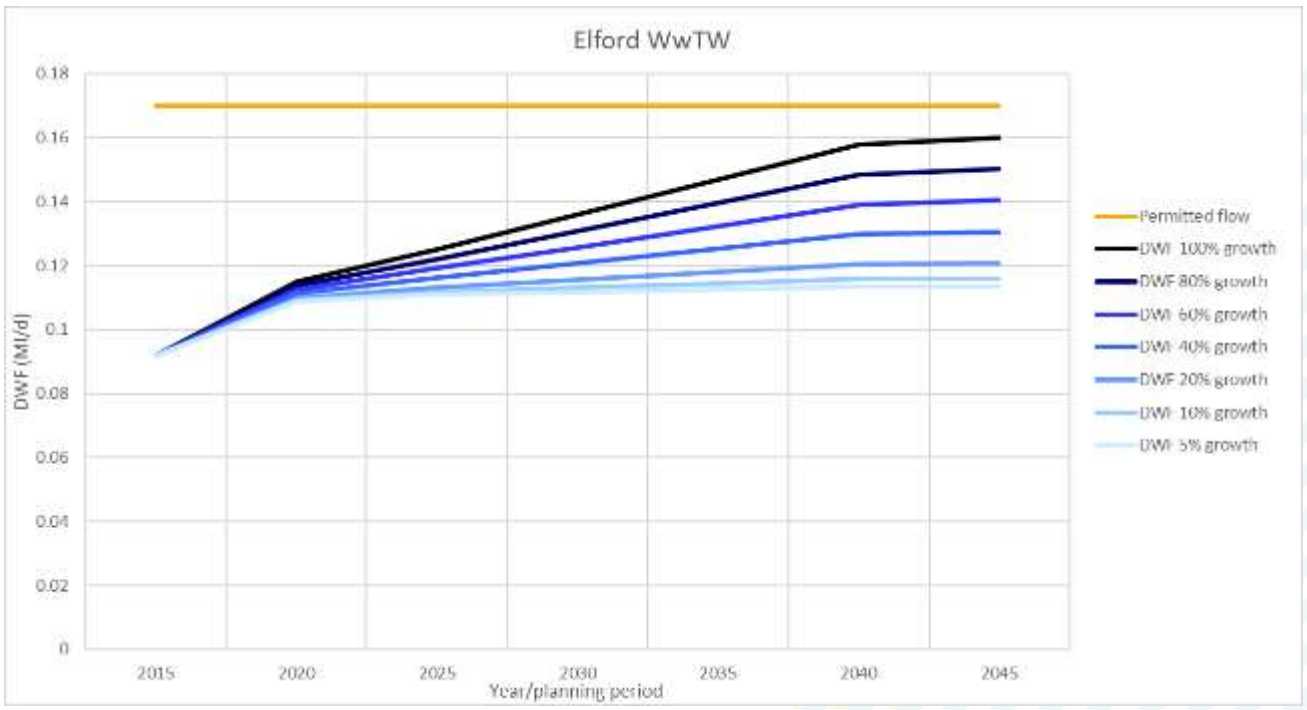

Colton WwTW
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

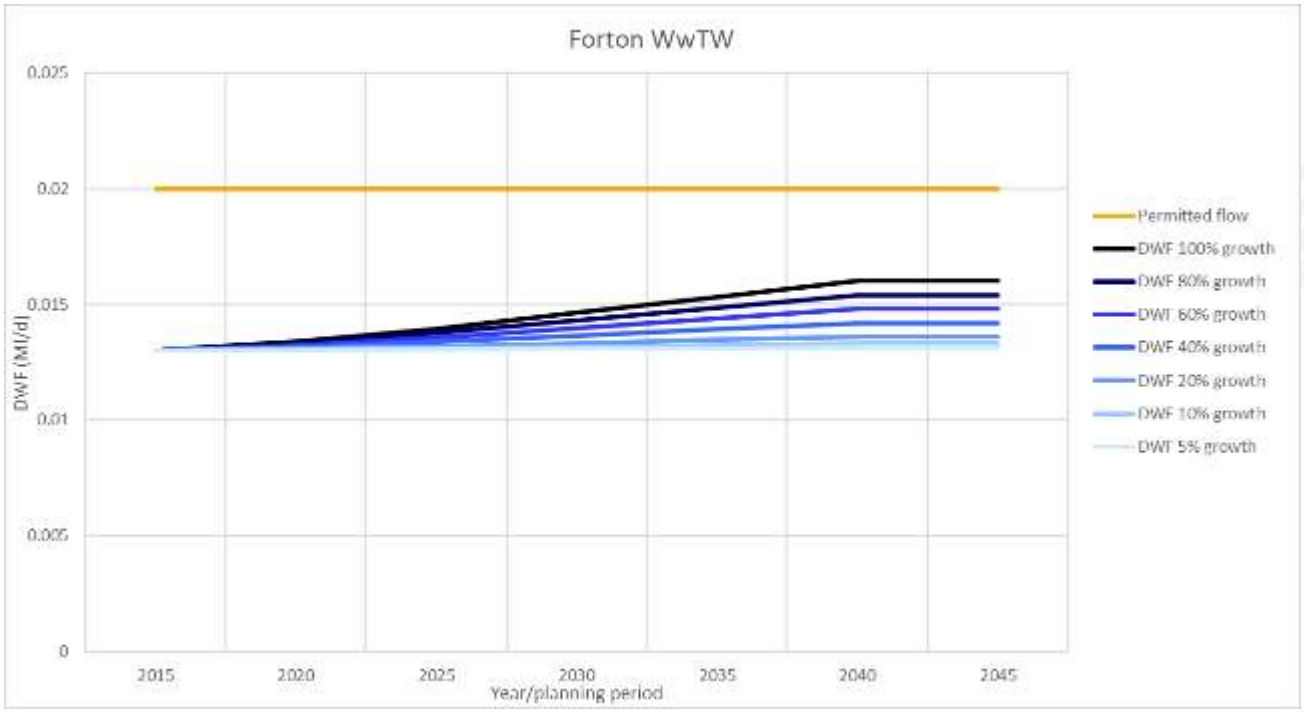

Coven Heath WwTW
12
10
8
6
4
2
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

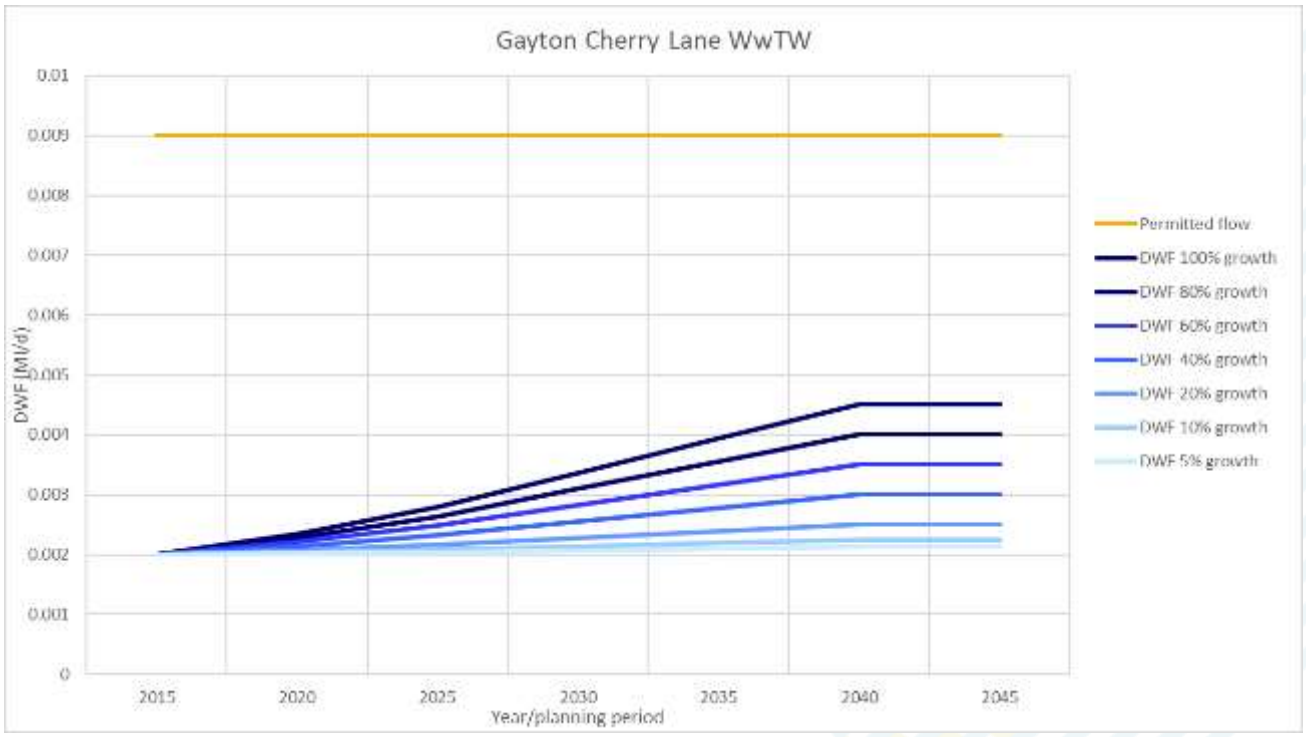

Derrington WwTW
DWF (Ml/d)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

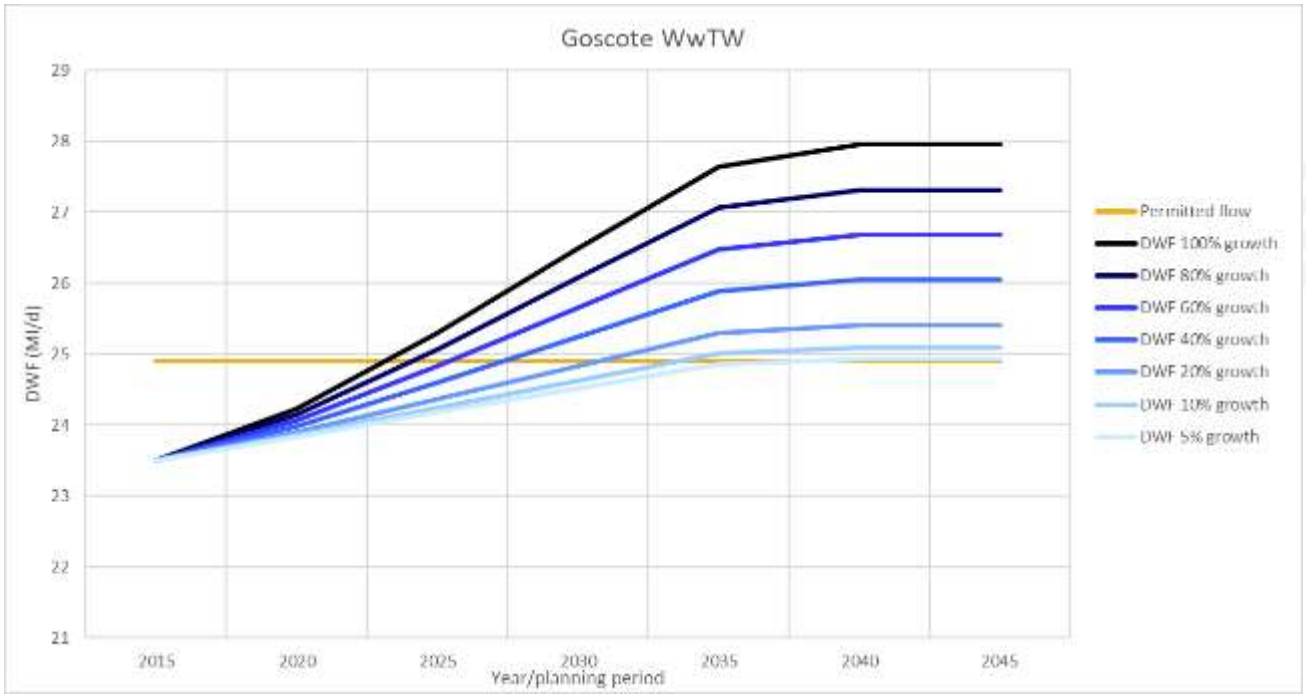

Eccleshall and Sturbridge WwTW
DWF (Ml/d)
4
3.5
3
2.5
2
1.5
1
0.5
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

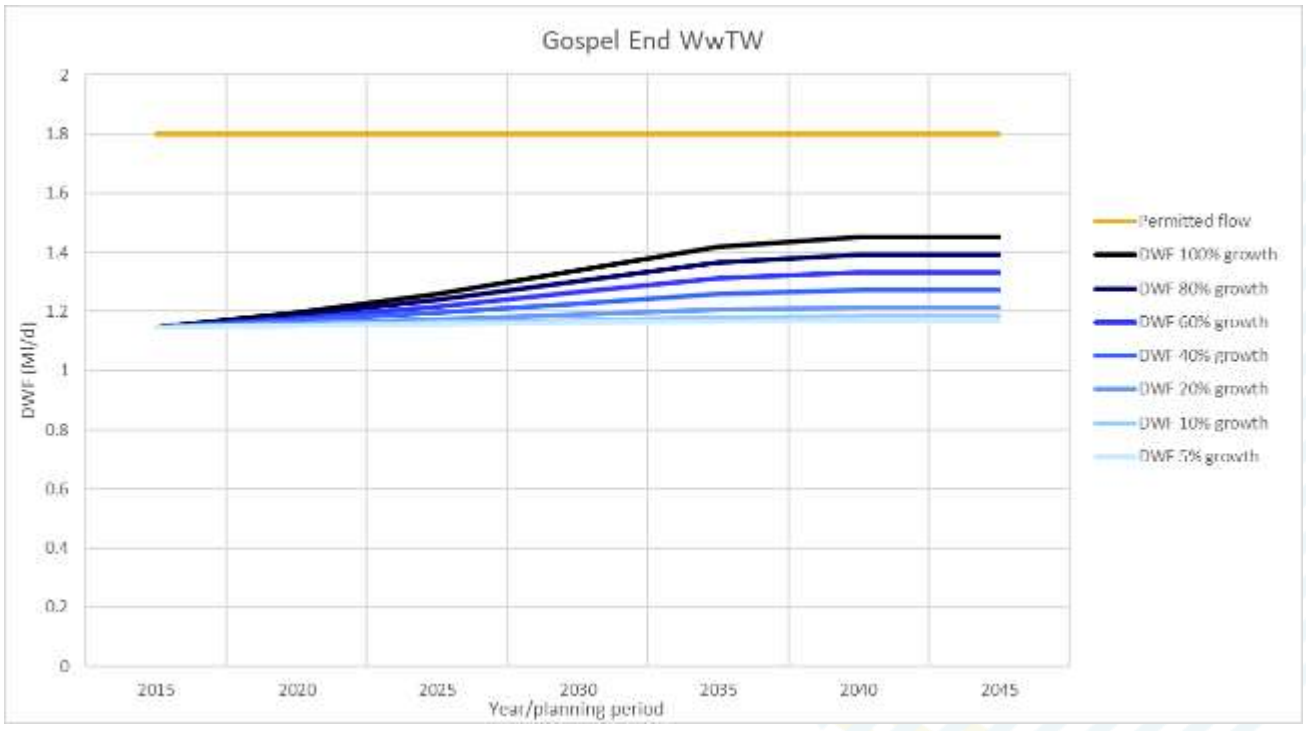

Edingale WwTW
DWF (Ml/d)
0.3
0.25
0.2
0.15
0.1
0.05
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

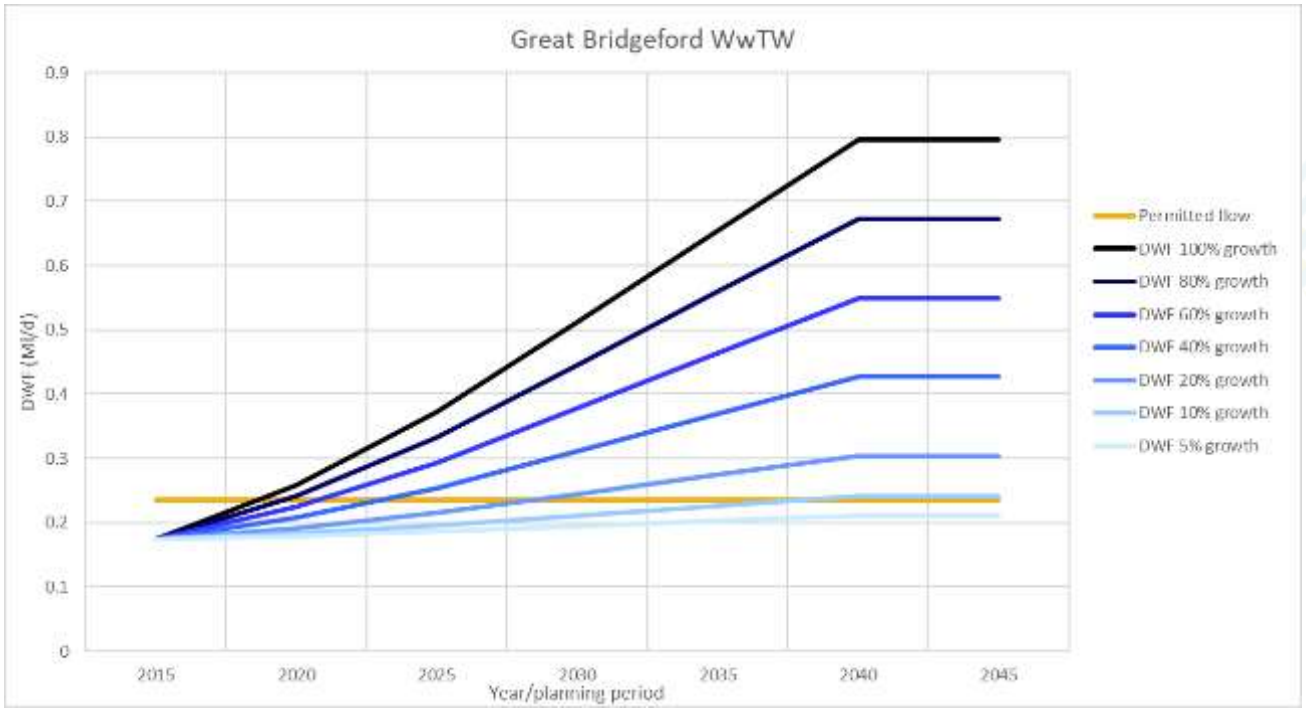

Elford WwTW
DWF (Ml/d)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

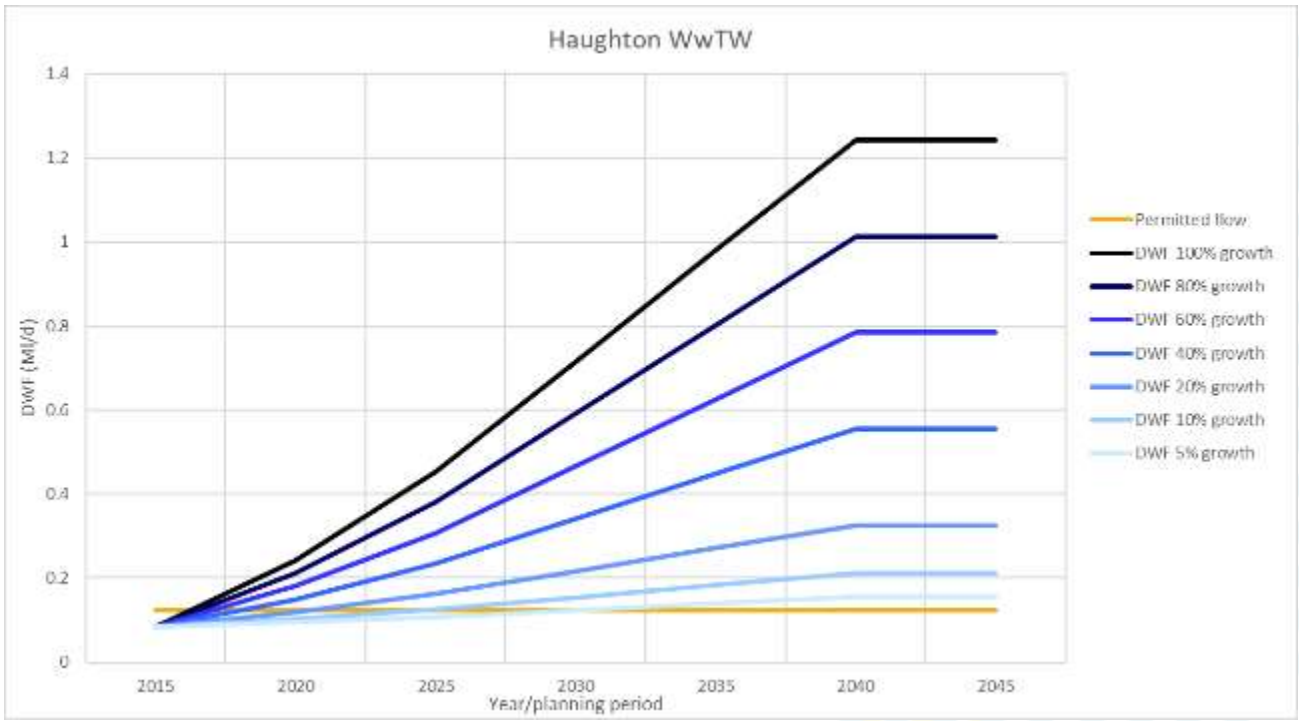

Forton WwTW
0.025
0.02
0.015
0.01
0.005
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

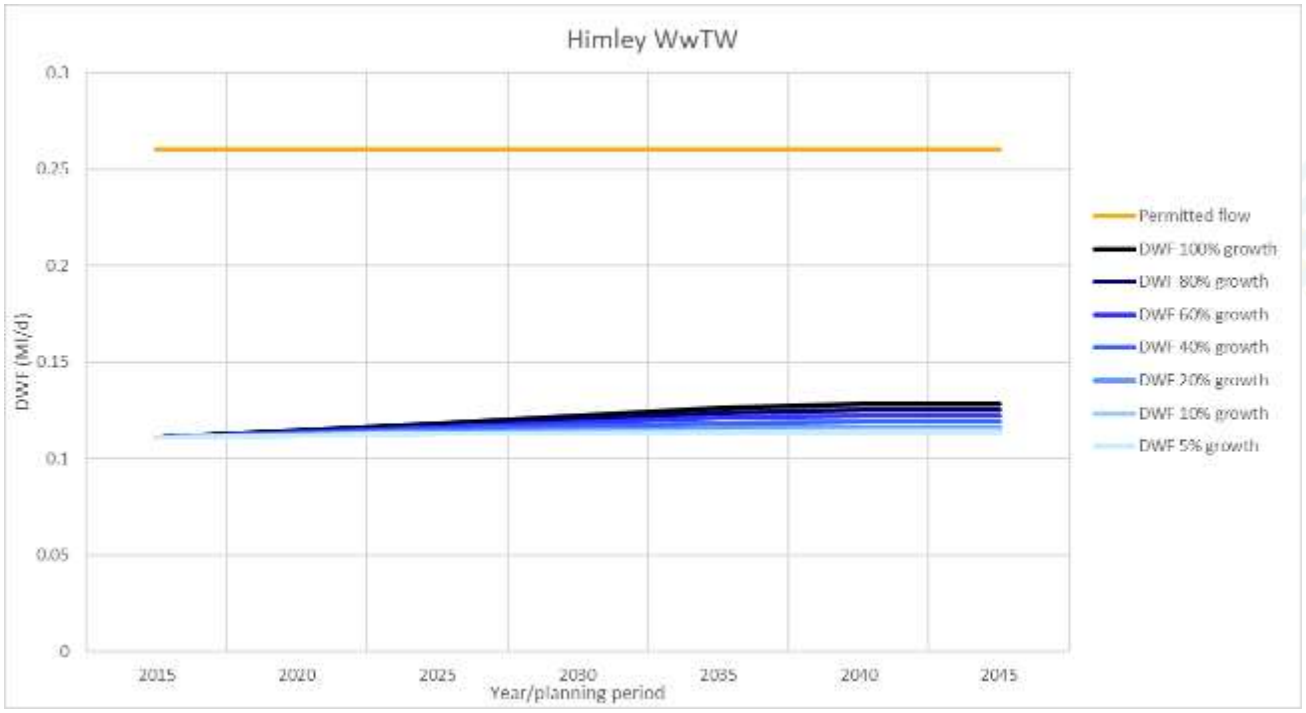

Gayton Cherry Lane WwTW
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

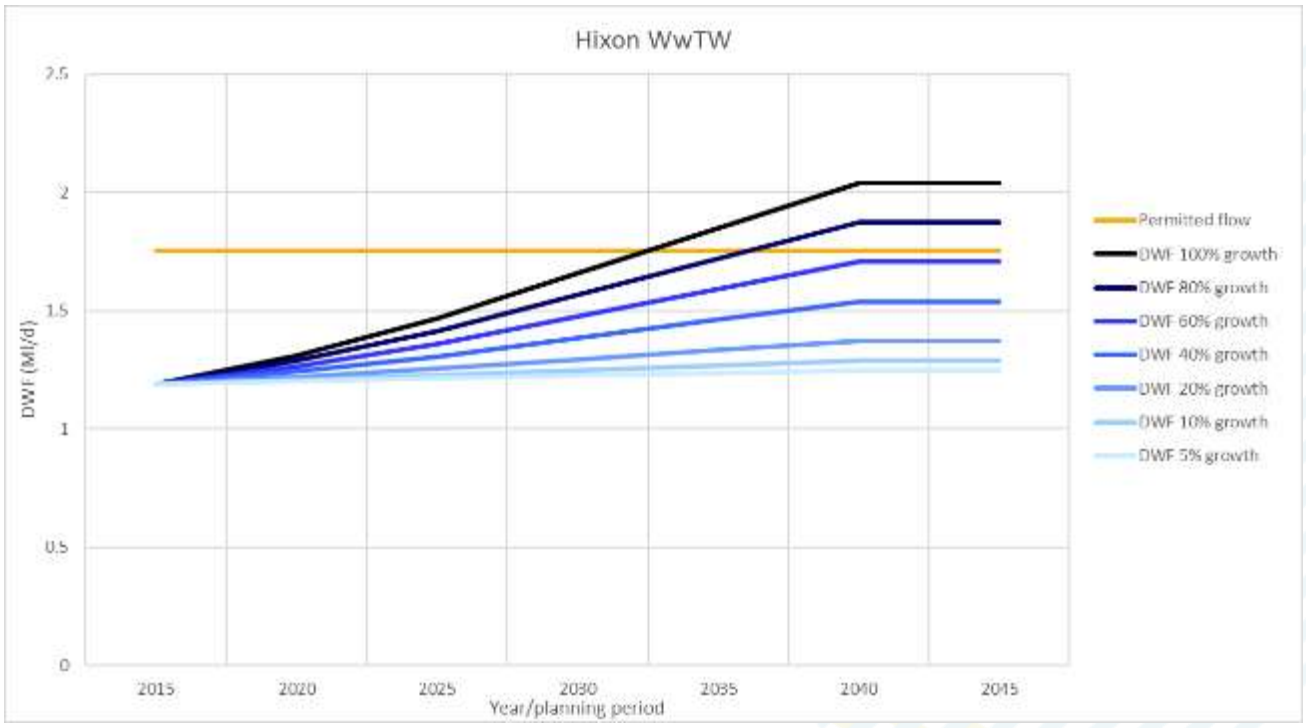

Goscote WwTW
DWF (Ml/d)
29
28
27
26
25
24
23
22
21
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

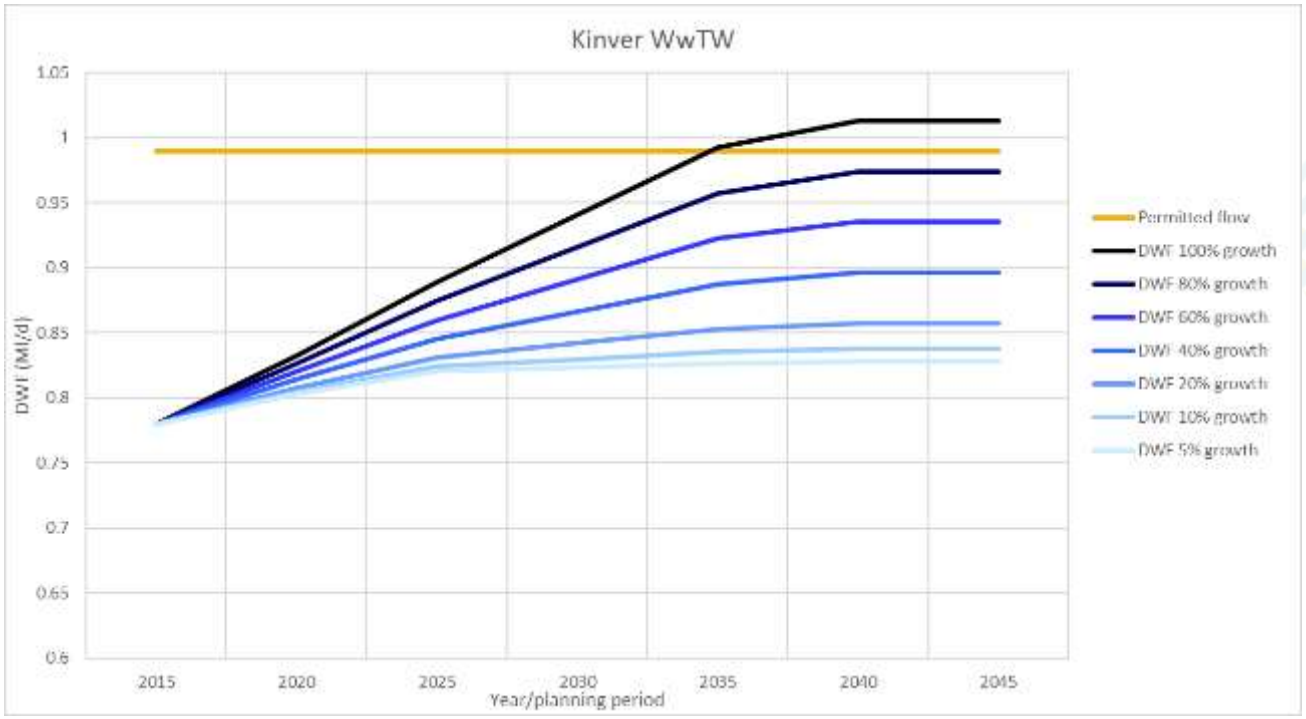

Gospel End WwTW
DWF (Ml/d)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

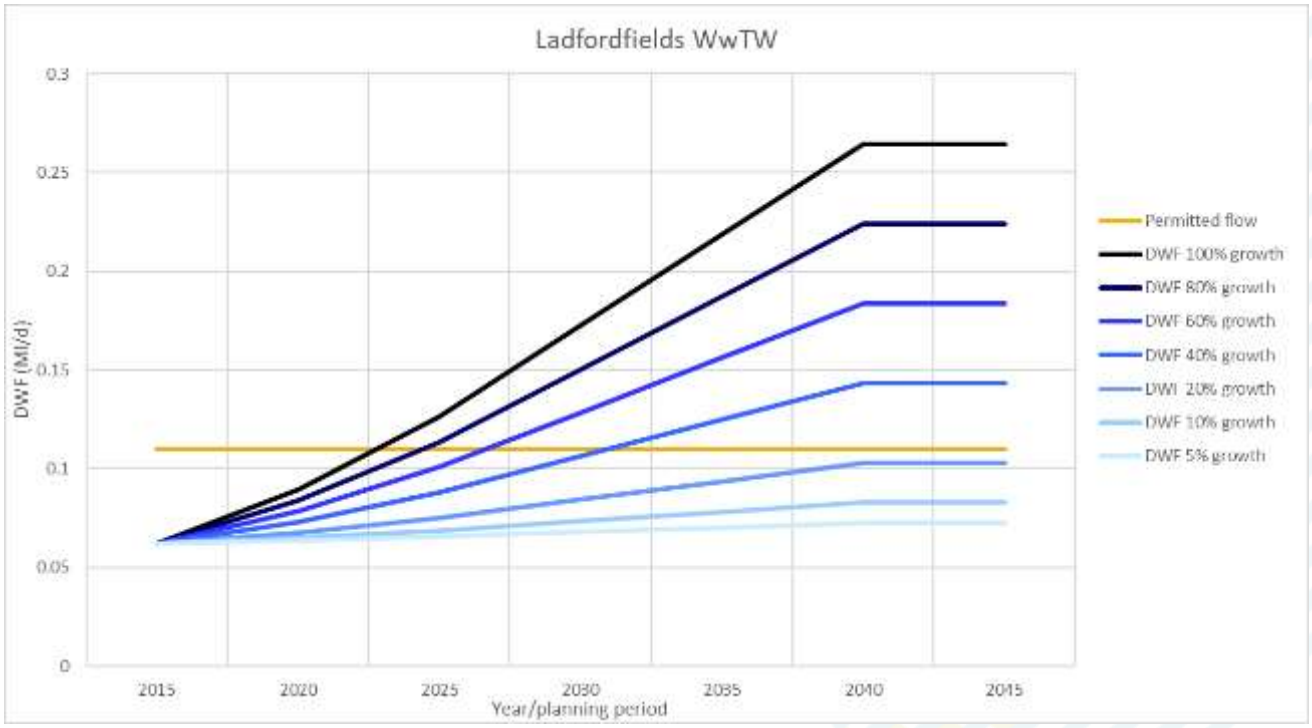

Great Bridgeford WwTW
DWI (Ml/d)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWI 100% growth
DWI 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

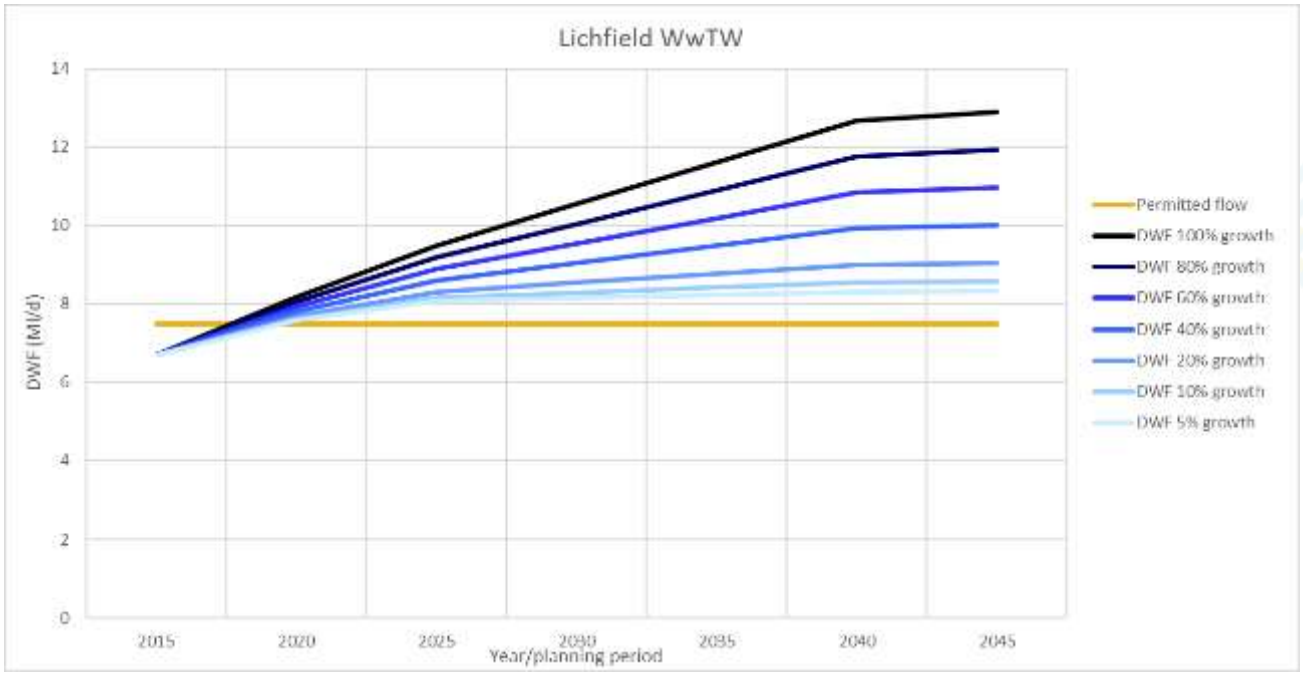

Haughton WwTW
DWI (Ml/d)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWI 100% growth
DWF 80% growth
DWI 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

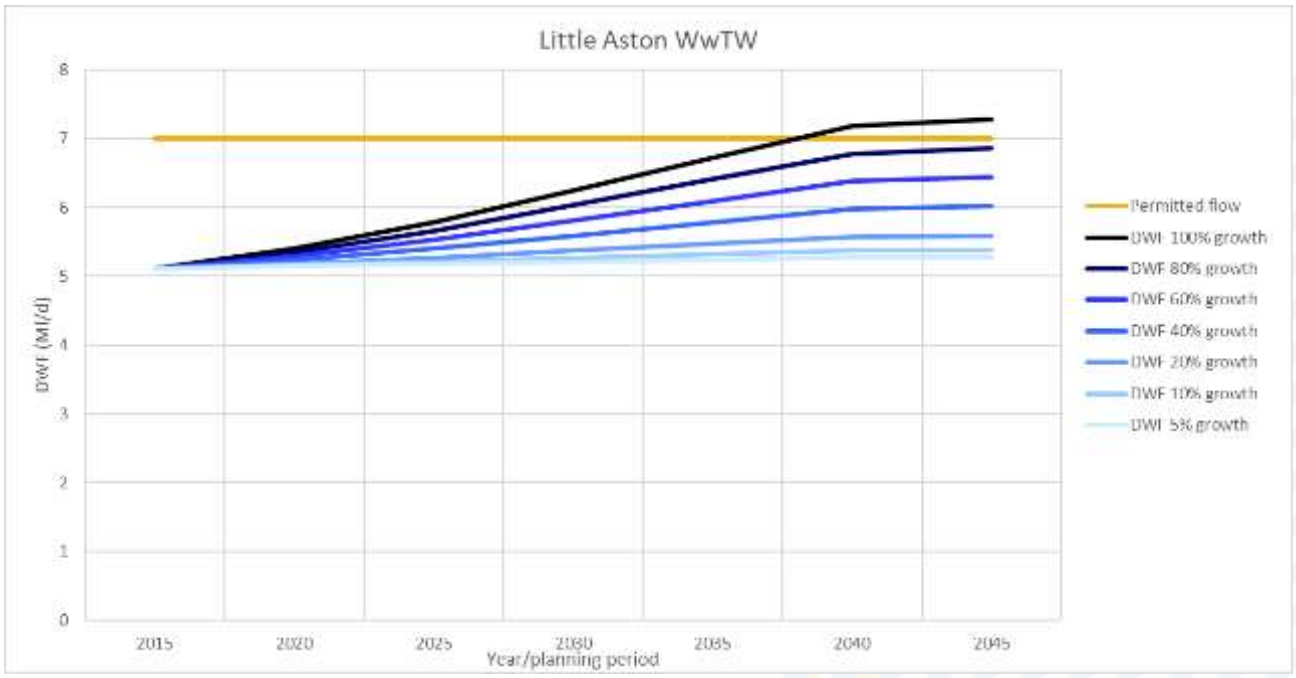

Himley WwTW
DWF (Ml/d)
0.1
0.25
0.2
0.15
0.1
0.05
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

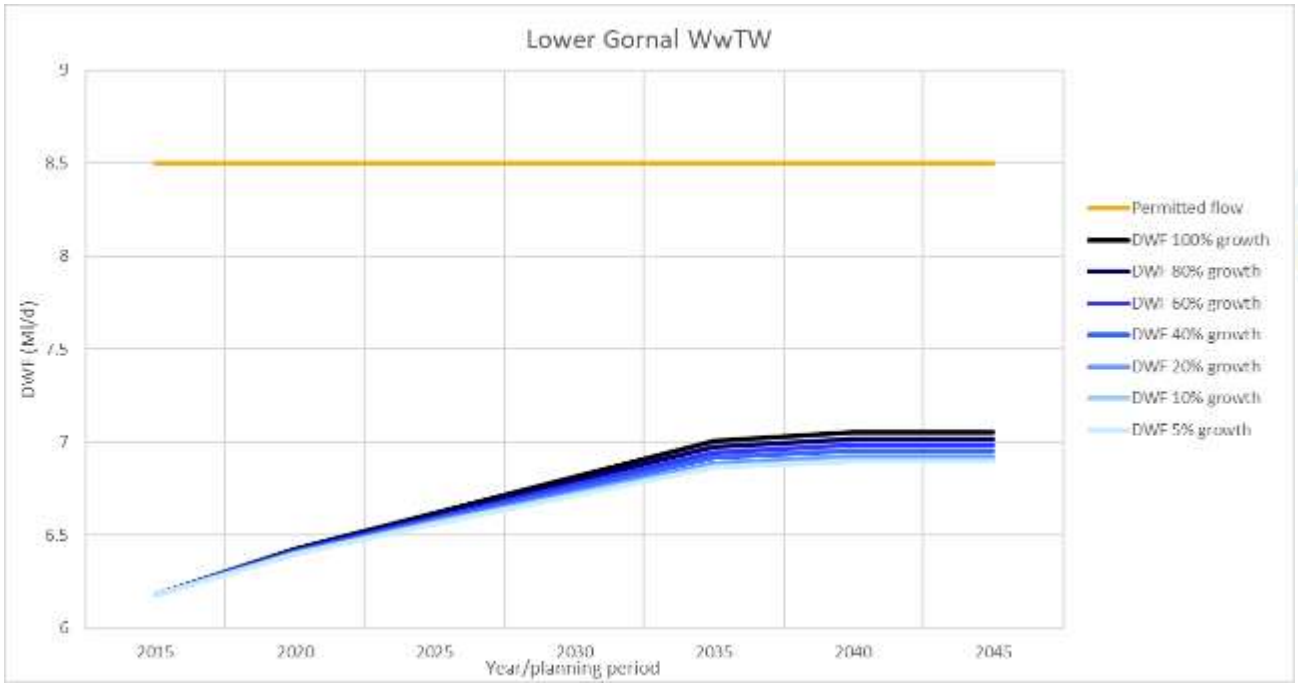

Hixon WwTW
DWF (Ml/d)
2.5
2
1.5
1
0.5
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

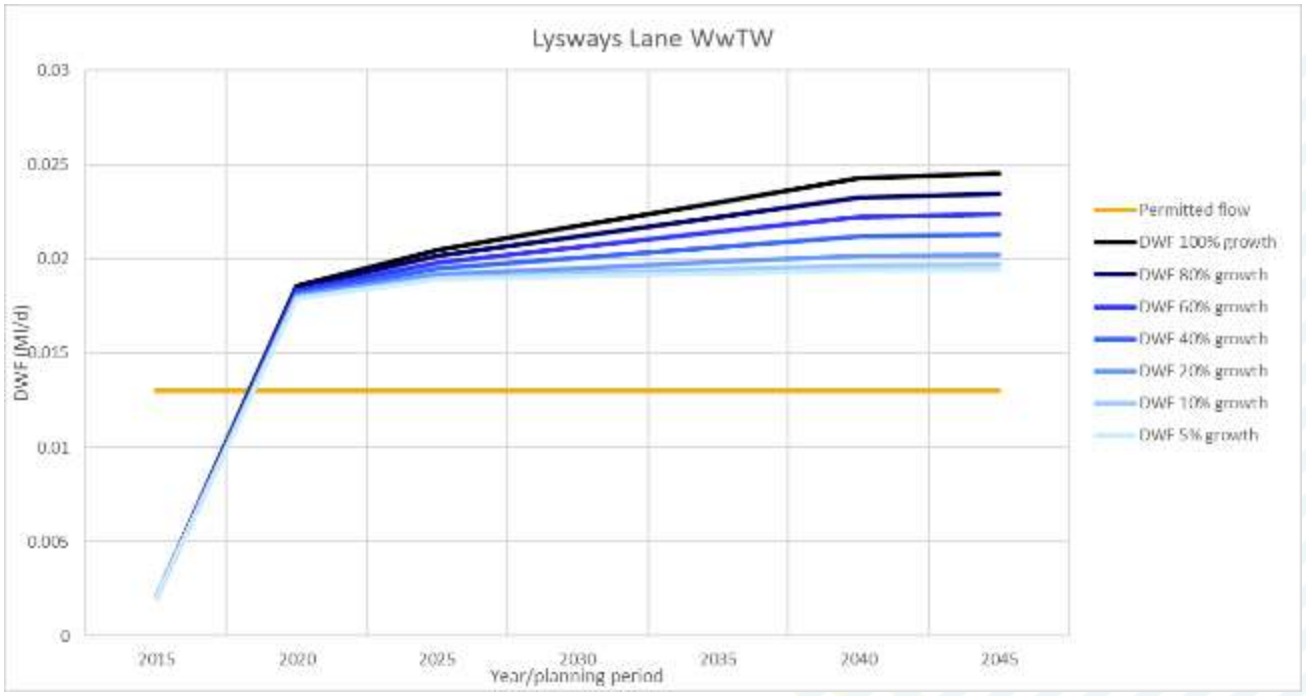

Kinver WwTW
DWF (Ml/d)
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

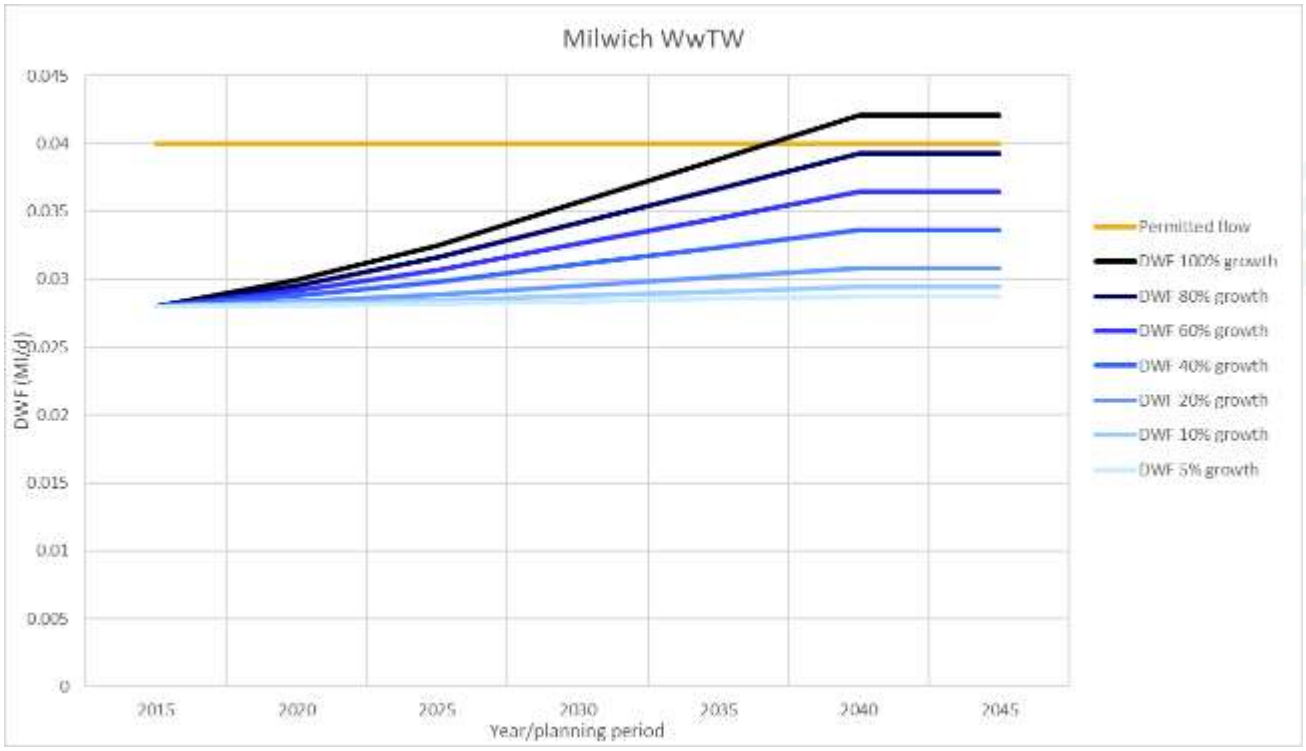

Ladfordfields WwTW
DWF (Ml/d)
0.3
0.25
0.2
0.15
0.1
0.05
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

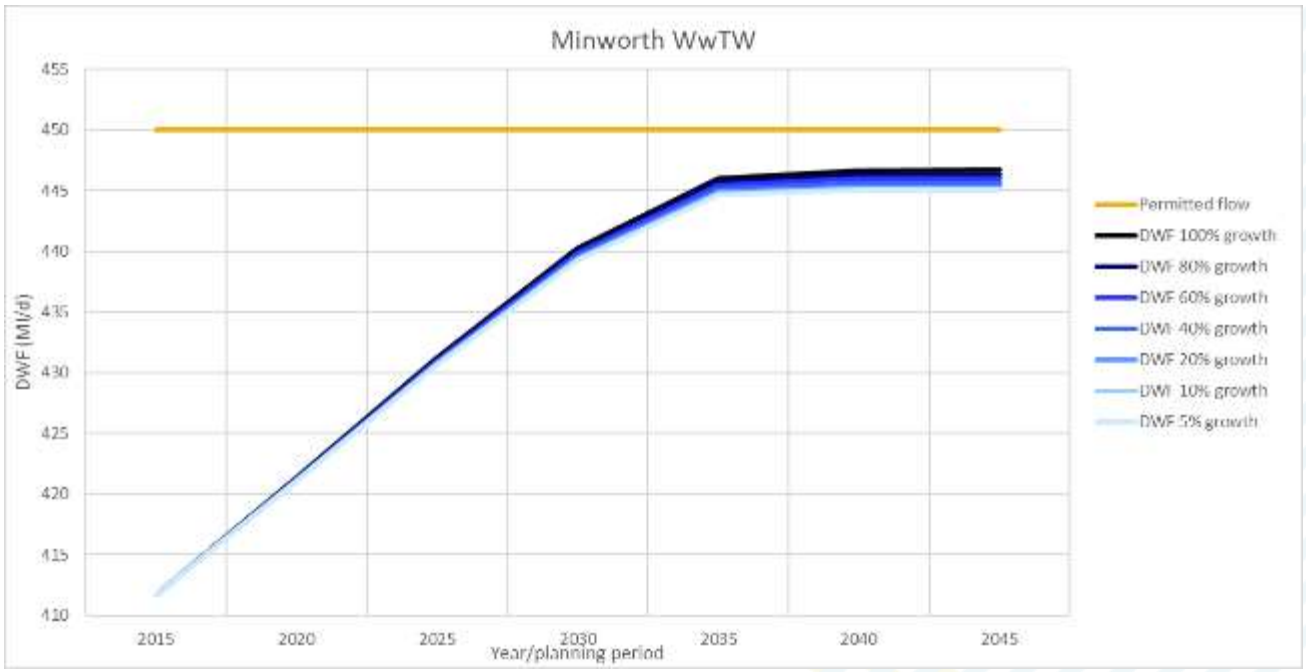

Lichfield WwTW
DWF (Ml/d)
0
2
4
6
8
10
12
14
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

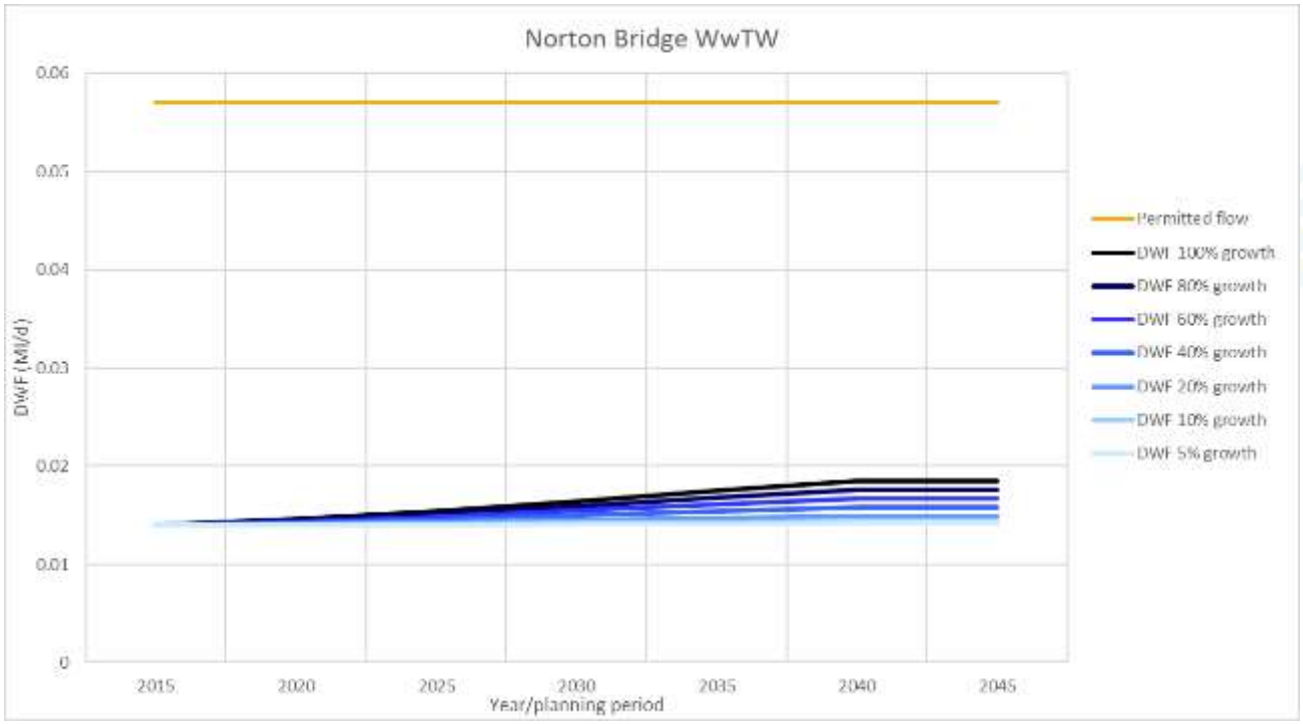

Little Aston WwTW
DWF (Ml/d)
0
1
2
3
4
5
6
7
8
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

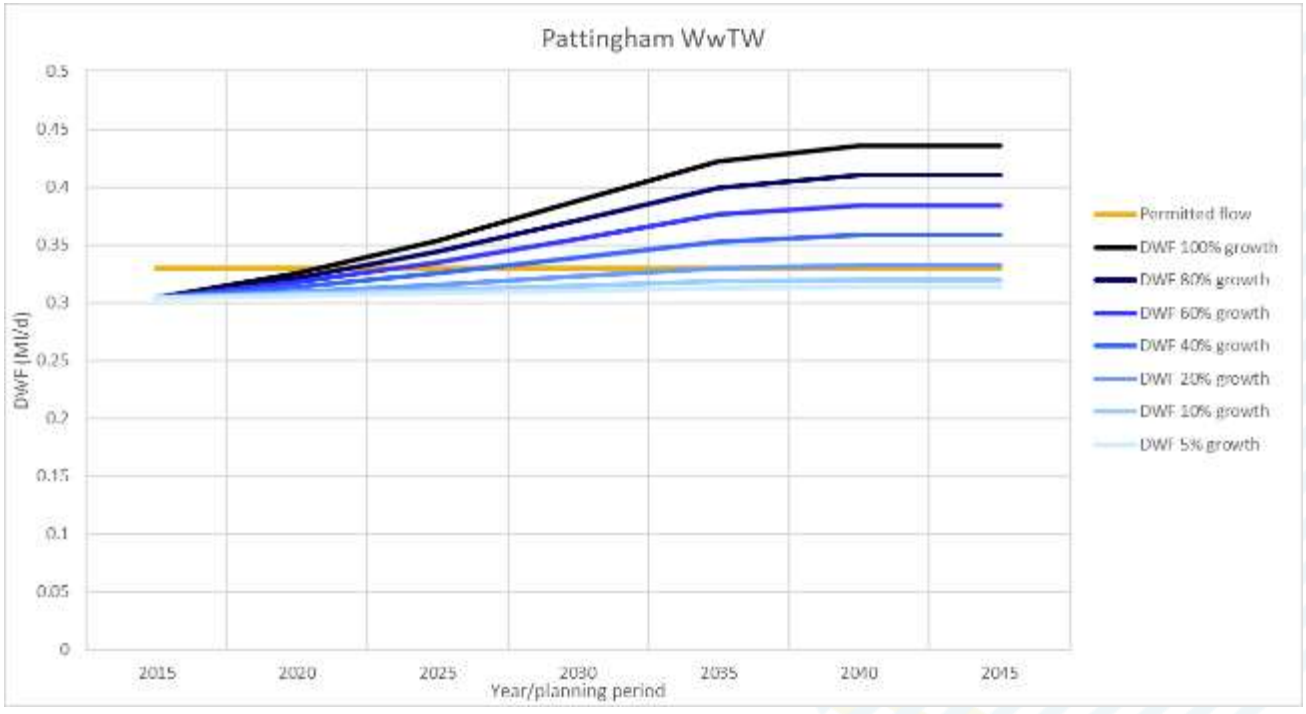

Lower Gornal WwTW
DWF (Ml/d)
9
8.5
8
7.5
7
6.5
6
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

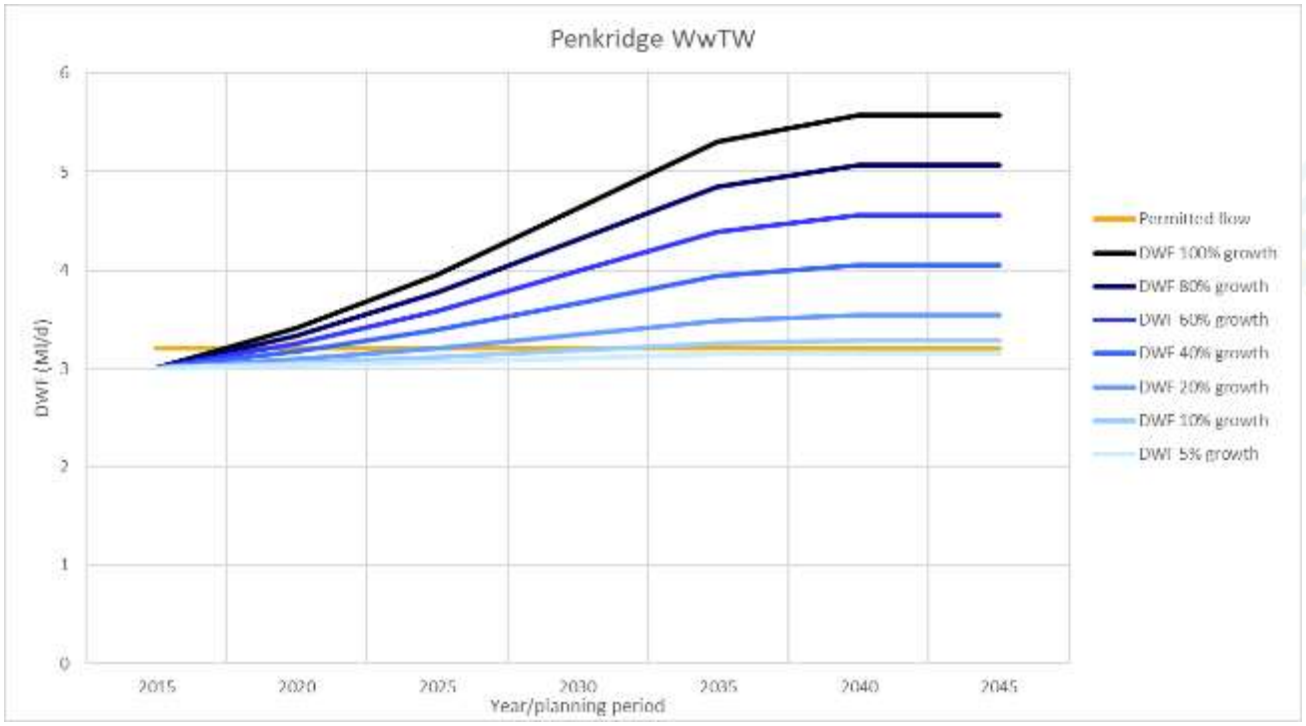

Lysways Lane WwTW
DWF (Ml/d)
0.03
0.025
0.02
0.015
0.01
0.005
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

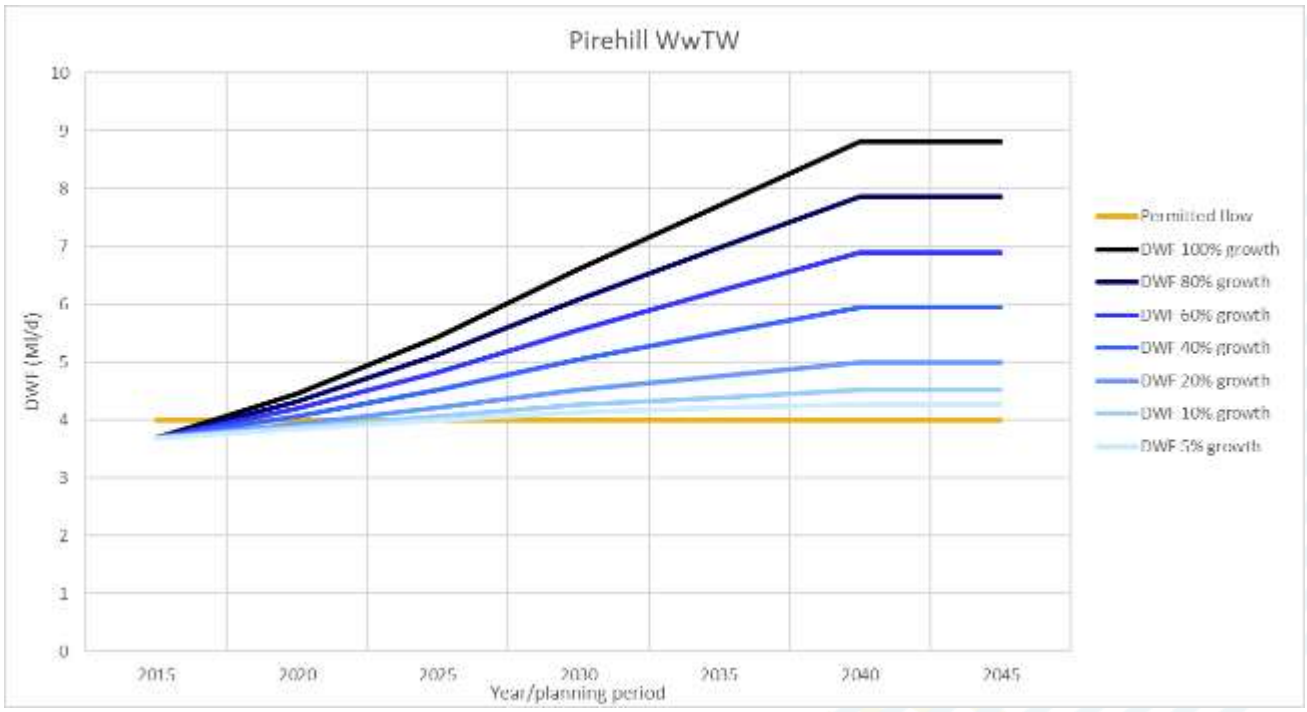

Milwich WwTW
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

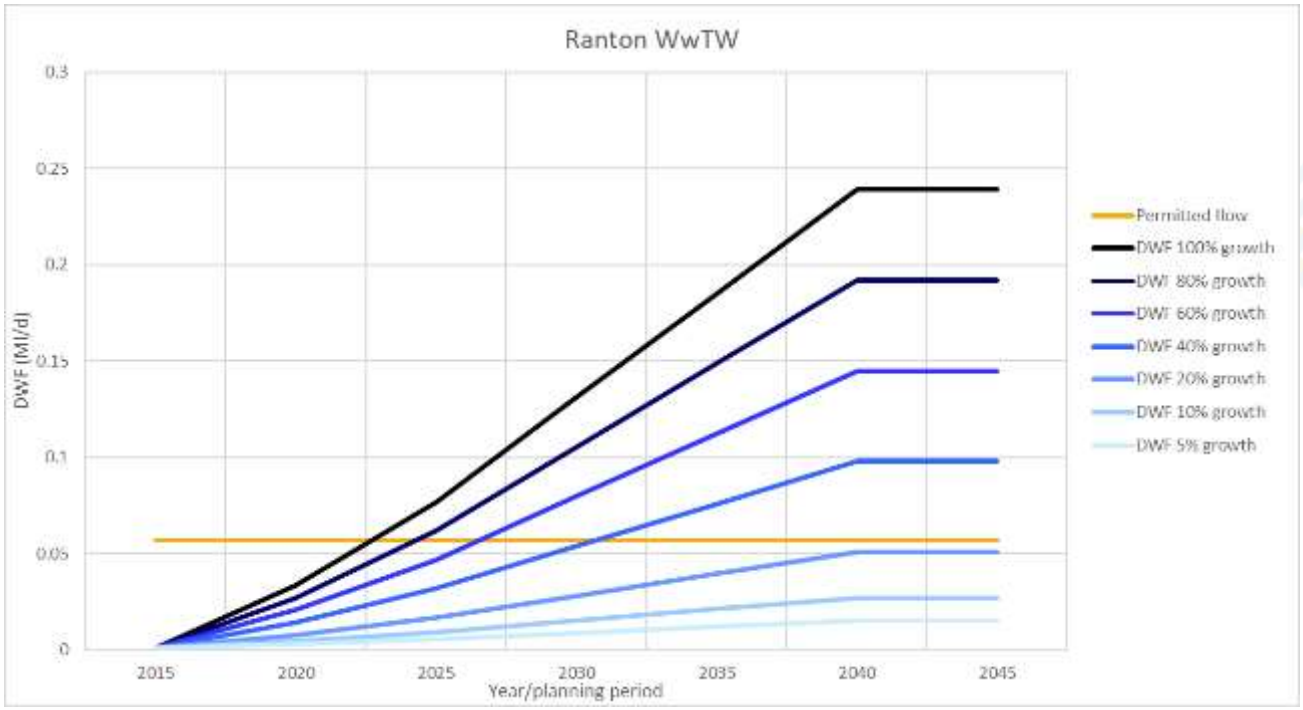

Minworth WwTW
455
450
445
440
435
430
425
420
415
410
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

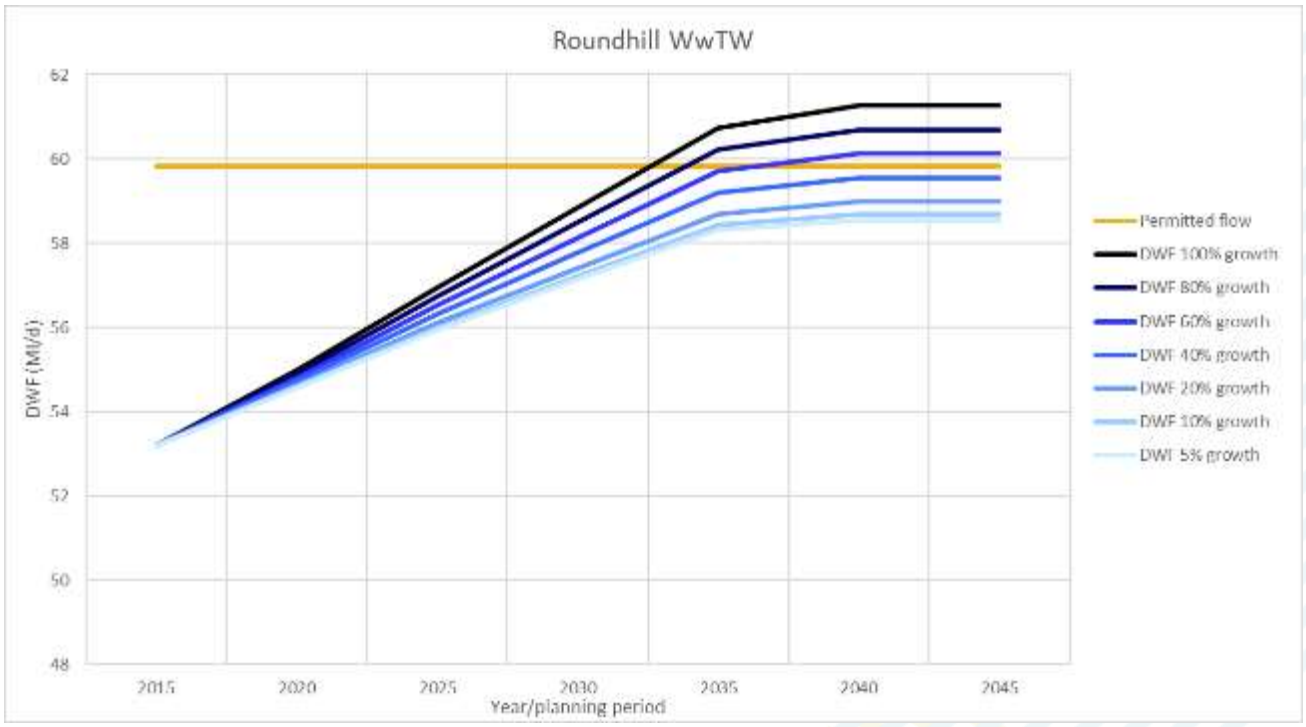

Norton Bridge WwTW
DWF (Ml/d)
0.06
0.05
0.04
0.03
0.02
0.01
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

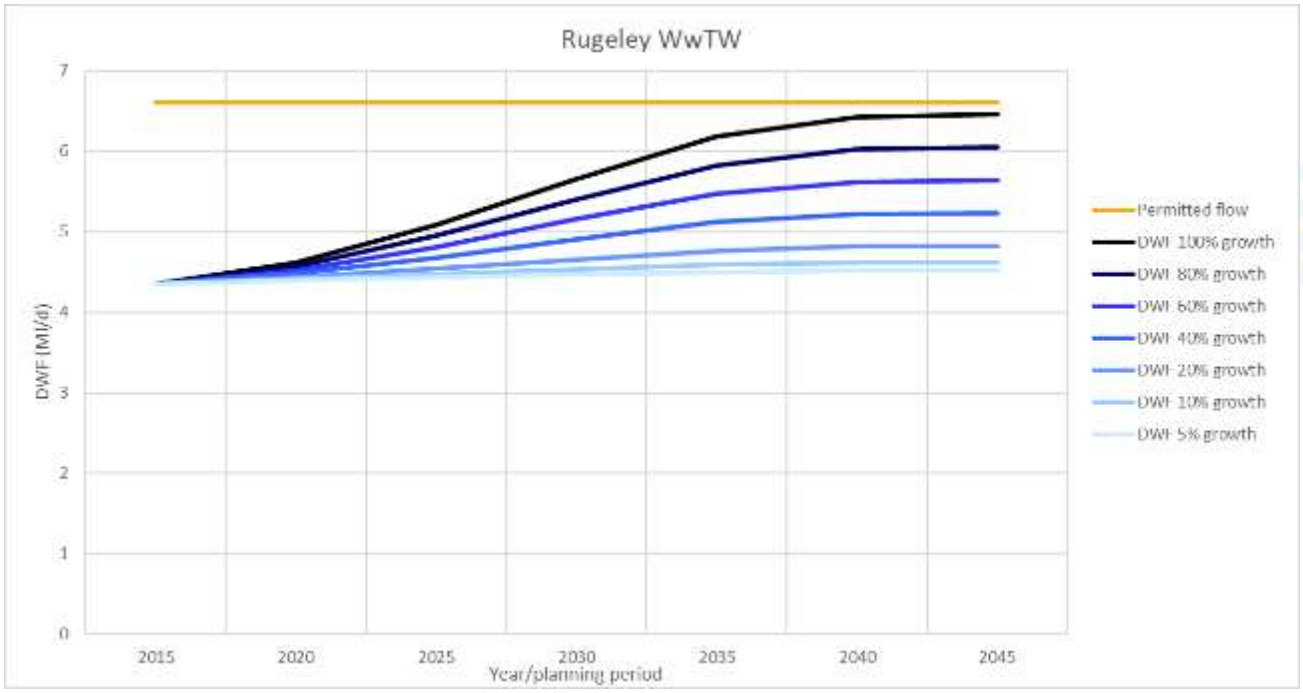

Pattingham WwTW
DWF (Ml/d)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

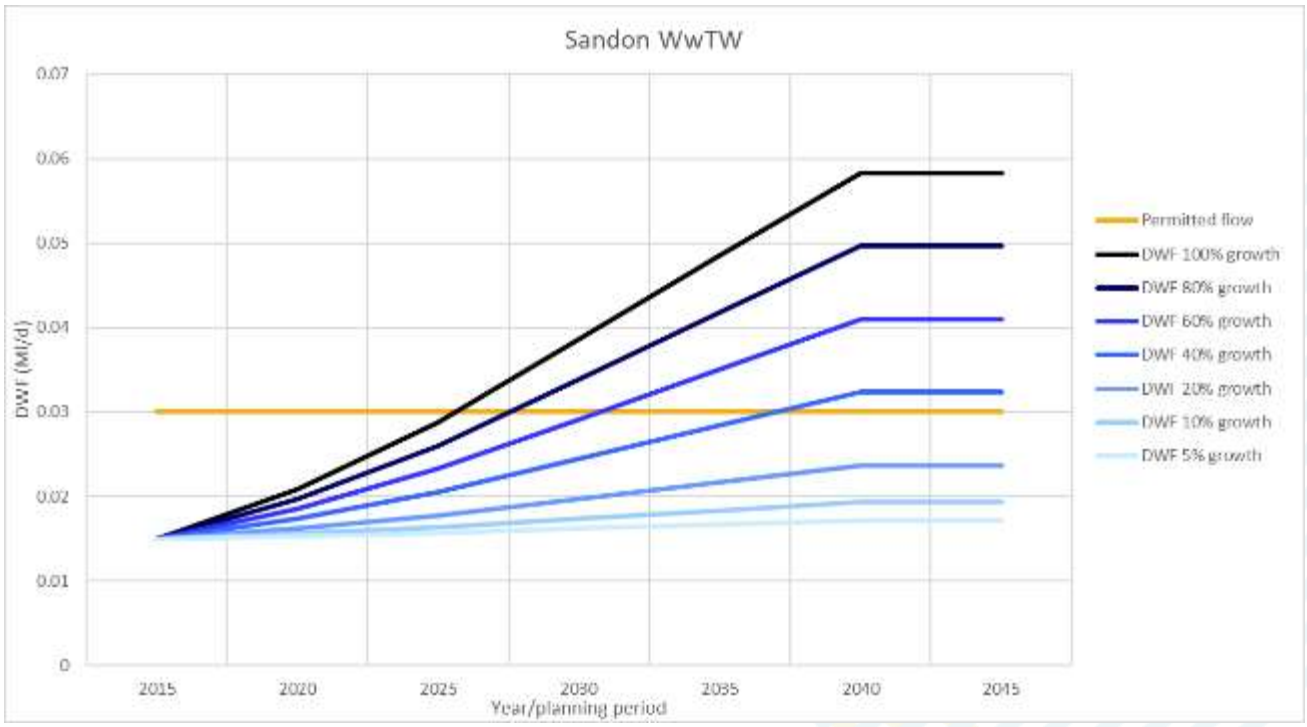

Penkridge WwTW
DWF (Ml/d)
0
1
2
3
4
5
6
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

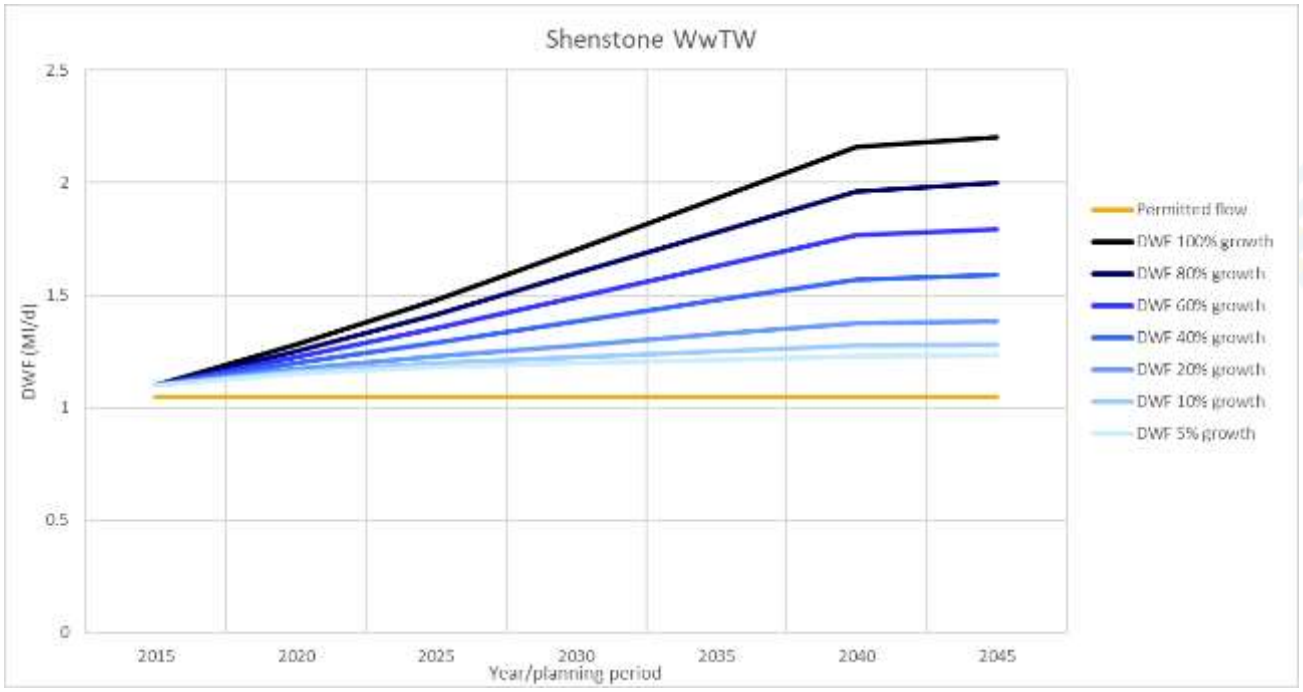

Pirehill WwTW
DWF (Ml/d)
0
1
2
3
4
5
6
7
8
9
10
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

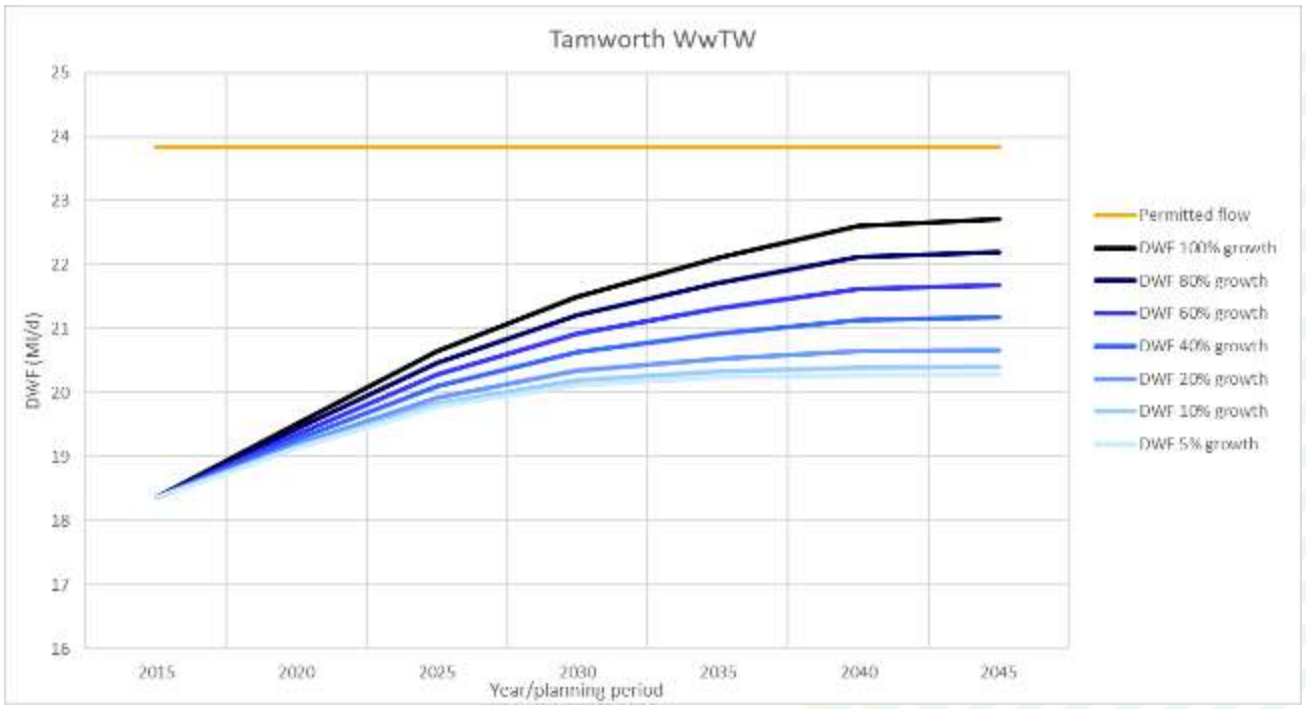

Ranton WwTW
DWF (Ml/d)
0.3
0.25
0.2
0.15
0.1
0.05
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

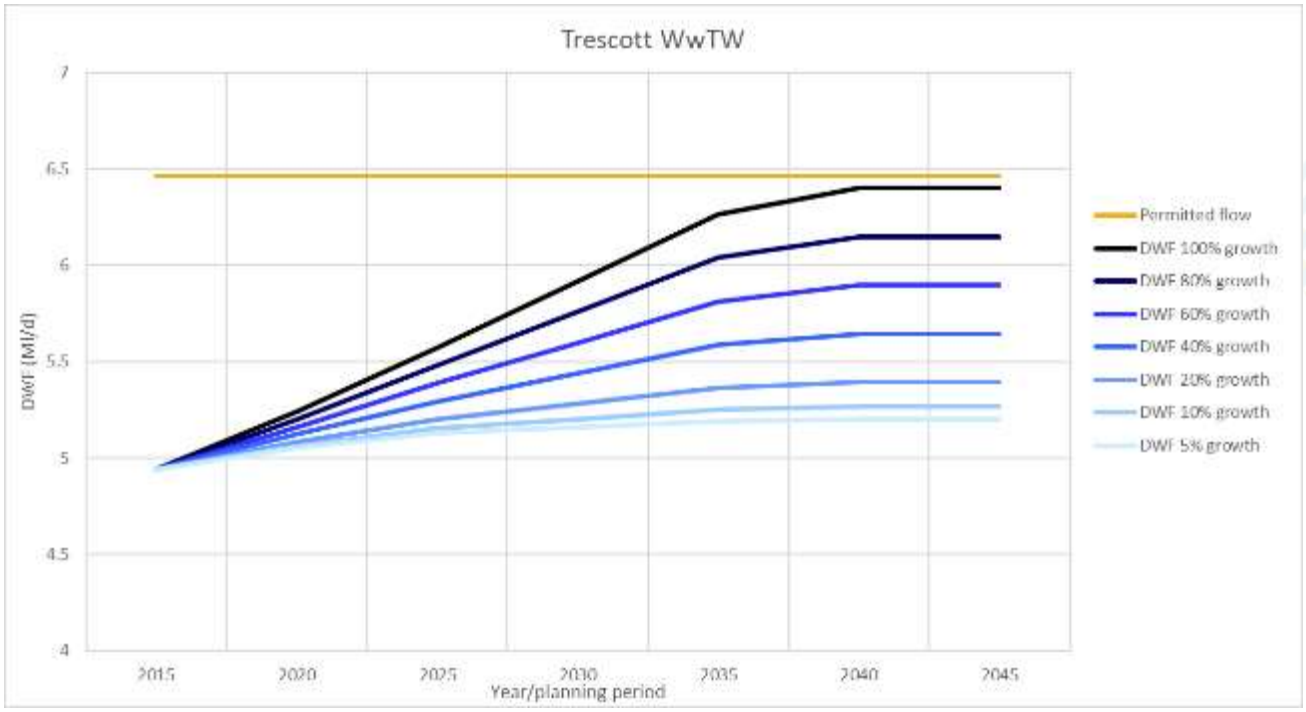

Roundhill WwTW
DWF (Ml/d)
62
60
58
56
54
52
50
48
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

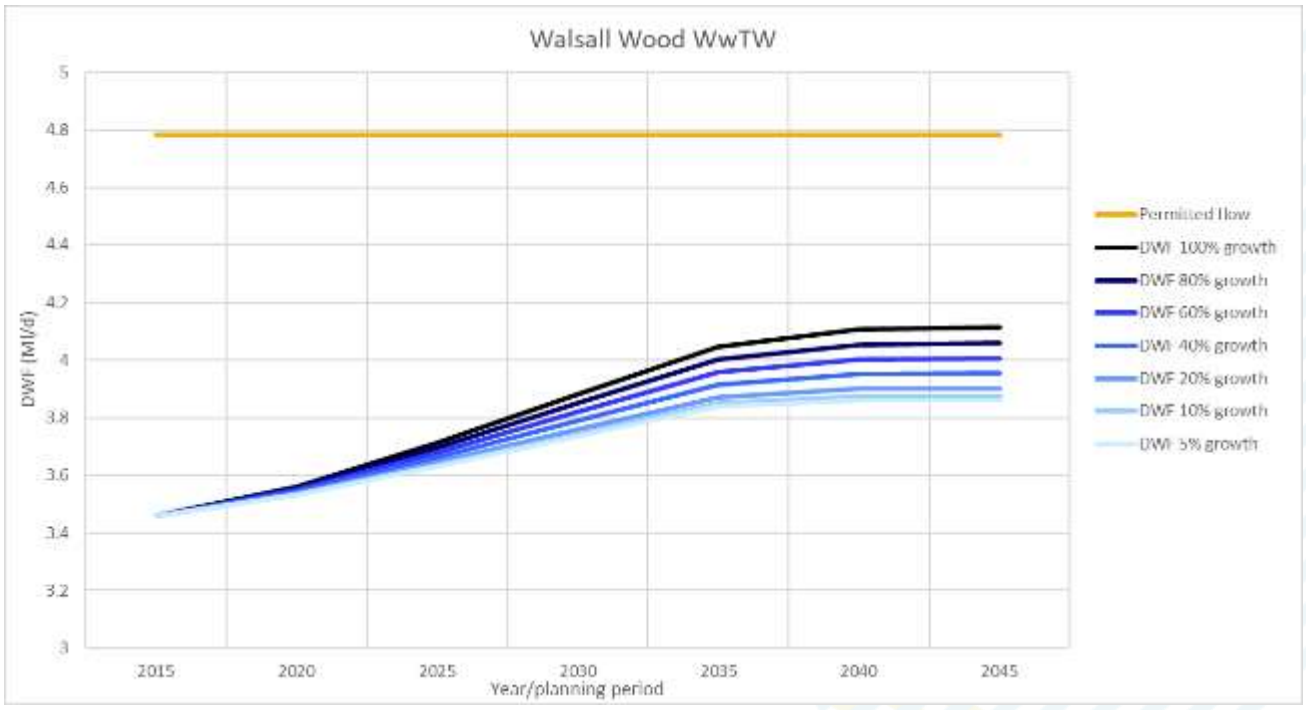

Rugeley WwTW
DWF (Ml/d)
0
1
2
3
4
5
6
7
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

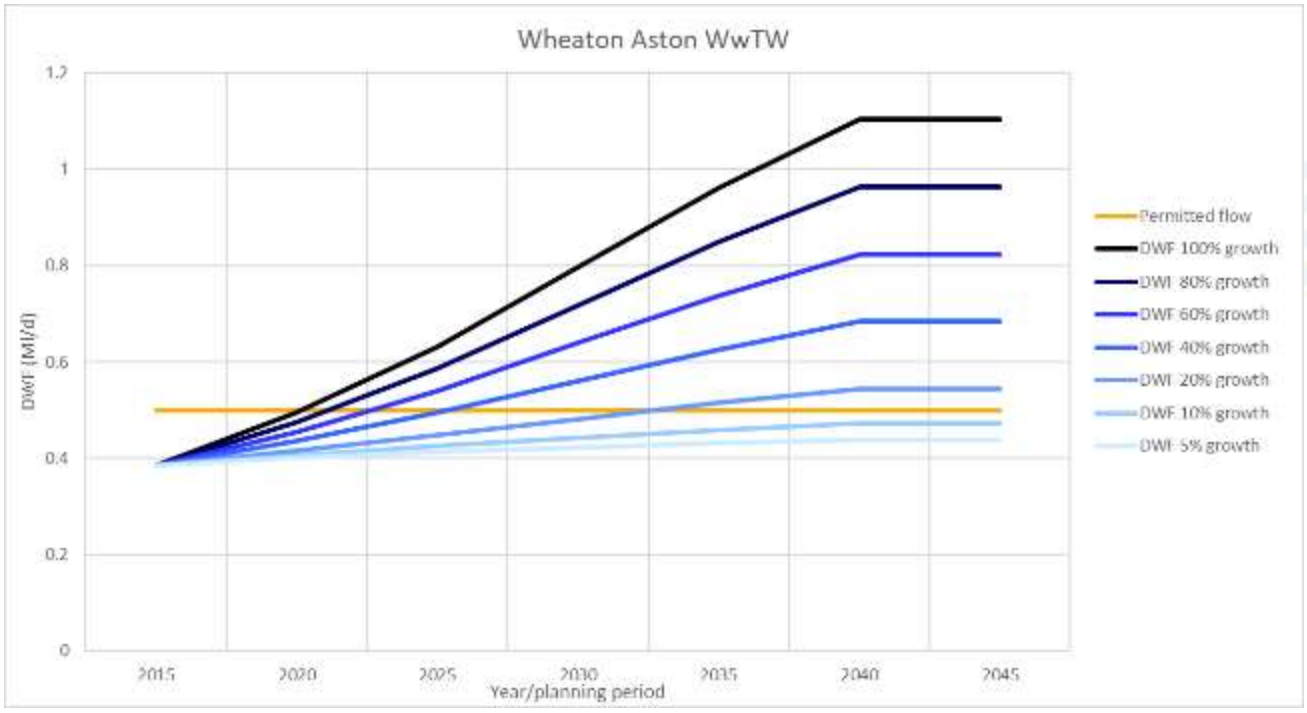

Sandon WwTW
DWF (Ml/d)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

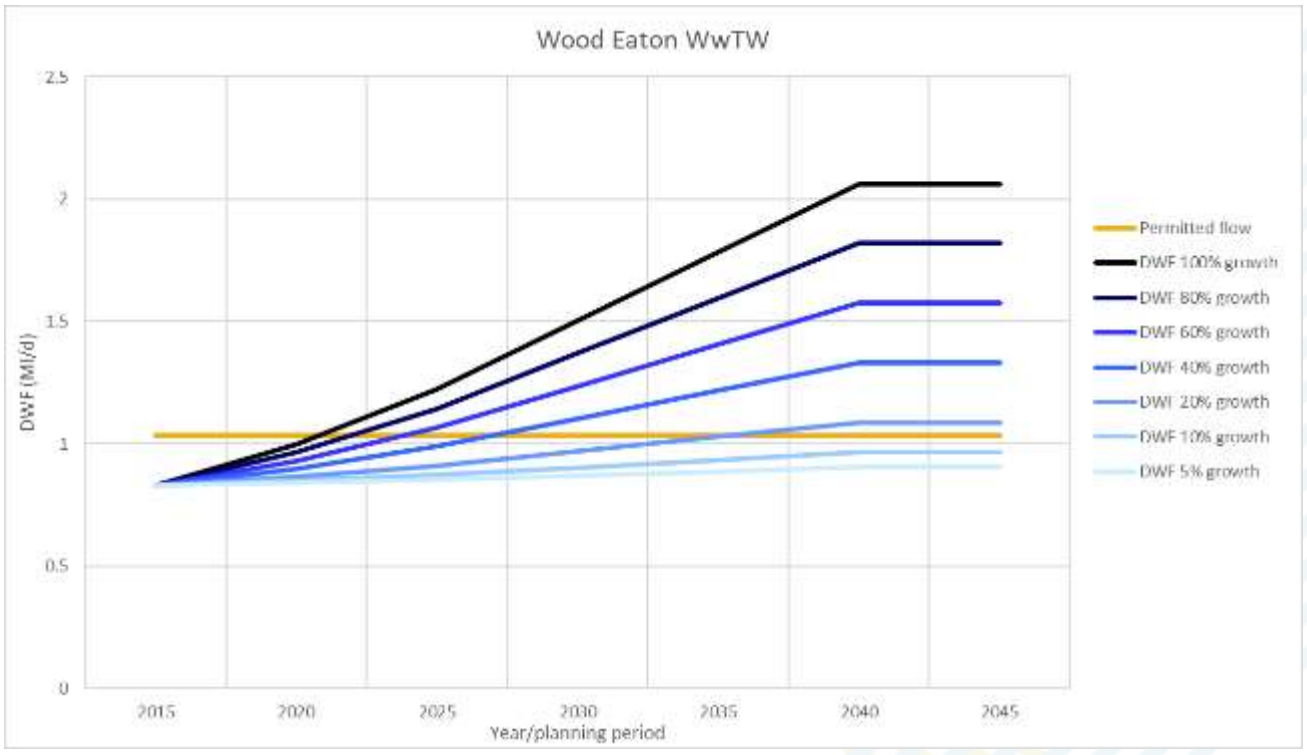

Shenstone WwTW
DWF (Ml/d)
2.5
2
1.5
1
0.5
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth


Tamworth WwTW
DWF (Ml/d)
25
24
23
22
21
20
19
18
17
16
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth


Trescott WwTW
DWF (Ml/d)
7
6.5
6
5.5
5
4.5
4
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth


Walsall Wood WwTW
DWF (Ml/d)
5
4.8
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth


Wheaton Aston WwTW
DWF (Ml/d)
1.2
1
0.8
0.6
0.4
0.2
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth


Wood Eaton WwTW
DWF (Ml/d)
2.5
2
1.5
1
0.5
0
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth


Woodseaves WwTW
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
DWF (Ml/d)
2015
2020
2025
2030
2035
2040
2045
Year/planning period
Permitted flow
DWF 100% growth
DWF 80% growth
DWF 60% growth
DWF 40% growth
DWF 20% growth
DWF 10% growth
DWF 5% growth

Offices at

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