Newcastle-under-Lyme Borough Council and Stoke-on-Trent City Council Water Cycle Study: Phase 1

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Revision History

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V1.0 – 25 March 2019	Draft Report	Melanie Hughes
V1.4 – 14 January 2020	Draft Final Report Incorporating Client comments	Jemma March
V2.0 – 16 January 2020	Final Report	Jemma March

Contract

This report describes work commissioned by Newcastle-under-Lyme Borough Council and Stoke-on-Trent City Council in October 2018. Newcastle-under-Lyme Borough Council's representative for the contract was Pete Atwell. Emily Jones and Richard Pardoe of JBA Consulting carried out this work.

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Purpose

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Acknowledgements

JBA Consulting would like to thank Jack Robinson from Severn Trent Water and Leanne Crook from United Utilities for their assistance in producing this report.

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Executive summary

The Water Cycle

Source: Environment Agency – Water Cycle Study Guidance

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

The Water Cycle Study has been carried out in co-operation with Severn Trent Water, United Utilities and the neighbouring Local Planning Authorities (LPAs).

Potential development sites were provided by Newcastle-Under-Lyme Borough Council and Stoke-on-Trent City Council, and wastewater treatment works (WwTW) likely to serve growth in the area were identified using the Environment Agency Consents database. 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 Phase 2. Where further study is required, a proposed methodology is provided.

Water Resources

The study area is covered the North Stafford water resource zone (WRZ) which is supplied by Severn Trent Water (STW). Growth accounted for within the Water Resource Management Plan is broadly in line with the Ministry of Housing Communities and Local Government (MHCLG) household projections for Newcastle-under-Lyme and Stoke-on-Trent, but less will occur than if growth is delivered in line with the Objectively Assessed Need (OAN) for housing. From 2024 a supply-demand deficit is predicted in the North Staffordshire WRZ, however the STW Water Resource Management Plan (WRMP) defines a number of actions that address this.

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 do not provide site-by-site analysis for potential development sites, however they stated that they "do not envisage a problem" for any sites that are within their water resource zone. As a consequence, all sites were given a "Green" red/amber/green (RAG) score.

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

Wastewater collection infrastructure

Severn Trent Water and United Utilities are responsible for wastewater services within the study area. 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 both companies is therefore essential to ensure that sewerage capacity can be provided without delaying development.

Severn Trent Water and United Utilities were provided with a list of the sites and forecast housing numbers and new employment floor space in order to provide assessment based upon the information they hold. Due to the large number of sites, STW set a threshold of 20 houses or employment sites greater than 0.5 ha above which an assessment would be carried out. Sites below this threshold were assumed to have sufficient capacity available to serve the planned growth and were given a "Green" RAG assessment.

United Utilities provided site-by-site assessment for all potential development sites, however they have not modelled the surface water network within the area and so some of the information is based upon past incidents and information provided by engineers.

No further study of the wastewater network is recommended as part of a Phase 2 Outline study.

Wastewater treatment capacity

Flow permit headroom assessments were carried out at all of the WwTW that are expected to serve growth in the Local Plan period. All of the considered WwTWs have sufficient volumetric capacity to provide for the proposed growth, with the exception of Baldwins Gate (Severn Trent Water) that is close to exceeding its permit. An upgrade of this WwTW to meet a new Phosphorus permit is planned to complete in late 2019. As part of this work, headroom will be revised to accommodate catchment growth.

Capacity is limited at some of the smaller works (Betley, Loggerheads Sanitorium and Loggerheads Village) and growth which exceeds that already planned, may not be able to be accommodated. However, upgrades at the two Loggerheads WwTWs to meet new effluent permits will also add capacity for future growth.

No further assessment of wastewater treatment capacity is recommended as part of a Phase 2 Outline Study.

Water quality

The increased wastewater discharges at the WwTWs serving growth in the study area have the potential to impact downstream water quality in the receiving watercourses.

A qualitative assessment was conducted using available data on WFD Cycle 2 status for the receiving watercourse, forecast growth for each WwTW and existing water quality assessments conducted on each WwTW where available.

Further assessment of the impact of planned development upon water quality should be undertaken as part of a Phase 2 Outline Water Cycle Study.

Flood risk from additional foul flow

A detailed assessment of flood risk can be found in the Newcastle-under-Lyme and Stoke-on-Trent Strategic Flood Risk Assessment. The impact of increased discharges of treated wastewater effluent flows due to planned growth was quantified and is not predicted to have a significant impact on flood risk in any of the receiving watercourses.

No further assessment is recommended in a phase 2 WCS.

Odour from WwTW

16 sites are close enough to a WwTW that a further odour assessment is recommended as part of the planning process. 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.

Environmental constraints

A number of SSSIs exist within Newcastle-under-Lyme and Stoke-on-Trent, 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. Consideration is also given to those outside pf the boundary. 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.

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Abbreviations / Glossary

ALS	Abstraction Licensing Strategy
AMP	Asset Management Plan
AP	Assessment Point
BOD	Biochemical Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Methodology
CAMS	Catchment Abstraction Management Strategies
CAPEX	Capital Expenditure
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
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
NuL	Newcastle-Under-Lyme
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
SoT	Stoke-on-Trent
SPA	Special Protection Area
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SS	Suspended Solids
SSSI	Site of Special Scientific Interest
STW	Severn Trent Water
SU	Sewerage Undertaker
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
uFMfSW	Updated Flood Map for Surface Water
UU	United Utilities
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

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1 Introduction

1.1 Terms of reference

JBA Consulting was commissioned by Stoke-on-Trent City Council and Newcastle-under-Lyme Borough Council to undertake a Water Cycle Study (WCS) for Stoke-on-Trent City Council and Newcastle-under-Lyme Borough Council to inform their joint Local Plan. The purpose of the WCS is to form part of a comprehensive and robust evidence base for the Local Plan which will set out a vision and framework for development in the area up to 2033 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 capability. A WCS will provide the required evidence, together with an agreed strategy to ensure that planned growth can occur 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: http://planningguidance.planningportal.gov.uk/blog/guidance/
on: 21/01/2019
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: 23/01/2019

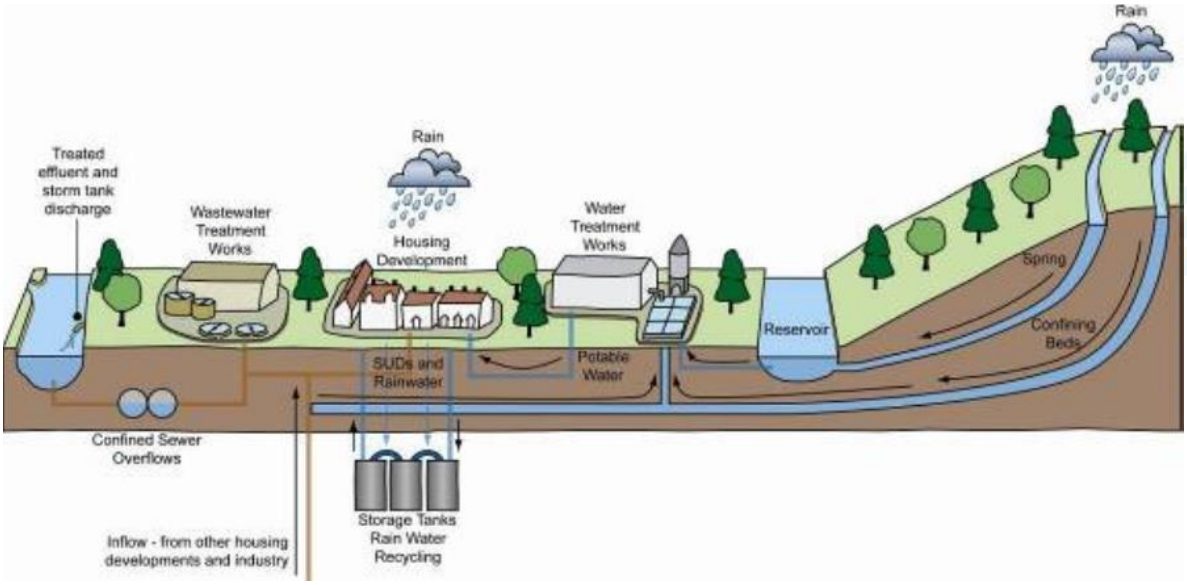

Figure 1.1 The Water Cycle

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 instrument, 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 a new joint Local Plan and to identify whether an outline / detailed WCS is required. Specific requirements, specified by the project brief, were to:

- Produce a high-level baseline assessment of the study area, identifying known capacity issues and available headroom within water and wastewater services, focusing on the preferred option sites
- Document how much growth is allowed for in existing company plans
- Identify the current capacity available to receive and accept growth without the need for upgrading the infrastructure
- Determine what sustainable water infrastructure is required and where and when it is needed
- Ensure future development is sustainable, allowing for climate change and compliant with the Water Framework Directive.
- Establish whether further study is required as part of a Phase 2 Outline study

1.5 Study Area

This WCS scoping report has been written for both Stoke-on-Trent City Council and Newcastle-under-Lyme Borough Council. These Local Authority areas cover 211km^2 and 93km^2 respectively. The borough of Newcastle-under-Lyme includes the main settlement of Newcastle-under-Lyme, the town of Kidsgrove and other large villages of Silverdale and Keele. Stoke-on-Trent is a polycentric city whereby it is made up of six towns; Tunstall, Burslem, Stoke, Hanley, Fenton and Longton.

The River Trent flows from the north east to the south west through the centre of Stoke-on-Trent with two other tributaries forming Main Rivers (Fowlea Brook and Lyme Brook). The Lyme Brook originates in Newcastle-Under-Lyme. The River Lea is also found in the west of Newcastle-under-Lyme.

Water services are provided by Severn Trent Water and wastewater services are provided by both Severn Trent Water and United Utilities Group.

1.6 Record of Engagement

1.6.1 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.

1.6.2 Scoping Study Engagement

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

Inception meeting

Engaged Parties	Newcastle-under-Lyme Borough Council Stoke-on-Trent City Council Staffordshire County Council Environment Agency Canal and Rivers Trust Severn Trent Water United Utilities Faithful & Gould
Details	Inception meeting to discuss project objectives, schedule, and data requirements.

Neighbouring authorities

Engaged Parties	Cheshire East Council Stafford District Council Staffordshire Moorlands District Council
Details	Requests for information on growth in the neighbouring authorities' areas where water/wastewater infrastructure is likely to be shared across the boundary. From available mapping and data from STW, it is not thought that there is any shared wastewater infrastructure across the boundary with Shropshire, so they were not contacted for information.

Collaboration with Water Companies

Engaged Parties	Severn Trent Water United Utilities
Details	Water companies were contacted for data they hold on water and wastewater assets, assessments of sites identified in the Joint Local Plan and comments on issues identified in the study.

2 Future Growth in Newcastle-under-Lyme and Stoke-on-Trent

2.1 Newcastle-under-Lyme Borough Council and Stoke-on-Trent City Council

Newcastle-under-Lyme and Stoke-on-Trent act as a single housing market area within the Strategic Housing Market Assessment[3]. This is defined based upon the high number of house-moves which are contained within the area, as well as a high proportion of labour being retained in the two authorities.

Table 2.1 Objectively Assessed Need (OAN) by Local Authority

Authority	OAN (Homes Per Annum)	OAN over planning period 2013 to 2033
Newcastle-under-Lyme	586	11,720
Stoke-on-Trent	804	16,080
Total	1,390	27,800

Source: Strategic Housing Market Assessment (2017)

Based upon the 2014 Sub-National Housing Projections (SNHP), projected annual dwelling growth is estimated at 805 per annum, whereby 315 are within Newcastle-Under-Lyme and 490 in Stoke-on-Trent. These figures provided a 'starting point' for evaluating the future need for housing.

These housing figures were then adjusted to more closely align with long term demographic trends and allow a return to higher levels of household formation amongst younger people. A further adjustment was made to support likely job growth.

The SHMA concludes that the Objectively Assessed Need (OAN) for housing is 1,390 dwellings per annum within the study area, with 586 houses in Newcastle-under-Lyme and 804 in Stoke-on-Trent.

2.2 Components of development forecast

For the purpose of the assessments within the water cycle study, a baseline growth forecast is defined for development in Stoke-on-Trent and Newcastle-under-Lyme over the Local Plan period. This forecast is made up of the following components:

- Preferred option sites identified through the Strategic Housing Land Availability Assessment process
- Commitments (development sites already in the planning system, but not yet built)
- Windfall

3 Strategic Housing Market Assessment, Stoke-on-Trent City Council and Newcastle-under-Lyme Borough Council (2017). Accessed online at: https://moderngov.newcastle-staffs.gov.uk/documents/s23193/2017%20SHMA%20Update%202.pdf on: 13/08/2019

- Development from outside the study area boundary but served by infrastructure within or shared with the Local Authorities.

These have been collated into an overall forecast contained in Appendix A.

2.3 Housing

2.3.1 Strategic Housing Land Availability Assessment (SHLAA)

Preparation of Strategic Housing Land Availability Assessments is a requirement of the National Planning Policy Framework (NPPF). They identify a future supply of land which is suitable, available and achievable for housing development during the plan period with the overall aim of meeting the housing needs. , The latest SHLAA update was in 2017, and this informed the Preferred Options Document and will continue to inform the site selection process.

2.3.2 Preferred Options

In order to meet the housing demand across the area, the Strategic Issues and Options Consultation document set out four growth options to be considered for the Joint Plan. These options provided varying levels of growth.

The Preferred Options document drew on the evidence and consultation responses received through the Strategic Issues and Options Consultation and concluded that 'Option C' (the majority of the growth met through sustainable urban extensions) was the most favourable option as this would deliver the Objectively Assessed Need (OAN) identified in the SHMA. The majority of Newcastle-Under-Lyme's housing need can be met via sustainable urban extensions, rather than rural development. Further development of the urban Newcastle and Kidsgrove is the preferred option for meeting the shortfall.

2.3.3 Commitments

These developments are those that are already in the planning system so do not appear in the SHELAA document but have not yet been completed so are not taken into account in the current water demand. They are not assessed individually in this study, but their water demand will be accounted for within calculations of infrastructure capacity.

2.3.4 Windfall

Authorities typically make an allowance for windfall sites based upon evidence that demonstrates that such sites have consistently become available and will continue to become available. Windfall sites are typically conversions of existing buildings and infill developments. Across the study area, it is estimated (at the point the Preferred Options document was published) that windfall sites, alongside smaller sites with planning permission, will contribute 4077 houses of which the majority are located in Stoke-on-Trent. For the purpose of producing a growth forecast, the proportion of windfall sites served by each WwTW was estimated based on the proportion of local plan sites served by each WwTW, the assumption being that the location of the highest levels of growth will also be where windfall sites are more likely to be identified. This is shown in Table 2.2.

Table 2.2 Allocation of windfall by WwTW

WwTW catchment	Approximate housing units per year
Audley	<1
Baldwins Gate	2
Betley	<1

Kidsgrove	5
Loggerheads Sanitorium	2
Loggerheads Village	6
Madeley	6
Strongford (contribution from NuL)	42
Strongford (contribution from SoT)	228
Total	**291**

2.4 Growth from neighbouring authorities

2.4.1 Cross boundary growth

Water and wastewater supply, collection and treatment systems may operate across local authority boundaries. Where this is the case, the water cycle study needs to consider all growth which might contribute additional demand to a water or wastewater system.

2.4.2 Staffordshire Moorlands District Council

Staffordshire Moorlands District forms a boundary with the eastern side of Stoke-on-Trent. The potentially shared WwTW include:

- Strongford WwTW
- Checkley WwTW

Both of these WwTW are operated by Severn Trent Water.

Staffordshire Moorlands District Council provided the developments within the two WwTW catchments and the number of dwellings or employment space associated with each. These figures are shown in Table 2.3.

Table 2.3: Staffordshire Moorlands District Council growth forecast

WwTW	Residential Dwellings	Employment Space (m^2)
Checkley WwTW	1,887	109,150
Stongford WwTW	75	0

The figures for both Strongford and Checkley have been incorporated into the growth forecast.

2.4.3 Cheshire East Council

Cheshire East forms a boundary with the north west of Newcastle-under-Lyme and so any developments within the area would potentially be served by the following WwTW operated by United Utilities:

- Betley WwTW
- Kidsgrove WwTW
- Madeley WwTW
- Audley WwTW

Cheshire East Council were contacted to provide details of any potential developments that are likely to be served by these WwTWs. Their local plan (2010-2030) aims to provide 36,000 net additional dwellings and 31,000 net additional jobs during the plan period. They stated that there are no allocations that would be served by WwTW shared with the study area, but it was not possible to say how many committed sites there are in those catchments. It has been assumed that Cheshire East will not contribute any additional wastewater requirements as part of the growth forecast for this study.

2.4.4 Stafford District Council

Stafford District borders the south of both Stoke-on-Trent and Newcastle-under-Lyme. The WwTW which may serve growth across this boundary are:

- Loggerheads Village WwTW
- Ashley WwTW
- Strongford WwTW
- Checkley WwTW

All these treatment works are operated by Severn Trent Water.

Stafford District Council did not provide any direct comments concerning the potential developments within the above WwTW but provided a link to their most recent WCS[4]. This forecast an additional 45 dwellings within Strongford WwTW. No growth was forecast in the other three WwTWs.

2.4.5 Other Neighbouring Authorities

Shropshire Council also share a boundary with Newcastle-under-Lyme (western boundary). The council was not contacted to provide any potential developments or allocations as it is not thought that any infrastructure will be shared across the boundary.

4 Southern Staffordshire Outline Water Cycle Study. (2010). Accessed online at: https://www.staffordbc.gov.uk/sites/default/files/cme/DocMan1/Forward%20Planning/Examination%20Library%202013/D44--SOUTHERN-STAFFORDSHIRE-OUTLINE-WATER-CYCLE-STUDY-FINAL-REPORT.pdf on: 01/02/2019.

2.5 Employment Land

2.5.1 Economic Needs Assessment

The Joint Employment Land Review[5] documented the requirement for employment land within the study area and provided a range of scenarios (demand-led, supply-led and past completions). The evidence produced in the ELR was considered in the SHMA Review (2017) which concluded that the OAN for employment land should be aligned with the scenario based on the Cambridge Econometrics Local Economic Forecasting Model.

The Preferred Options Technical Paper[6] identifies that the OAN for employment development land is 258 hectares between 2013 and 2039 within the study area. During the plan period from 2013 to 2033, this would equate to 199 hectares, made up of 68 hectares for NuL and 131 hectares for SoT.

Table 2.4 Forecast change in employment land requirements (2013-2033)

Local Authority	Employment floorspace requirement
Newcastle-under-Lyme	68 ha office and industrial land
Stoke-on-Trent	131 ha office and industrial land

5 Joint Employment Land Review, Newcastle-under-Lyme Borough Council and Stoke-on-Trent City Council (2015). Accessed online at: https://www.newcastle-staffs.gov.uk/sites/default/files/IMCE/Planning/Planning_Policy/Employment_Land_Review_Report.pdf on: 01/03/2019

6 Preferred Options Technical Paper, Newcastle-Under-Lyme Borough council and Stoke-on-Trent City Council (2018). Accessed online at: https://www.newcastle-staffs.gov.uk/sites/default/files/IMCE/Planning/Planning_Policy/POJLP/PO%20Employment%20Technical%20Paper.pdf on: 13/08/2019

3 Legislative and Policy Framework

3.1 National Policy

3.1.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[7] was published on 27th March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. A comprehensive revision was issued in July 2018. This was further revised in February 2019[8], 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. This has not yet been updated to take account of the 2018 or 2019 updates of the NPPF, however MHCLG have stated that this will, where necessary, be updated in due course. Of relevance to this study;

- Flood Risk and Coastal Change[9]
- Water Supply, Wastewater and Water Quality[10].
- Housing - Optional Technical Standards[11].

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7 National Planning Policy Framework, Department for Communities and Local Government (2012)
8 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: 27/02/2019
9 Planning Practice Guidance: Flood Risk and Coastal Change, Department for Communities and Local Government (2014). Accessed online at: http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/ on: 21/01/2019.
10 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: 23/01/2019
11 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: 23/01/2019

3.1.2 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.

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

A summary of the specific guidance on how infrastructure, water supply, wastewater and water quality considerations should be accounted for in both plan-making and planning applications is summarised below in Figure 3.2.

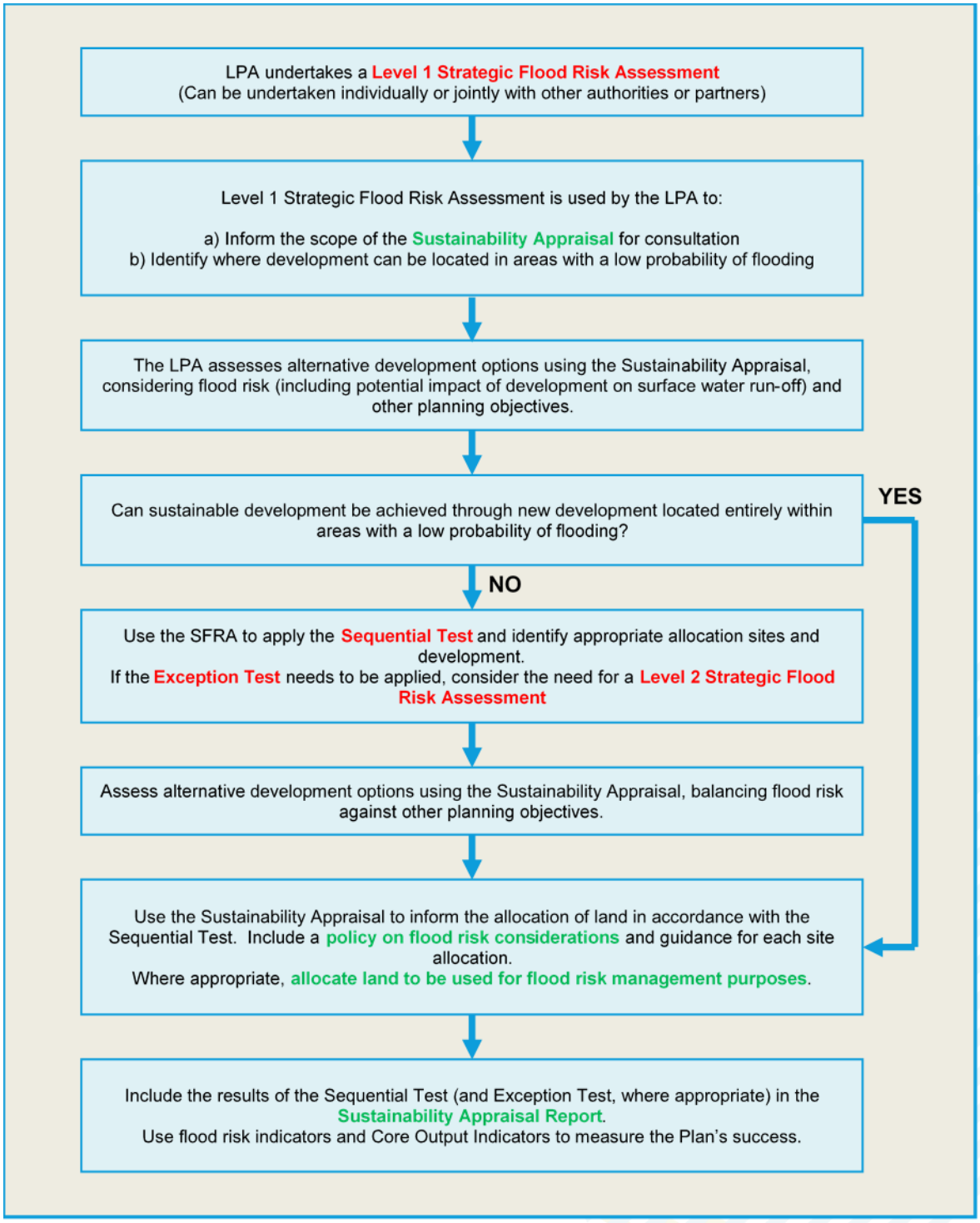

Figure 3.1 Flood Risk and the Preparation of Local Plans[12]

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

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).

Figure 3.2 PPG: Water supply, wastewater and water quality considerations for plan-making and planning applications

3.1.4 Planning Practice Guidance: Housing – Optional Technical Standards

This guidance, advises planning authorities on how to gather evidence to set optional requirements, including for water efficiency. It states that "all new homes already have to meet the mandatory national standard set out in the Building Regulations (of 125 litres/person/day). Where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day. Planning authorities are advised to consult with the EA and water companies to determine where there is a clear local need, and also to consider the impact of setting this optional standard on housing viability. A 2014 study[13] into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £9 for a four-bedroom house.

3.1.5 Building Regulations

The Building Regulations (2010) Part G[14] 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.

3.1.6 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[15]. 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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13 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: 23/01/2019

14 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: 23/01/2019

15 BREEAM International New Construction 2016: Technical Manual SD233 2.0, BREEAM (2016). Accessed online at: https://www.breeam.com/discover/technical-standards/newconstruction/ on: 09/03/2018

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%

3.1.7 Sustainable Drainage Systems (SuDS)

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

- The National Planning Policy Framework, which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.
- The House of Commons written statement[16] 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[17]. 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.
- Stoke-on-Trent City Council are a 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 "Sustainable Urban Drainage Systems (SuDS) Handbook" was published in February 2017[18] and contains guidance for the design and application of SuDS for nine LLFA's, across the West Midlands, including Stoke-on-Trent.
- Staffordshire County Council are the LLFA for the Newcastle-under-Lyme area.

16 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: 23/0/2019
17 Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems, Defra (2015).
18 Sustainable Urban Drainage Systems (SuDS) Handbook, Staffordshire County Council, (2017). Accessed online at: https://www.staffordshire.gov.uk/environment/Flood-Risk-Management/SuDS-Handbook.pdf on: 23/01/2019

- An updated version of the CIRIA SuDS Manual[19] was published in 2015. The guidance covers the planning, design, construction and maintenance of SuDS for effective implementation within both new and existing developments. The guidance is relevant for a range of roles with the level of technical detail increasing throughout the manual. The guidance does not include detailed information on planning requirements, SuDS approval and adoption processes and standards, as these vary by region and should be checked early in the planning process.
- Severn Trent Water do not currently have a SuDS adoption manual. In its "Charting a Sustainable Course" document[20] it is stated that innovative approaches, such as SuDS, are required in order to reduce the pressure in their WRZ's as drainage systems will not cope with the increasing pressure. It is also addressed that further clarification is required concerning legislation for the adoption of SuDS, by water companies, that third parties have built. United Utilities also do not have a SuDS adoption manual. However, in their "Guide to the adoption of new sewers"[21], it is stated that SuDS should be considered prior to any connection to the public sewer system. It is also clarified that they do not currently adopt any SuDS.
- SuDS features not adopted by the council or water companies need to be maintained by householders (in the case of SuDS on private land) and by management companies for other SuDS on public open spaces and highways.

3.2 Regional Policy

3.2.1 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. The study area is divided between three CFMP's. Stoke-on-Trent is within the River Trent CFMP[22] area. The majority of Newcastle-under-Lyme is within the Weaver Gowy CFMP[23], however the south-western tip is located within the River Severn CFMP[24].

3.2.2 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. A SWMP is in place for Kidsgrove in the north of the study area, and one is currently in progress for Stoke-on-Trent, to be published summer 2019.

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19 The SuDS Manual (C753), CIRIA (2015).
20 Charting a Sustainable Course, Severn Trent Water (2015). Accessed online at: https://www.severntrent.com/content/dam/stw/ST_Corporate/About_us/Docs/Changing-course-delivering-a-better-future-for-customers.pdf on: 23/01/2019
21 Guide to the adoption of new sewers, United Utilities. Accessed online at: https://www.unitedutilities.com/globalassets/documents/pdf/guide_adoption_sewers_2017_acc16.pdf on: 23/01/2019
22 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
23 Weaver Gowy Catchment Flood Management Plan, Environment Agency (2009). Accessed online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/293779/Weaver_Gowy_Catchment_Flood_Management_Plan.pdf
24 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

3.2.3 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 WRMPs covering Stoke-on-Trent and Newcastle-Under-Lyme are reviewed in section 4.2.

3.3 Local Policy

3.3.1 Localism Act

The Localism Act (2011) changes the powers of local government, it re-distributes 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"*[25].

The Localism Act also provides new rights to allow local communities to come together and shape the development and growth of their area by preparing 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. As neighbourhoods draw up their proposals, Local Planning Authorities are required to provide technical advice and support.

3.3.2 Local Plan and Local Strategy

Newcastle-Under-Lyme and Stoke-on-Trent are currently working on a Joint Local Plan which will guide future development, in the two areas until 2033. This will include the overall strategy, site allocations and development management policies and replaces the Councils' planning policies currently set out in the Core Spatial Strategy (2009), saved policies in the 2001 City Plan, and detailed policies where appropriate.

25 Localism Act 2011: Section 110, UK Government (2011). Accessed online at: http://www.legislation.gov.uk/ukpga/2011/20/section/110 on: 23/01/2019

3.4 Environmental Policy

3.4.1 Urban Wastewater Treatment Directive (UWWTD)

The UWWTD[26] 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 Waste Water Treatment (England and Wales) Regulations 1994 and 'The Urban Waste Water Treatment (England and Wales) (Amendments) Regulations 2003'.

3.4.2 Habitats Directive

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

- Special Areas of Conservation (SACs) - 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 so called "habitat types" (e.g. special types of forests, meadows, wetlands, etc.), which are of European importance.

3.4.3 The Water Framework Directive

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

River Basin Management Plans (RBMP) are required under the WFD and document the baseline classification of each waterbody in the plan area, the objectives, and a programme of measures to achieve those objectives. The study area falls into multiple River Basin Districts, Stoke-on-Trent is entirely within the Humber River Basin District (RBD) and Newcastle-Under-Lyme is divided between the North West RBD and the Severn RBD. 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 RBMPs. Another equally important objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment and compromise WFD objectives. The WFD objectives as outlined in the updated RBMPs are summarised below:

- "To prevent deterioration of the status of surface waters and groundwater
- to achieve objectives and standards for protected areas

26 UWWTD. Accessed online at: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31991L0271 On: 23/01/2019.

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

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.

3.4.4 Protected Area Objectives

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

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

The types of protected areas are:

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- Areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish);
- Bodies of water designated as recreational waters, including Bathing Waters;
- Nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive (UWWTD); and
- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant Natura 2000 sites.

Many WFD protected areas coincide with water bodies; these areas will need to achieve the water body status objectives in addition to the protected area objectives. Where water body boundaries overlap with protected areas the most stringent objective applies; that is the requirements of one EC Directive should not undermine the requirements of another. The objectives for Protected Areas relevant to this study are as follows:

Drinking Water Protected Areas

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

Economically Significant Species (Freshwater Fish Waters)

- To protect or improve the quality of running or standing freshwater to enable them to support fish belonging to Indigenous species offering a natural diversity;

or species, the presence of which is judged desirable for water management purposes by the competent authorities of the Member States.

Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

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

Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

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

Natura 2000 Protected Areas (water dependent SACs and SPAs)

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

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

3.4.5 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. This is the minimum length of time the Environment Agency think pollutants need to become diluted or reduce in strength by the time they reach the borehole.

Zone 3 (Total catchment)

This is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

Zone of special interest

This is defined on occasions, usually where local conditions mean that industrial sites and other polluters could affect the groundwater source even though they are outside the normal catchment.

The Environment Agency's approach to Groundwater protection[27] sets out a series of position statements that detail how the Environment Agency delivers government policy on groundwater and protects the resources from contamination. The position statements that are relevant to this study with regard to discharges to groundwaters, include surface

27 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: 29/10/2018

water drainage and the use of SuDS, discharges from contaminated surfaces (e.g. lorry parks) and from treated sewage effluent.

3.4.6 European Derived Legislation and Brexit

Much of the legislation behind the regulation of the water environment derives from the UK enactment of European Union (EU) directives. Following the referendum decision of June 2016 that the United Kingdom would leave the EU, the UK Government announced that it would introduce the "European Union (Withdrawal) Bill" to repeal the European Communities Act 1972 and to transpose European Union law into domestic law "wherever practical". This Bill received Royal Assent on 26 June 2018. A White Paper published in March 2017[28] states the following objectives for the Bill:

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

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

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 for the Local Plan. Should this situation change, a review of this Water Cycle Study may be required considering any new emerging regulatory regime.

3.5 Water Industry Policy

3.5.1 The Water Industry in England

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

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

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

3.5.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies;

- The Water Services Regulation Authority (OfWAT) – economic/ customer service regulation
- Environment Agency - environmental regulation

28 "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: 30/01/2019

- Drinking Water Inspectorate (DWI) - drinking water quality

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

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

3.5.3 Drainage and Wastewater Management Plans

The UK Water Industry Research (UKWIR) "21st Century Drainage" programme has brought together water companies, governments, regulators, local authorities, academics and environmental groups to consider how planning can help to address the challenges of managing drainage in the future. These challenges include climate change, population growth, urban creep and meeting the Water Framework Directive.

The group recognised that great progress has been made by the water industry in its drainage and wastewater planning over the last few decades, but that, in the future, there needs to be greater transparency and consistency of long-term planning. The Drainage and Wastewater Management Plan (DWMP) framework[29] sets out how the industry intends to approach this, with the objective of the water companies 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 those areas which do not drain to a treatment works. The framework defines drainage to include all organisations and all assets which have a role to play in drainage, although, as the plans will be water company led, it does not seek to address broader surface water management within catchments.

LPAs and LLFAs are recognised as key stakeholders and will be invited to join, alongside other stakeholders, in Strategic Planning Groups (SPGs) organised broadly along river basin district catchments.

As the DWMP process is only just commencing, it is too early to 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, and this should be taken into account in SFRAs, Water Cycle Studies, as well as in site-specific FRAs and Drainage Strategies.

3.5.4 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

29 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: 07/01/2019.

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.

3.5.5 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[30]. These rules apply to all companies in England and will commence on 1st April 2018. The two relevant water companies for the study area have now published their charging arrangements which can be found in the footnotes[31,32]. The key changes include:

- More charges will be fixed and published on water company websites. This will provide greater transparency to developers and will also allow alternative connection providers to offer competitive quotations more easily.
- There will be a fixed infrastructure charge for water and one for wastewater.
- The 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 will now apply 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:
    - United Utilities[32] provide a reduced infrastructure charge for developments which meet the specified conditions. For a reduced water infrastructure charge, it must be demonstrated that the properties are built to use 110 litres per person per day, or less. A reduced sewer infrastructure charge is awarded whereby properties are built with no surface water connection to the public sewer.
    - Severn Trent Water[33] will provide 100% discount on the water infrastructure charge whereby builds are demonstrated to be below 110 litres per person per day. They also provide incentives for sewerage infrastructure charge. Whereby there is no surface water connection,

30 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: 23/01/2019
31 New Connections Charging, Severn Trent Water (2018). Accessed online at: https://www.stwater.co.uk/content/dam/stw/stw_buildinganddeveloping/STWChargingArrangementDocument-brandv0.230012018A.pdf 24/01/2019
32 New Connections and Developer Services, United Utilities (2018). Accessed online at: https://www.stwater.co.uk/content/dam/stw/stw_buildinganddeveloping/STWChargingArrangementDocument-brandv0.230012018A.pdf 24/01/2019
33 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/ 24/01/2019

100% discount is applied. Alternatively, whereby a surface water connection is available via a sustainable drainage system, the charge is reduced by 75%.

3.5.6 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 they will subsequently be adopted by water companies, under Section 104 of the Water Industry Act. This is the method by which most new sewerage is designed, constructed and becomes a public sewer.

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), which was released as a pre-implementation version in August 2018[34]. This recognises the roles of the various Risk Management Authorities with responsibilities for surface water management, and the expectation within NPPF that SuDS be implemented, as a first preference, for all developments. It therefore widens the definition of what can be defined as adoptable sewers, to include components which:

- drain buildings and yards appurtenant to buildings,
- have a channel,
- convey water to a sewer, surface water body or groundwater, and
- 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 SfA8.

The responsibility for the final approval of SfA8 lies with the industry regulator OfWAT, and it is anticipated that it will come into effect in mid-2019. This will, therefore, during the life of the Local Plan, provide developers with a nationally consistent route for having many SuDS components adopted by the relevant water company.

34 Water UK (2018) Sewers for Adoption Eighth Edition. August 2018. Accessed online at: https://www.water.org.uk/publication/sewers-for-adoption/ on: 05/02/2019

4 Water Resources and Water Supply

4.1 Introduction

4.1.1 Surface Waters

Figure 4.1 shows the main watercourses within the study. The River Trent flows through Stoke City; the river becomes 'Main River' as it enters the boundary near Norton Green. The Trent then flows south-westerly through the city and exits north of Trentham. The Fowlea Brook flows south along the western boundary, of Stoke City, becoming a Main River in Middleport. It forms a tributary to the River Trent in Stoke-upon-Trent. Further south, the Lyme Brook also flows along the western boundary of Stoke (bordering Newcastle-Under-Lyme). The Lyme Brook is classified as a Main River near Knutton and later forms a tributary to the Trent, within the Stoke City boundary, near Hanford. In the west of Newcastle-Under-Lyme, the River Lea flows past Madeley before exiting the boundary again.

4.1.2 Geology

Across both Stoke-on-Trent and Newcastle-Under-Lyme, there is a mixture of geologies. Figure 4.2 shows that in Newcastle-Under-Lyme, the south western area and western boundary is underlain by undifferentiated Triassic rocks (mudstone, siltstone and sandstone). On the south west tip, this is intersected by a small area of Warwickshire Group (siltstone and sandstone with subordinate mudstone) and undifferentiated Permian rocks (interbedding sandstone and conglomerate). Through the centre of the borough, there is another large area of Warwickshire Group geology. The north east, is underlain by Pennine Middle Coal Measures formation. Stoke-on-Trent has three distinct geological bands whereby the west is Warwickshire Group; the centre is Pennine Upper Coal Measures formation and the east is Pennine Middle Coal Measures formation. In the south east, there is a small area of undifferentiated Triassic rocks.

Both Newcastle-Under-Lyme and Stoke-on-Trent are underlain by various types of superficial deposits, shown in Figure 4.3. The southern and south-eastern areas of Stoke-on-Trent are underlain by glacial till, as well as smaller areas in the north. These deposits are also found along the northern boundary of Newcastle-Under-Lyme. Through the centre of Stoke-on-Trent (west-east) there is a band of alluvium and small areas of undifferentiated river deposits. These are also found in the centre of Newcastle-Under Lyme. Throughout Newcastle-Under-Lyme, there are isolated areas of glacial sand and gravel.

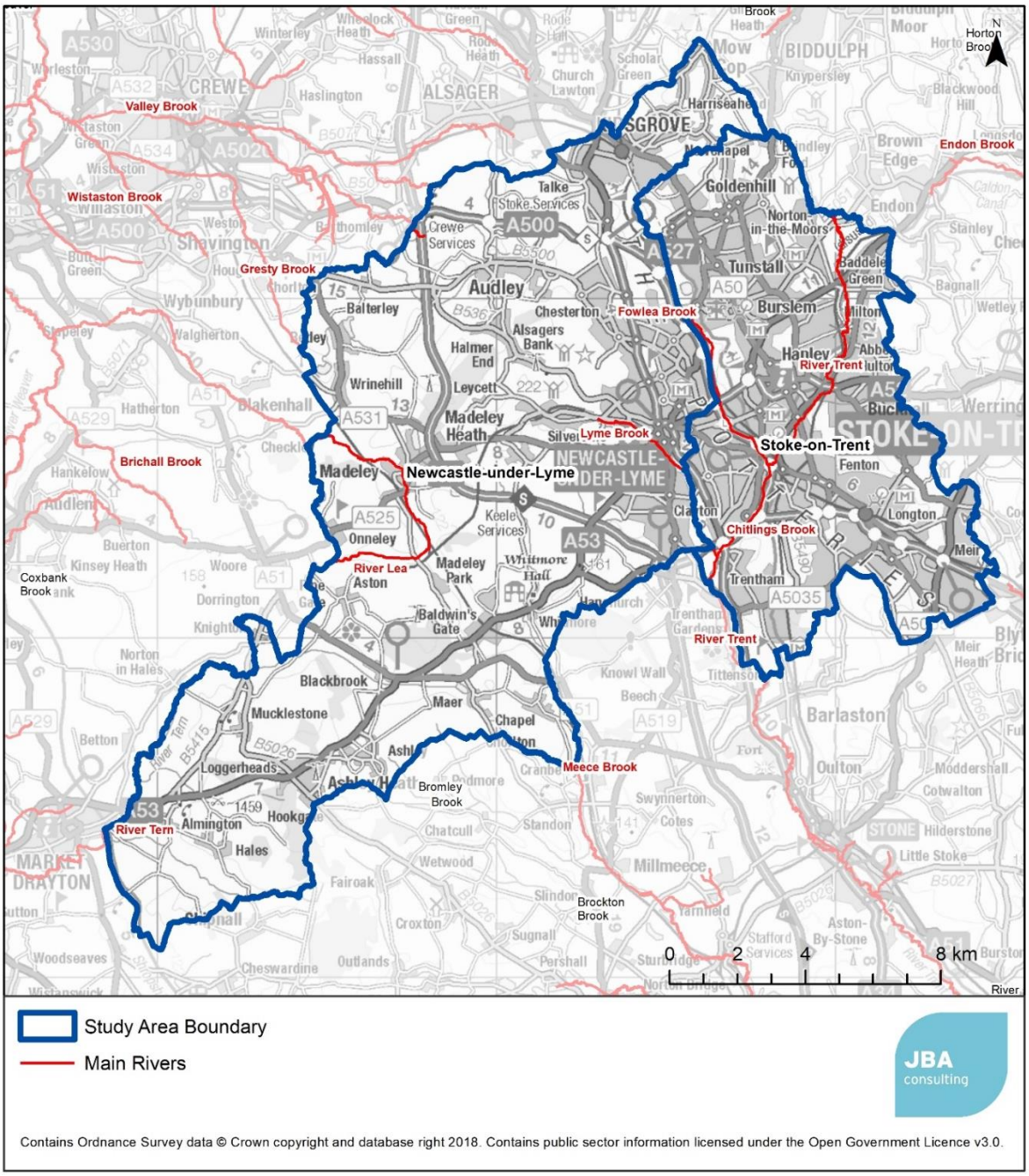

Figure 4.1 Main Rivers within Newcastle-under-Lyme and Stoke-on-Trent

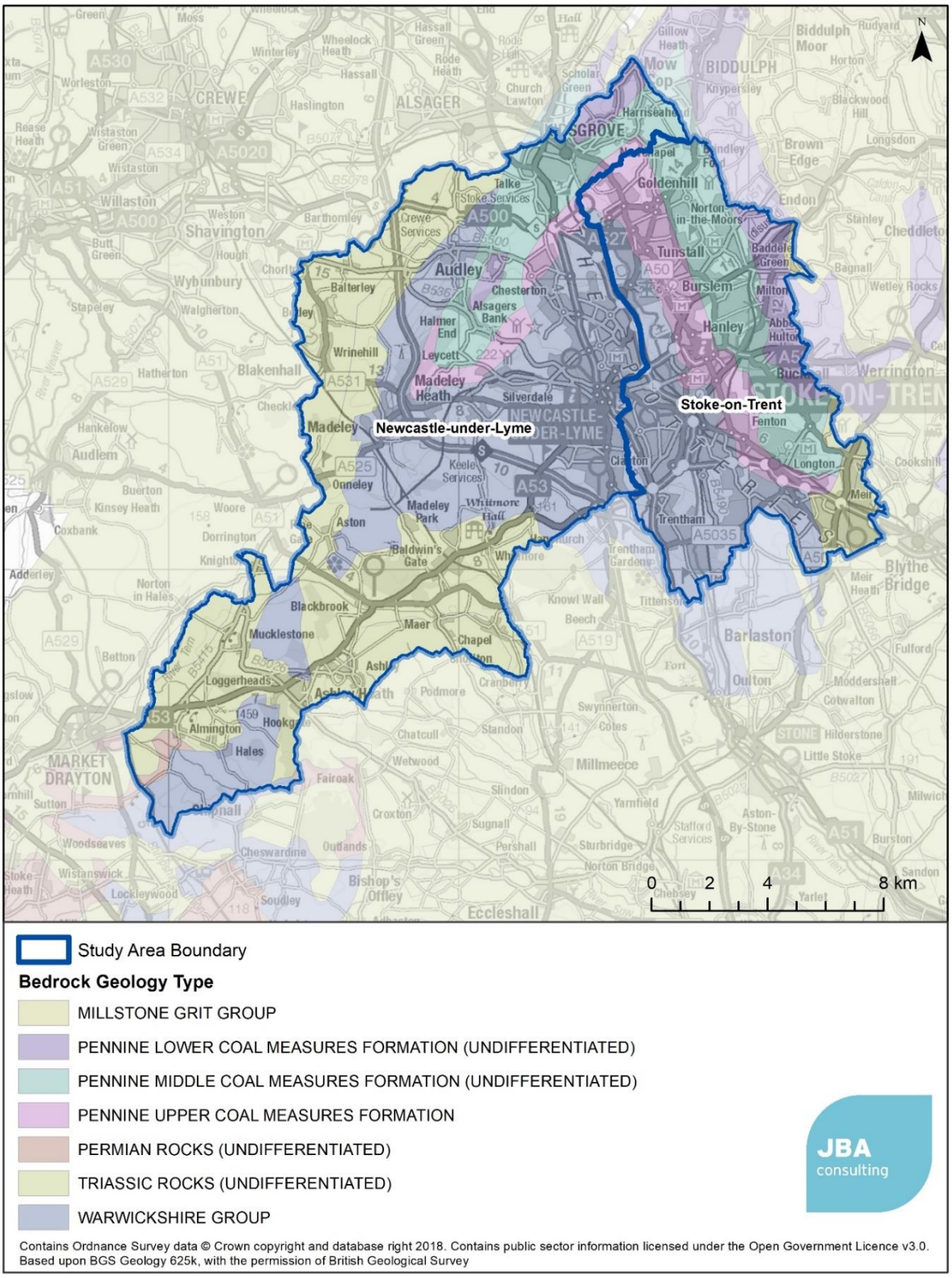

Figure 4.2 Bedrock geology of Newcastle-under-Lyme and Stoke-on-Trent

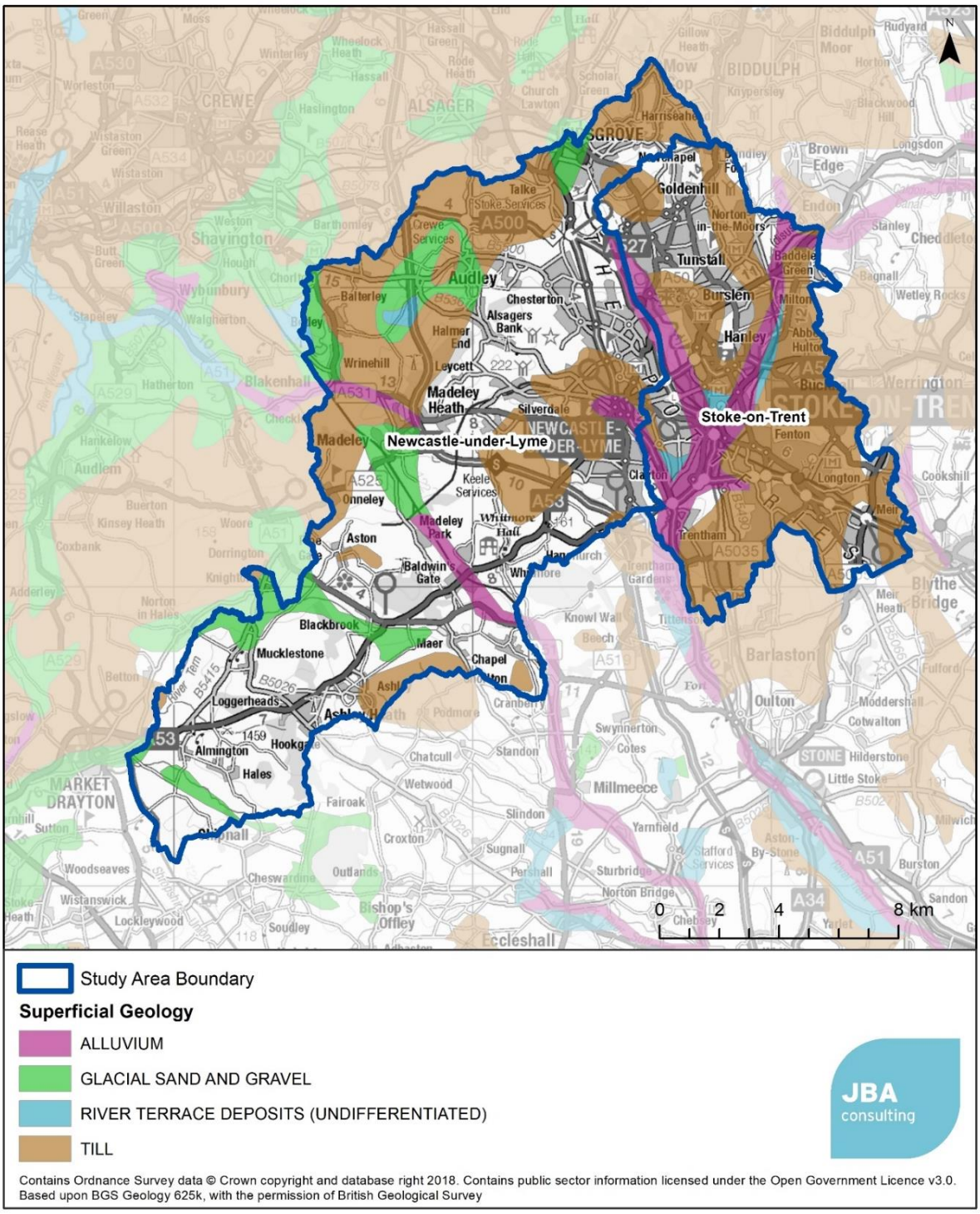

Figure 4.3 Superficial deposits in Newcastle-under-Lyme and Stoke-on-Trent

4.1.3 Availability of Water Resources

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 licenses. 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[35]. Newcastle-under-Lyme and Stoke-on-Trent are covered by three ALS areas: Shropshire Middle Severn, Staffordshire Trent Valley and Weaver and Dane, as shown in Figure 4.4 below.

The Environment Agency have advised that the ALS for this area are due to be updated in 2019, and the resource availability could change as a result.

35 Environment Agency (2018) Managing Water Abstraction. Accessed Online at: https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process on: 23/01/2019

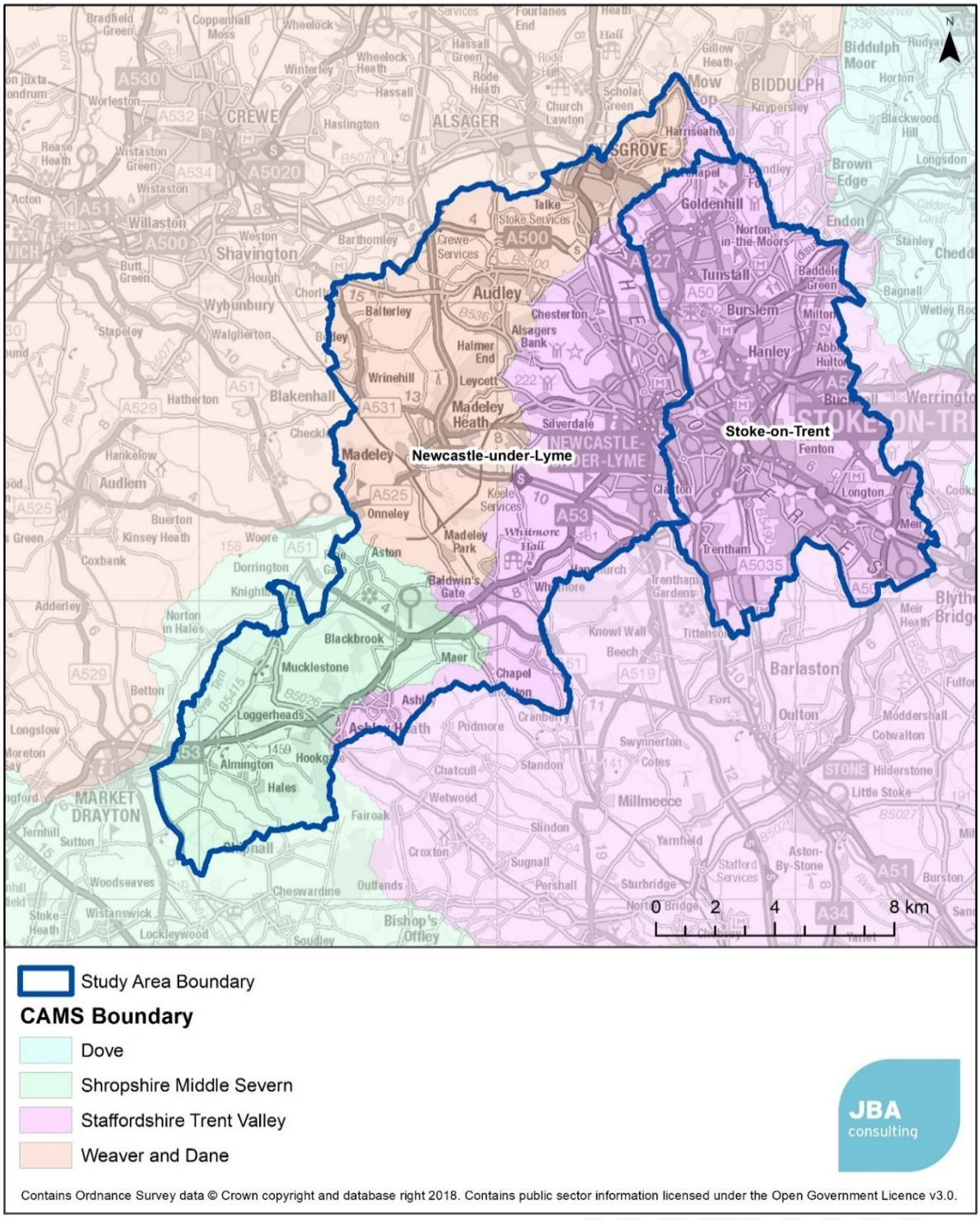

Figure 4.4 CAMS Boundaries covering Newcastle-under-Lyme and Stoke-on-Trent

4.1.4 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.

4.1.5 Shropshire Middle Severn ALS

The Shropshire Middle Severn ALS[36] is a largely rural catchment which incorporates parts of Staffordshire, Cheshire, Wrexham, Telford and Wrekin. It includes several tributaries

36 Shropshire Middle Severn abstraction licensing strategy, Environmental Agency (2013). Accessed online at: https://www.gov.uk/government/publications/cams-shropshire-middle-severn-abstraction-licensing-strategy on: 28/11/2018

of the River Severn, however, does not include the Severn itself. This ALS only covers a small area in the south west of Newcastle-under-Lyme.

There are eight gauging stations within the ALS with the closest to the study area being AP3 (River Tern at Ternhill). For new surface water licences on the River Tern, this means:

- There is no water available for unconstrained abstraction i.e. abstraction with no HOF restriction.
- Water is only available during periods of medium to high flows subject to a HOF condition.
- The HOF condition applied will state that abstraction must cease when flow in the River Tern falls below 427 Ml/d as measured at the Environment Agency gauging station at Walcot.
- A time limit of 31 March 2027 will be imposed on the licence.

Resource availability for AP3 for HOFs is shown in Table 4.2 below.

Table 4.2 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?
3	River Tern at Ternhill	Shropshire Middle Severn	Restricted water available for licensing	427 Ml/d at Walcot gauging station on the Tern	146	45	Yes

(1) Hands off Flow restriction

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

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

The groundwater management unit covering the section of Newcastle-under-Lyme is Wellings and Market Drayton. Within this area, abstraction of groundwater is prevented as the existing levels of licensed abstraction exceed the long-term rate of recharge. The EA's aim is to reduce the unacceptable impact of groundwater abstraction on surface water low flows. Many Permo-Triassic Sandstone catchments in the Midlands region have suffered in this way, but the high storage capacity of the aquifer also provides the means to restore sustainability. The EA will encourage modification of existing water supply schemes to make better use of aquifer storage in conjunction with surface water.

4.1.6 Staffordshire Trent Valley ALS

The Staffordshire Trent Valley ALS[37] includes the Staffordshire River Trent, from its source on Biddulph Moor (north of Stoke-on-Trent) to the downstream confluence with the Tame. It also includes the tributaries. This ALS contains the entirety of Stoke-on-Trent and eastern areas of Newcastle-under-Lyme. Moving away from the urban areas of Stoke, the ALS becomes increasingly rural with the majority of land being used for agricultural purposes.

There are ten assessment points across the ALS, of which two are relevant to the study area. These are AP1 and AP7.

The only principal aquifer in the ALS consists of Sherwood Sandstone geology and provides a large quantity of water for abstraction (mainly for the use of drinking water). This aquifer typically contributes to the baseflow of rivers, however abstractions at the

37 Staffordshire Trent Valley abstraction licensing strategy, Environment Agency (2013). Accessed online at: https://www.gov.uk/government/publications/cams-staffordshire-trent-valley-abstraction-licensing-strategy on: 28/11/2018

headwaters have resulted in lowering of the groundwater table. The greatest abstraction of water from surface water and groundwater is by water companies with significant volumes also used for agriculture, power and industry (abstracted directly and not via water companies). Sewage discharges into the River Trent augment flows, in particular from the largest treatment works which is Strongford (south of Stoke-on-Trent).

Table 4.3 Staffordshire Trent Valley ALS resource availability

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)	Gauging station at AP?
1	Trent to & including Strongford STW	Staffordshire Trent Valley	Water available for licensing	208 Ml/d at Darlaston	212	13.3	No
7	Upper River Blithe	Staffordshire Trent Valley	Water not available for licensing	N/A	N/A	Closed	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 AP1, there is water available for licensing subject to HOF of 208Ml/d at Darlaston. This means that for new licenses:

- All new consumptive or partially consumptive licences will be issued with this HOF
- Water is only available during periods of medium to high flows due to the HOF condition
- There is a time limit of 31 March 2027

At AP7, there is no water available for licensing due to over licensing and abstraction. This means that no new licenses will be issued and there is no impact on existing licence holders.

There are four groundwater management units which are within the study area which are Tittensor, Hatton, Forsbrook and Spot. All of these units are classified as not having water available for licensing due to previous over abstraction. In total, there are ten management units across the ALS, of which three have water available for licensing.

4.1.7 Weaver and Dane ALS

The Weaver and Dane ALS[38] covers the catchment area for the River Weaver and the River Dane. The River Wheelock also joins the Dane in Middlewich. There are several canals within the ALS (Trent and Mersey canal, Shropshire Union Canal, and the Macclesfield Canal. The ALS covers north western and central areas of Newcastle-under-Lyme.

Water is abstracted through the catchments from both surface waters and groundwater for a number of uses including industry, agriculture and public water supply. United Utilities Water plc is the public supply company for the region and supply the ALS area through an integrated network of water sources. They abstract from both surface water and boreholes, and after use, water is released back into rivers.

38 Weaver and Dane abstraction licensing strategy, Environment Agency (2013). Accessed online at: https://www.gov.uk/government/publications/weaver-and-dane-abstraction-licensing-strategy on: 28/11/2018

In total, there are 13 assessment points across the ALS. However, none of these are within Newcastle-under-Lyme. The River Lea, within the ALS, flows through Newcastle-under-Lyme and forms a tributary to the River Weaver in close proximity to assessment point 2 (AP2). The resource availability for AP2 is shown below in Table 4.4. Tributaries to the main river, such as the Lea, may also be subject to different restrictions and quantities.

Table 4.4 Weaver and Dane water resource availability

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (Ml/d) (3)	Gauging station at AP?
2	Beam Bridge (River Weaver)	Weaver and Dane	Water Available	17.3	365	6.6	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 AP2, there is water available for licensing. This means that:

- There is water available for unconstrained abstraction.
- We will continue licensing the available resource and then implement the Hands-off Flow (HOF) constraints.
- There is a time limit of 31st March 2025.
- Due to the nature of the Sherwood Sandstone aquifer in the Weaver and Dane catchment, there are on groundwater management units managed as part of the ALS.

4.1.8 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,
- 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.

4.1.9 Water Stress

Water stress is a measure of the level of demand for water (from domestic, business and agricultural users) compared to the available freshwater resources, whether surface or groundwater. Water stress causes deterioration of the water environment in both the quality and quantity of water, and consequently restricts the ability of a waterbody from achieving a "Good Status" under the WFD.

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

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

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

In the Environment Agency and Natural Resources Wales assessment[39], United Utilities and Severn Trent Water both currently have "moderate stress" upon their water resources which is stable in all future stress scenarios.

Severn Trent Water have commented that "we appreciate the reports suggestion to use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance in water-stressed areas."

39 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: 31/10/2018

4.2 Water Resource Assessment: Water Resource Management Plans

4.2.1 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 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 secondly by providing the water company with a growth estimate allowing them to assess the impact of planned growth on their water resource zone.

4.2.2 Methodology

Severn Trent Water Resource Management Plan (WRMP)[40], covering the period 2020 to 2080 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
- 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[41] 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.

40 Draft Water Resource Management Plan 2019, Severn Trent Water (2018). Accessed online at: https://www.severntrent.com/about-us/future-plans/water-resource-management/wrmp-19-documents/on: 28/11/2018

41 2014-Based Household Projections for England, Office for National Statistics (2018). Accessed online at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/householdprojectionsforengland on: 31/10/2018

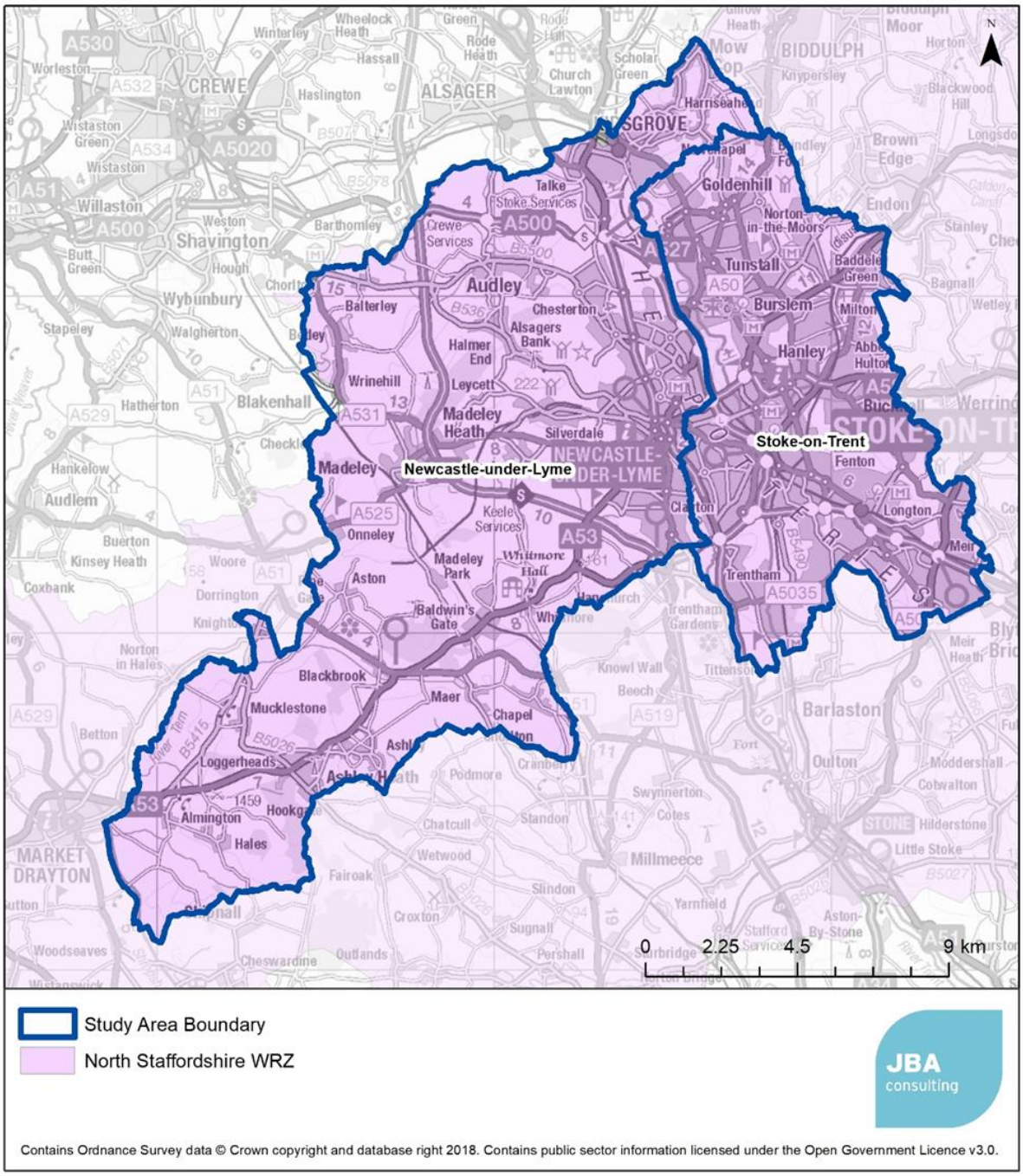

Figure 4.5 Severn Trent Water WRZ

4.2.3 Severn Trent Water

Severn Trent Water supply an area of 21,000km^2 across the Midlands and Mid-Wales, providing clean water to 7.9 million people and sewerage services to 8.95 million people. The area is divided into fifteen water resource zones (WRZ's) which vary greatly in size. The largest is the strategic grid which encompasses the majority of the customers that Severn Trent supply. There are also smaller WRZs such as Mardy and Bishops Castle which contain much smaller populations.

Within the WRMP, future challenges to water supply have been identified including:

- Sustainable abstraction and preventing environmental deterioration – the WRMP continues the programme of restoring sustainable abstraction and, as a result, abstraction reduction is required up to 69Ml/d (over the next 10 years) for some

sources. The WFD 'no-deterioration' issue will potentially result in a further 157 Ml/d of current deployable output being replaced.

- Climate change and uncertainty – Severn Trent Water's modelling is based upon the UKCP09 datasets which all point towards a reduction in deployable output.
- Meeting future growth – in order to meet the demand from population growth, it is planned that it will be offset using mitigation methods such as reducing leakage.

The study area is supplied by the North Staffordshire WRZ. Assessment shows that, without any further investment, the WRZ will face a supply/demand shortfall over the next 25 years. In order to meet the supply needs, there are several proposals in place, with the aim of preventing the deficits. These include:

- Leakage - approximately 23% of total water is lost to leaks annually. Between 2020 and 2025, Severn Trent aim to reduce leakage by 15%. Despite the overall target of reducing leakage from supply, North Staffordshire's leakage target remains at 29.4Ml/d throughout the next 25 years.
- Water efficient activities – this involves water demand management through providing free/subsidised products to increase efficiency. Severn Trent Water also provide home water efficiency checks which result in customers saving water, energy and money. Through this programme, it is estimated that water usage will reduce by 19 Ml/d through AMP7 (2020-25).
- Increasing water meters – Severn Trent plan to change their approach to water meters, whereby the current reactive programme becomes proactive resulting in increased household meter coverage. Estimates suggest that full meter coverage would reduce demand by up to 80 Ml/d. As North Staffordshire WRZ is one of the areas with greatest supply/demand deficit, it would be one of the first areas to adopt this new approach.
- Specific to the North Staffordshire WRZ, there are two schemes aimed at increasing available water for supply. One is an enhancement to water treatment at the Peckforton borehole group that will prevent a loss in output due to deteriorating groundwater quality and allow an increase from current levels. The second scheme is a reconfiguration to an existing water treatment works to allow greater flexibility during low flow periods. The name and location of this WTW is redacted within the WRMP.

Not specifically focused upon North Staffordshire, 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 upon the WRZ's across the supply area identified those most sensitive to the impacts of climate change. The results showed that the largest WRZs (the Strategic Grid and Nottingham) are both vulnerable to potential changes in temperature and rainfall. However, 'high' vulnerability was applied to all WRZs to maintain consistency. The North Staffordshire WRZ is classified as having a 'low' vulnerability prior to the general application of 'high' vulnerability.

4.2.4 Population and household growth

Since 2000, the population within the water supply region has grown by 0.5 million people however the water supply has fallen by 3%, across the same timescale. This reduction was achieved through reducing leakage and providing support to customers to reduce their own water consumption.

It is estimated that, over the next 25 years, the population across the region is likely to grow by a further 1.13 million people and the water supply will continue to become increasingly scarce. Assessments show that, without any further investment there will be a supply/demand shortfall in the Strategic Grid, Nottinghamshire and North Staffordshire WRZs. The actions proposed to improve the supply/demand shortfall are explained in 4.2.3.

MHCLG 2014-based projections forecast an 8.65% increase (average) in the number of households within Newcastle-under-Lyme and Stoke-on-Trent. This is lower than the growth forecast for all authorities within the WRZ, and lower than the forecast provided by Severn Trent's WRMP.

If growth occurred according to the objectively assessed need, it would result in an increase in the number of households of nearly 17.8% during the local plan period. This exceeds what has been accounted for the WRMP.

Table 4.5 Comparison of household growth forecasts

Forecast	2016	2036	% Increase
MHCLG 2014-based forecast – Stoke-on-Trent	**109,000**	**119,000**	**8.9%**
MHCLG 2014-based forecast – Newcastle-under-Lyme	**47,000**	**51,000**	**8.4%**
MHCLG 2014-based forecast All Local Authorities in North Staffordshire WRZ	225,044	244,770	8.8%
WRMP Forecast – North Staffordshire	250,952	284,225	13.3%
OAN – Stoke-on-Trent and Newcastle-under-Lyme	**156,000**	**183,800**	**17.8%**

Note: 1,390 was used as the annual OAN figure for Newcastle-under-Lyme and Stoke-on-Trent combined

4.3 Summary

Both Newcastle-under-Lyme and Stoke-on-Trent are supplied by the North Staffordshire WRZ. Without any future intervention, there will be a large supply/demand imbalance from 2024 (total demand + headroom = approximately 125 Ml/d however total available water declines to approximately 95 Ml/d). However, the proposed actions (Section 4.2.3) would provide adequate supply to address this.

Table 4.6 Summary of RAG scores for water resources

Water company	Water Resource Zone	RAG score description	Comments
Severn Trent Water	North Staffordshire	Adopted WRMP has planned for the increase in demand, or sufficient time to address supply demand issues in the next WRMP.	Severn Trent Water stated that they would have adequate water resource for all proposed development sites.

4.4 Water Efficiency

Severn Trent Water provided the following advice on water efficiency:

> Part G of Building Regulations specify that new homes must consume no more than 125 litres of water per person per day. We recommend that you consider taking an approach of installing specifically designed water efficient fittings in all areas of the property rather than focus on the overall consumption of the property. This should help to achieve a lower overall consumption than the maximum volume specified in the Building Regulations.
>
> We recommend that in all cases you consider:
>
> - Single flush siphon toilet cistern and those with a flush volume of 4 litres.
> - Showers designed to operate efficiently and with a maximum flow rate of 8 litres per minute.
> - Hand wash basin taps with low flow rates of 4 litres or less.
> - Water butts for external use in properties with gardens.
>
> To further encourage developers to act sustainably, Severn Trent currently offer a 100% discount on the clean water infrastructure charge if properties are built so consumption per person is 110 litres per person or less. More details can be found on our website:
>
> https://www.stwater.co.uk/building-and-developing/regulations-and-forms/application-forms-and-guidance/infrastrucutre-charges/

Severn Trent Water encourage the councils to impose the expectation on developers that properties are built to the optional requirement in Building Regulations of 110 litres of water per person per day.

4.5 Conclusions

The WRMP shows a supply-demand deficit from 2024 if no action is taken. It goes on to define a number of actions that will address this. Severn Trent 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.

4.5.1 Recommendations

Table 4.7 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. Take the latest growth forecasts into account in the emerging 2019 WRMP.	STW	Ongoing
Provide yearly profiles of projected housing growth to water companies to inform the WRMP.	NuL / SoT	Annually
Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Practice Guidance[42] in water-stressed areas and use the BREEAM standard to require percentage improvement over baseline building water consumption of at least 12.5%.	NuL / SoT	In Local Plan

42 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

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 Phase 1 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. This would be funded through the charging rules for new connections described in 3.5.4 and 3.5.5.

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 "piggy back" on planned leakage or metering schemes, to survey and retrofit water efficient fittings into homes[43]. This is particularly feasible within property owned or managed by the local authorities, such as social housing.

5.2 Methodology

Severn Trent Water were provided with a complete list of sites and the potential / equivalent housing numbers for each and asked to comment on the impact of the proposed growth on water supply infrastructure in the area. A RAG assessment was then applied based on the following definitions:

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.

5.3 Results

STW do not typically provide a site by site analysis as they do not have a team resourced to carry out such an assessment. They advise that as long as a site is within a water resource zone with sufficient water resources, then they "do not envisage a problem" with supply to that site. They also note that there are no new garden towns or villages proposed, which can prove more of a challenge to supply water to. Where a site is a long distance from the network, a requisition may be required which is assessed at the time of contact with developer.

43 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: 29/10/2018

All the proposed sites are therefore assumed to have available supply capacity and have been given a "Green" RAG assessment. This approach was confirmed as acceptable by STW. However, it should be noted that these sites have not received a detailed assessment, and so it is recommended that further analysis is conducted for each individual site prior to development.

Table 5.1 summarises the scoring given to each site. A site by site list of these assessments is contained in Appendix A.

Table 5.1 Summary of Severn Trent Water supply RAG scores

Water supply networks RAG score	RAG Score description	Number of sites
Green	Capacity available to serve the proposed growth	All Sites - 658

5.4 Conclusions

- Within the study area, there is enough water resource to supply all the proposed developments.
- No limitations on the provision of water supply infrastructure were identified by STW.
- A site by site assessment has not been completed as part of this study. Individual sites should be assessed as part of the planning process, and early engagement between developers and STW is recommended to ensure that the water supply network has sufficient capacity locally to accommodate the additional demand without detriment to existing customers.

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

5.5 Recommendations

Table 5.2 Recommendations for water supply infrastructure

Action	Responsibility	Timescale
NuL, SoT and Developers should engage early with STW to ensure infrastructure is in place prior to occupation.	NuL SoT STW Developers	Ongoing
STW to undertake network modelling to ensure adequate provision of water supply is feasible.	STW Developers	In response to developer enquiries

6 Wastewater Collection

6.1 Sewerage undertakers

Severn Trent Water is the Sewerage Undertaker (SU) for Stoke-on-Trent. Newcastle-under-Lyme is served by both Severn Trent Water and United Utilities. 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, neither company will adopt SuDS, although this position is likely to change following the implementation of Sewers for Adoption version 8 (see section 3.5.6 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.

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 and United Utilities were provided with a list of the sites and forecast housing numbers. Using this information, they were asked to assess each site using the range of datasets they hold. Due to the large number of sites, STW set a threshold of 20 houses or employment sites greater than 0.5 ha above which an assessment would be carried out. Sites below this threshold were assumed to have sufficient capacity available to serve the planned growth and were given a "Green" RAG assessment.

United Utilities provided a site-by-site assessment for all potential development sites; however, they have not modelled the surface water network within the area and so some of the information is based upon past incidents and information provided by engineers.

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

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.

6.4 Data collection

The following datasets were to assess the sewerage system capacity:

- Locations of promoted sites in GIS format (provided by Newcastle-under-Lyme District Council and Stoke-on-Trent City Council)
- Site tracker spreadsheet (see Appendix A)
- Wastewater catchments (provided by Severn Trent Water and United Utilities)

6.5 Results

6.5.1 Severn Trent Water DWMP

Whilst publication of Drainage and Waste Water Management Plans (DWMPs) is not scheduled until 2022/23, STW have published a draft of their initial findings as they start the process[44]. This has been reviewed to report information on the sewer network of relevance this this WCS.

The Strongford wastewater catchment is the largest in the study area and covers most of Stoke-on-Trent, with the combined trunk sewer network draining a high proportion of the impermeable area within the city. High levels of infiltration, partly linked to historic mining activities, are observed in this catchment which contribute to the trunk sewers filling quickly in response to a storm resulting in more frequent operation of the CSOs. Unmitigated development within the catchment could increase the frequency of CSO operation and is subject to an ongoing investigation by STW.

It was reported that the majority of CSOs are influenced by the trunk sewer system, and so in addition to local capacity upgrades, a catchment wide strategic solution is required. A number of options were considered by STW including infiltration reduction, separation of surface water, upsizing/duplication of trunk sewers and installing a new WwTW.

The final solution is likely to be achieved mainly through the sealing of sewers against infiltration and removing surface water from the combined network.

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44 A9: Drainage and Wastewater Management Plan 2018, Severn Trent Water (2018). Accessed online at: https://www.stwater.co.uk/content/dam/stw/about_us/pr19-documents/sve_appendix_a9_drainage_and_wastewater_management_plan.pdf on: 27/02/2019

An example of this is given in the draft DWMP where 160 hectares of developed land has been identified that is drained via a separate foul and surface water sewer, but both then enter the combined trunk sewer system. The peak surface water runoff from this land is calculated to be approximately 9,000 l/s, and if removed, could have a significant impact on combined flows, and therefore CSO operation. Future investment will therefore focus on connecting the surface water component from these areas separately via a surface water only sewer to a Sustainable Drainage System (SuDS) or watercourse.

6.5.2 Foul sewer network assessment

Table 6.1 and Table 6.2 summarise the RAG assessments of the foul sewer network for STW and UU. A complete list of assessments and comments on a site-by-site basis can be found in Appendix A and are shown graphically in Figure 6.1. Where a "red" assessment was given, this reflects either a lack of existing foul network in this area or the complexity of connecting a large development to the existing network.

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

Table 6.1 Severn Trent Water RAG scores for foul sewerage capacity

RAG Score	Number of Sites	
Green	Residential	Employment
	83	28
Amber	Residential	Employment
	34	15
Red	Residential	Employment
	19	6

Table 6.2 United Utilities RAG scores for foul sewerage capacity

RAG Score	Number of Sites	
Green	Residential	Employment
	22	1
Amber	Residential	Employment
	6	0
Red	Residential	Employment
	3	0

6.5.3 Surface water network assessment

Table 6.3 and Table 6.4 summarise the RAG assessment of the surface water network given to sites by STW and UU. The complete list of assessments, with comments, can be found in Appendix A and shown graphically in Figure 6.2.

A "red" assessment reflects where there is no existing surface water sewer, or where the existing sewer is a combined sewer system. An increase in surface water from developments that discharges via a combined sewer system could increase the frequency of CSO operation and is likely to be resisted by STW and UU.

A suitably designed SuDS (see section 0) could in many cases overcome these concerns, however a surface water drainage strategy is likely to be required for these developments as part of the planning process.

Table 6.3 Severn Trent Water RAG scores for surface water capacity

RAG Score	Number of Sites	
Green	Residential	Employment
	97	37
Amber	Residential	Employment
	18	4
Red	Residential	Employment
	21	4

Table 6.4 United Utilities RAG scores for surface water capacity

RAG Score	Number of Sites	
Green	Residential	Employment
	27	1
Amber	Residential	Employment
	4	0
Red	Residential	Employment
	3	0

6.6 Summary Mapping

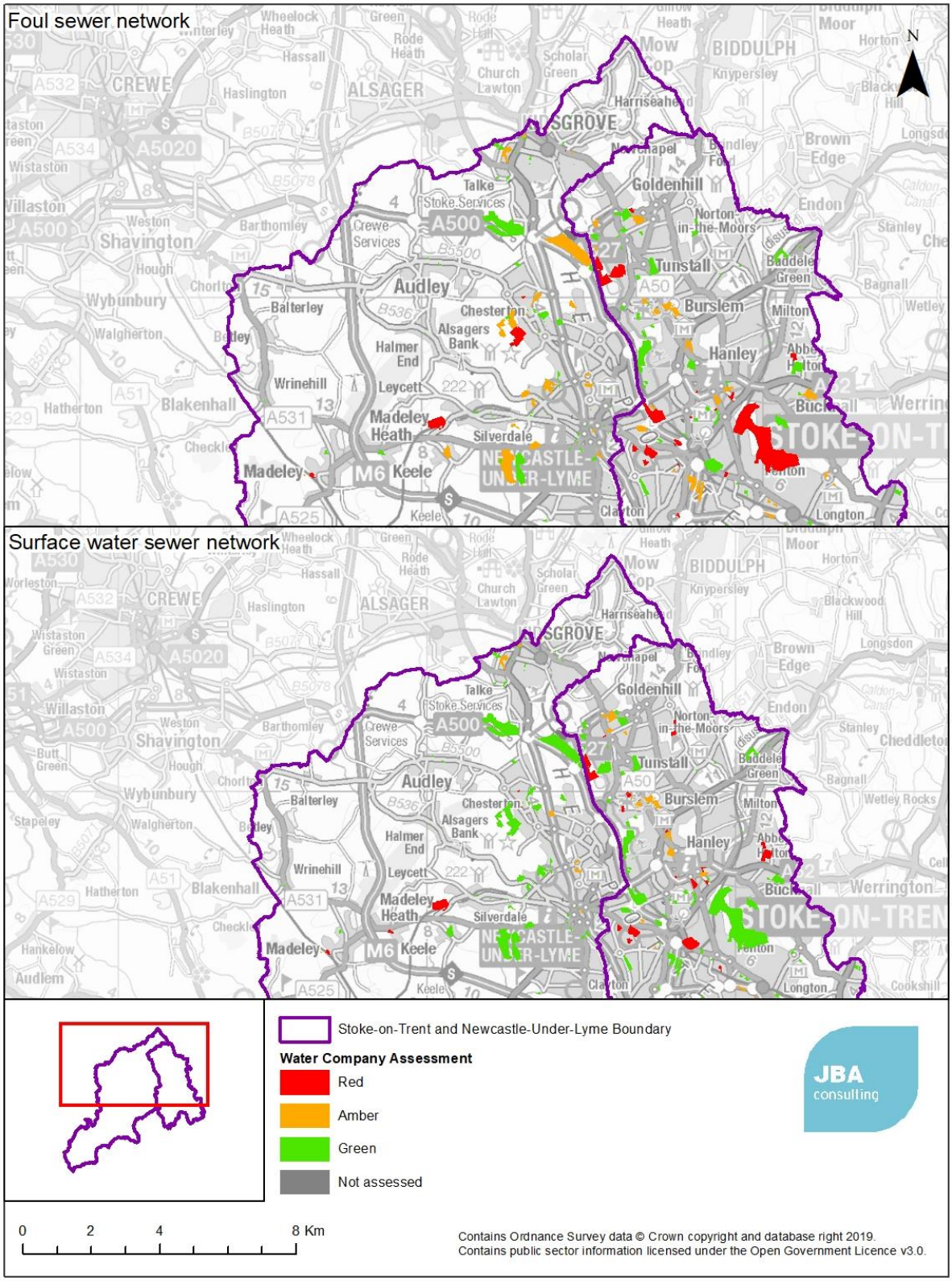

Figure 6.1 Water company assessments for the north of the study area

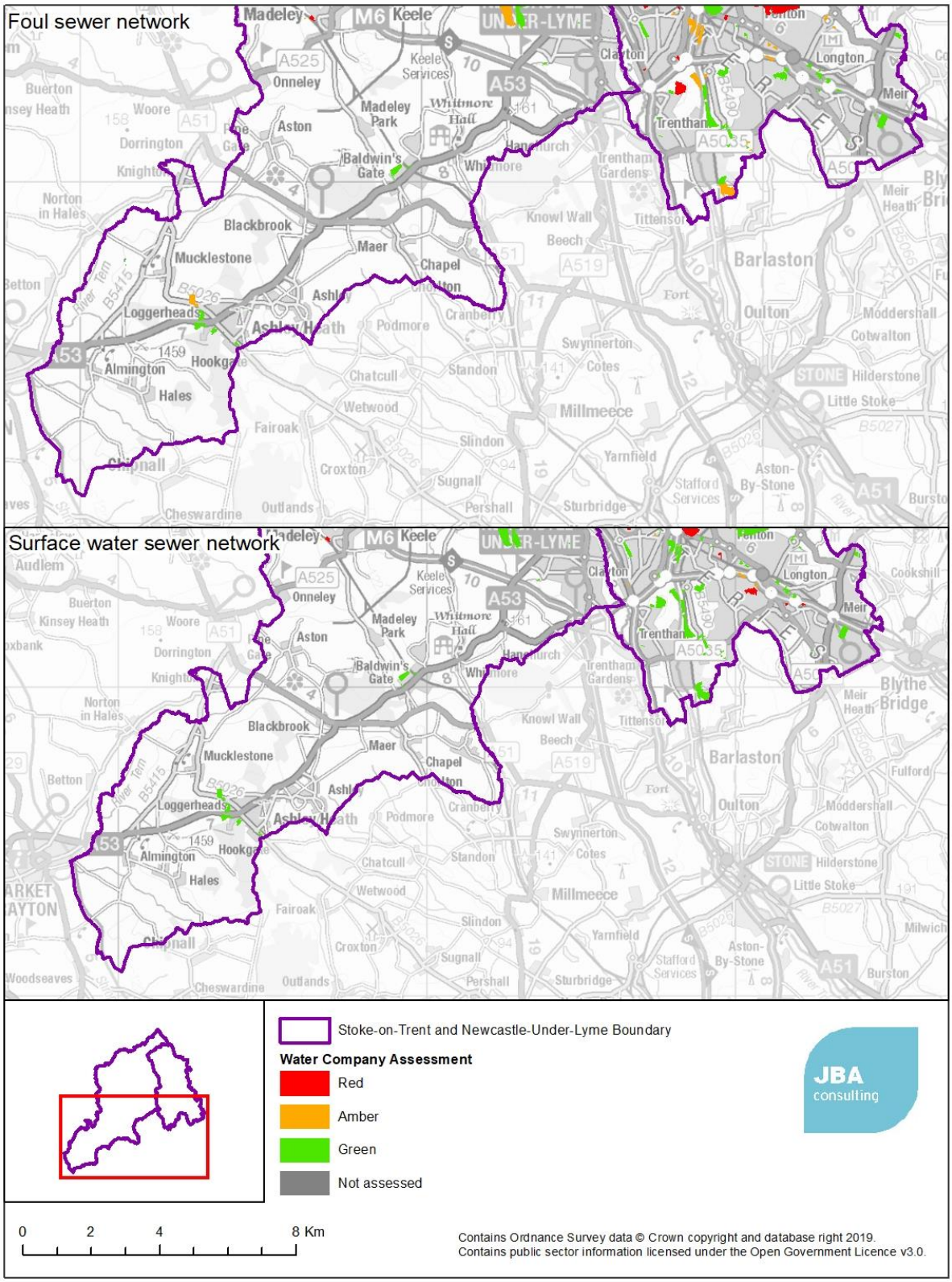

Figure 6.2 Water company assessments for the south of the study area

6.7 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 and United Utilities is required, and further modelling of the network may be required at the planning application stage. This is particularly true for United Utilities whereby surface water drainage systems have not yet been modelled. Furthermore, in both STW and UU 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.

No further study of the wastewater network is recommended as part of a Phase 2 Outline study.

6.8 Recommendations

Table 6.5 Recommendations from wastewater network assessment

Action	Responsibility	Timescale
Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker	NuL SoT UU 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, UU 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 Newcastle-under-Lyme and Stoke-on-Trent

There are eleven WwTW within the study area that are operated by Severn Trent Water and United Utilities. All of these are likely to serve a proportion the proposed growth as well as growth from neighbouring authorities. The location of these WwTW is shown in Figure 7.1 below.

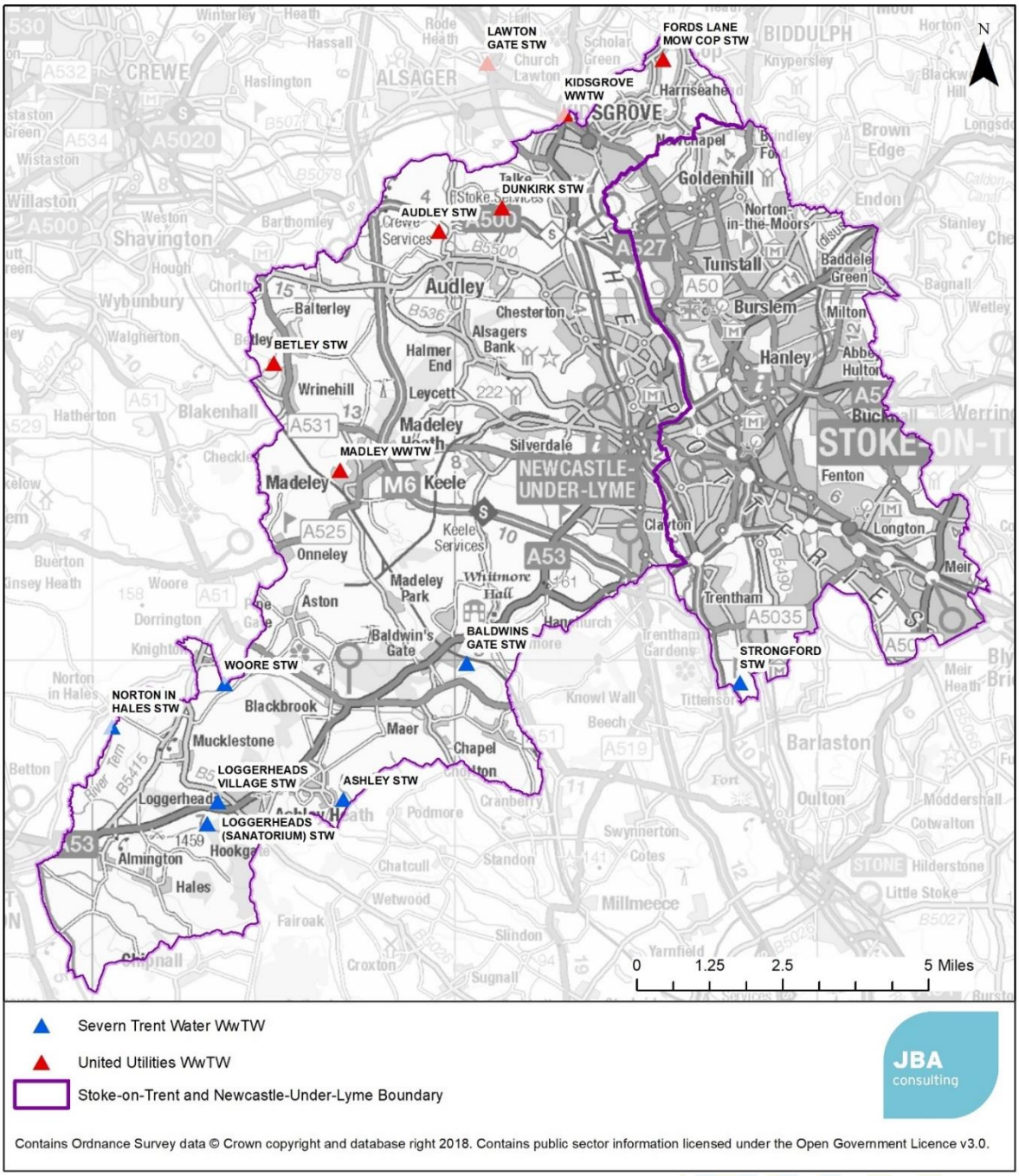

Figure 7.1 Location of WwTWs

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 7.2 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.

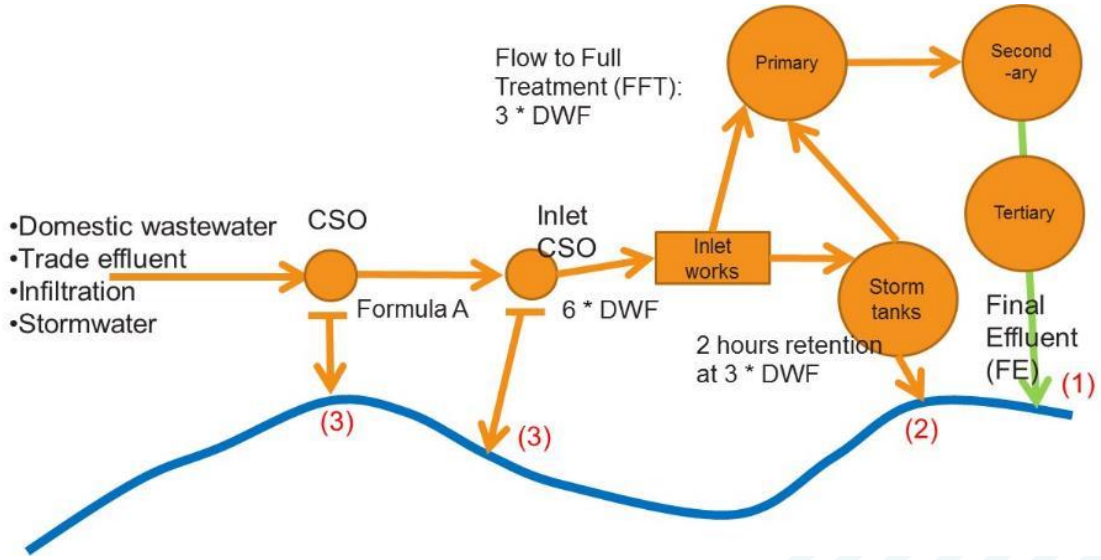

Figure 7.2 Overview of typical combined sewerage system and WwTW discharges

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 m3/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).

WwTW Environmental Permits also consent for maximum concentrations of pollutants, in most cases Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia (NH4). 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 Water and United Utilities were provided with the list of proposed development sites and the potential housing numbers for each site (See Appendix A). Both water companies were then invited to provide an assessment of the receiving WwTW and provide any additional comments about the impacts of the development.

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

- Calculate the current measured Dry Weather Flow (DWF). This was calculated as the 80-percentile exceedance flow for the period January 2013 to December 2017.
- The flow data was cleaned to remove zero values and low outlier values which would bring the measured DWF down.
- 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 Values used in water demand calculations, 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.

Table 7.1 Values used in water demand calculations

Water Company	Water Resource Zone	Occupancy rate (persons per dwelling)	Per capita consumption (m3/person/day)
Severn Trent Water	North Stafford	2.19	0.112

The demand forecast contains data from all of the preferred option sites, commitments, windfall and neighbouring authority growth sites outlined in section 2.

The following red / amber / green traffic light definition was used by Severn Trent Water and United Utilities 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.

STW provided a RAG assessment for Strongford WwTW only. JBA therefore applied a RAG score based on calculated headroom (section 7.4) for the other STW treatment works. Current and estimated future flows from each WwTW serving growth were plotted on a graph against current consented flow. Where the estimated future flow is less than consented flow, it implies that there is available headroom at the WwTW to accommodate additional flows from the perspective of volumetric capacity. This may be restricted by water quality considerations described in section 9. Where estimated future

flow exceeds consented flow, additional capacity may be required and/or an increase in the flow permit may be required.

7.4 Results

7.4.1 Audley WwTW (United Utilities)

Audley WwTW is located in the north of Newcastle-under-Lyme, and has a catchment that covers Audley, Wereton, Miles Green and Alsagers Bank (Figure 7.3). This WwTW is forecast to serve six developments (both residential and employment) as well as five additional windfall properties (estimated from total windfall).

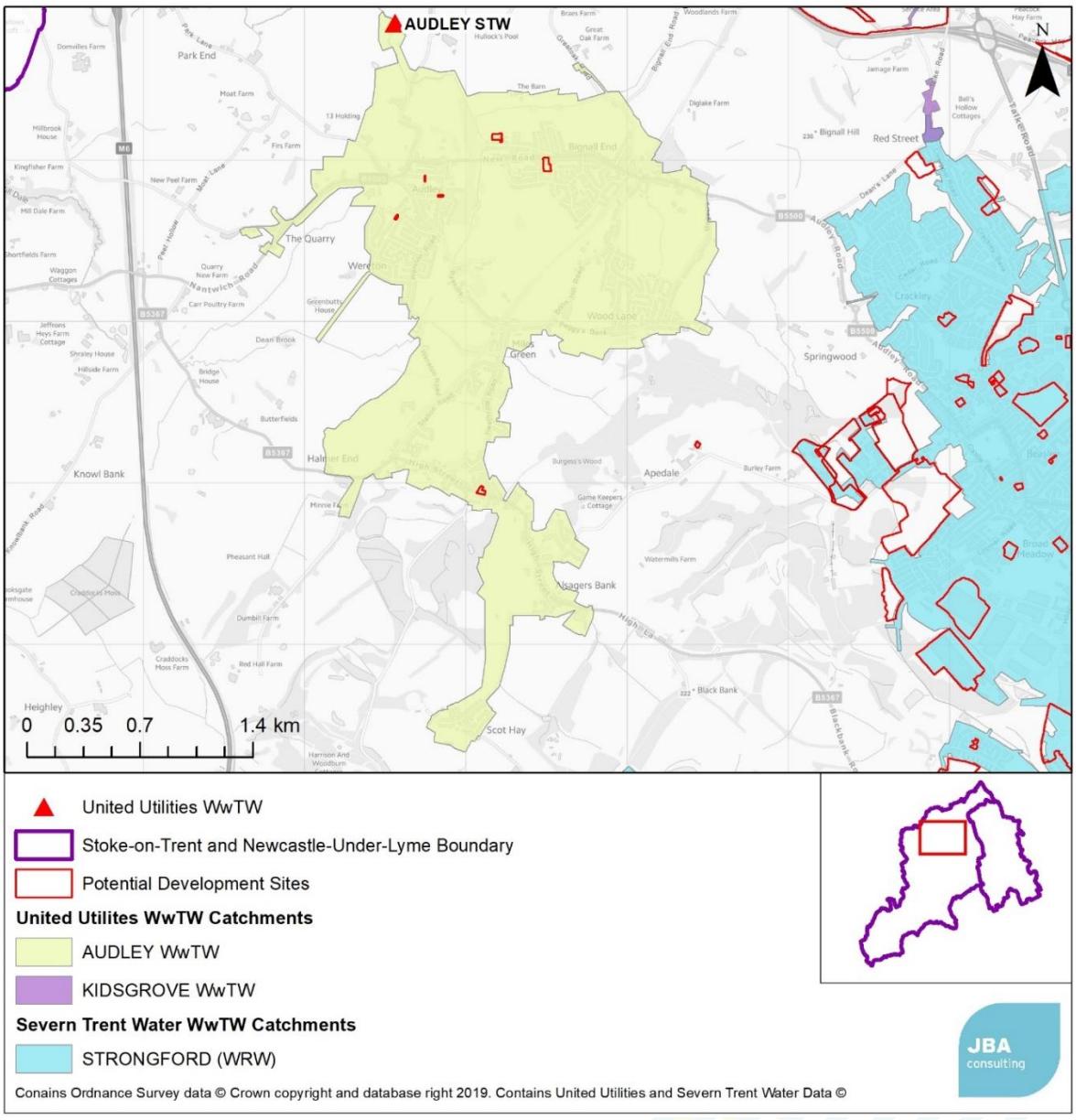

Figure 7.3 Audley WwTW catchment

The Audley WwTW has a maximum permitted DWF of 2.047 Ml/d. Comparison of this permitted flow against the future flow (Figure 7.4) from proposed development, shows that there is sufficient capacity at the treatment works to accommodate all of the sites identified in the Local Plan process.

Figure 7.4 Flow permit assessment for Audley WwTW

WwTW Flow capacity RAG Score	Comments from United Utilities
Capacity available to serve the proposed growth	No comments provided

7.4.2 Betley WwTW (United Utilities)

Betley WwTW is located in the north west corner of Newcastle-under-Lyme and has a catchment that covers Betley, Ravenshall and Wrinehill (Figure 7.5). This is a relatively small WwTW and is associated with only four small future development sites, alongside four windfall properties (estimated from total windfall).

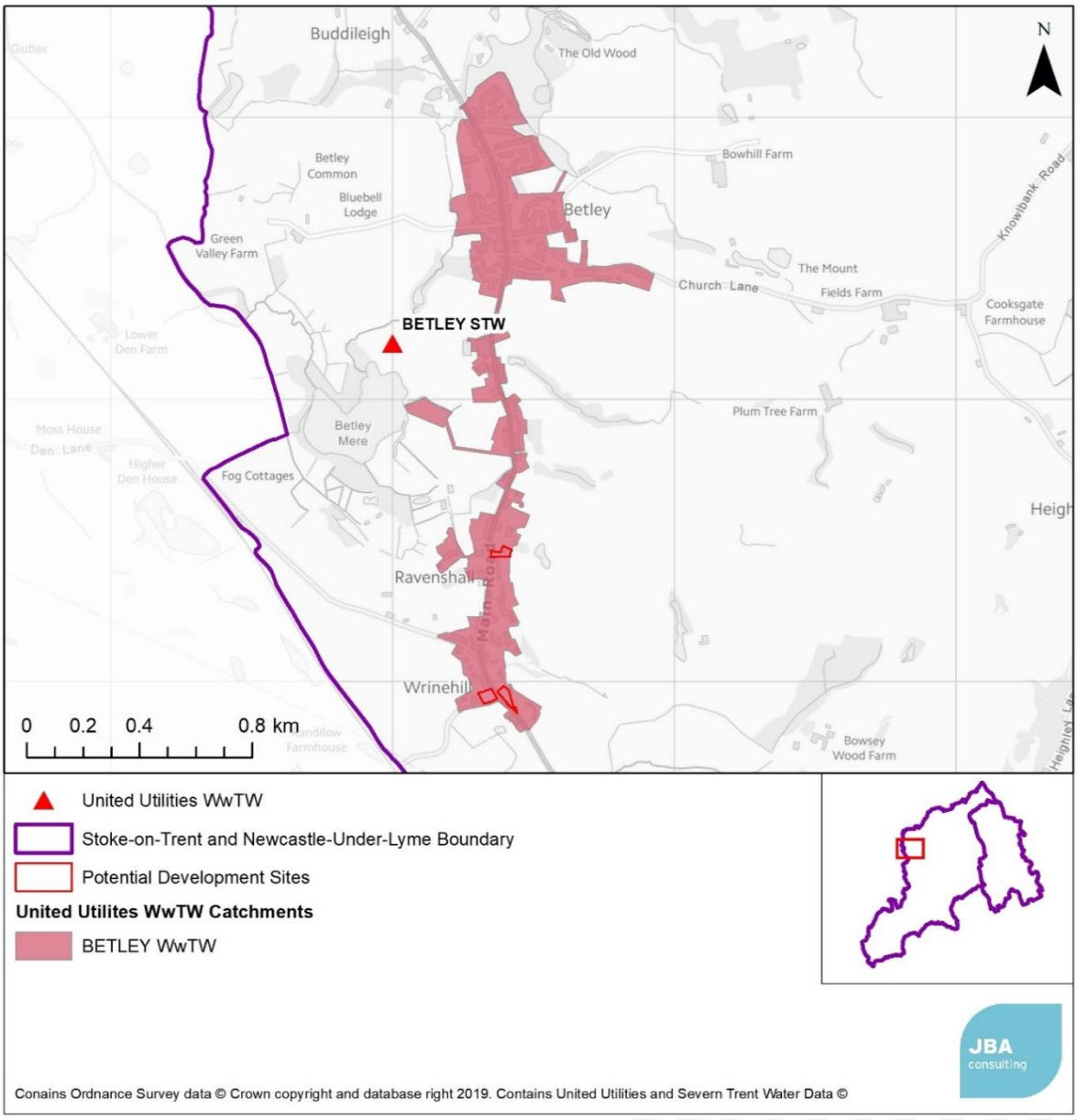

Figure 7.5 Betley WwTW catchment

The maximum permitted DWF for the Betley WwTW is 0.16 Ml/d, and Figure 7.6 shows that future flows (accounting for proposed developments) are within this permit. Despite the sufficient capacity, United Utilities have scored Betley WwTW with an amber RAG Score. No comments were provided to explain this scoring; however, it is likely to be as a result of the relatively small size of the WwTW, which can accommodate the planned growth but would not have the capacity to serve additional or larger sites should they be identified.

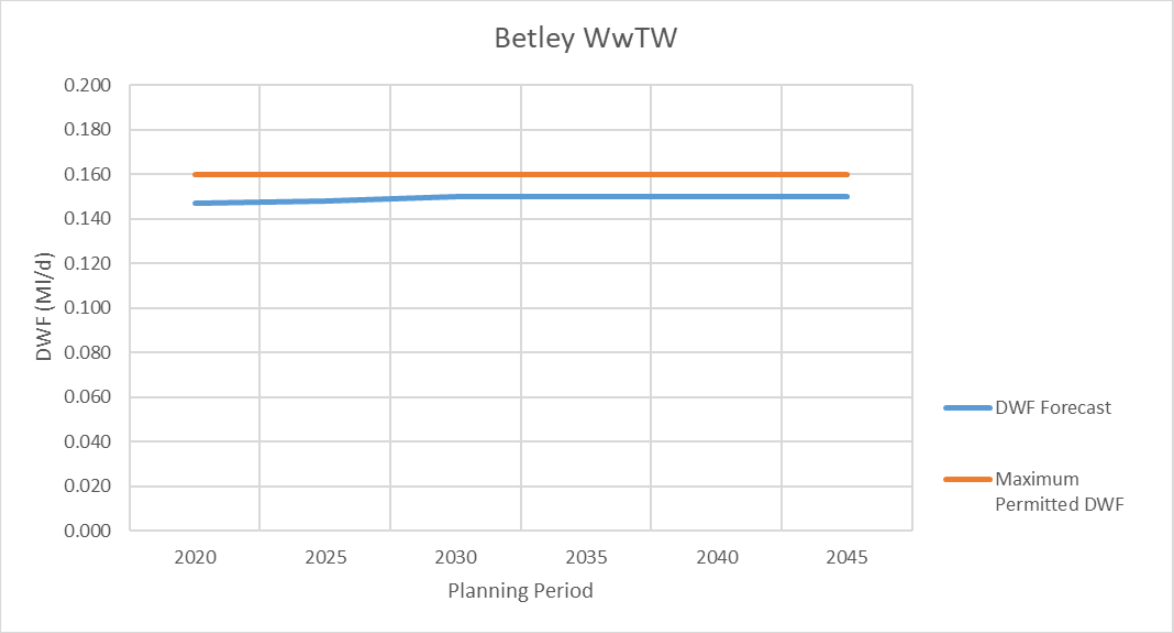

Figure 7.6 flow permit assessment for Betley WwTW

WwTW Flow capacity RAG Score	Comments from United Utilities
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	No comments provided

7.4.3 Kidsgrove WwTW (United Utilities)

Kidsgrove WwTW is located in the north east of Newcastle-under-Lyme, covering the borough of Kidsgrove, as shown in Figure 7.7. This is a large WwTW and is forecast to provide for a large number of houses as well as a significant area for employment space. It is also estimated that the WwTW will serve approximately 78 windfall properties.

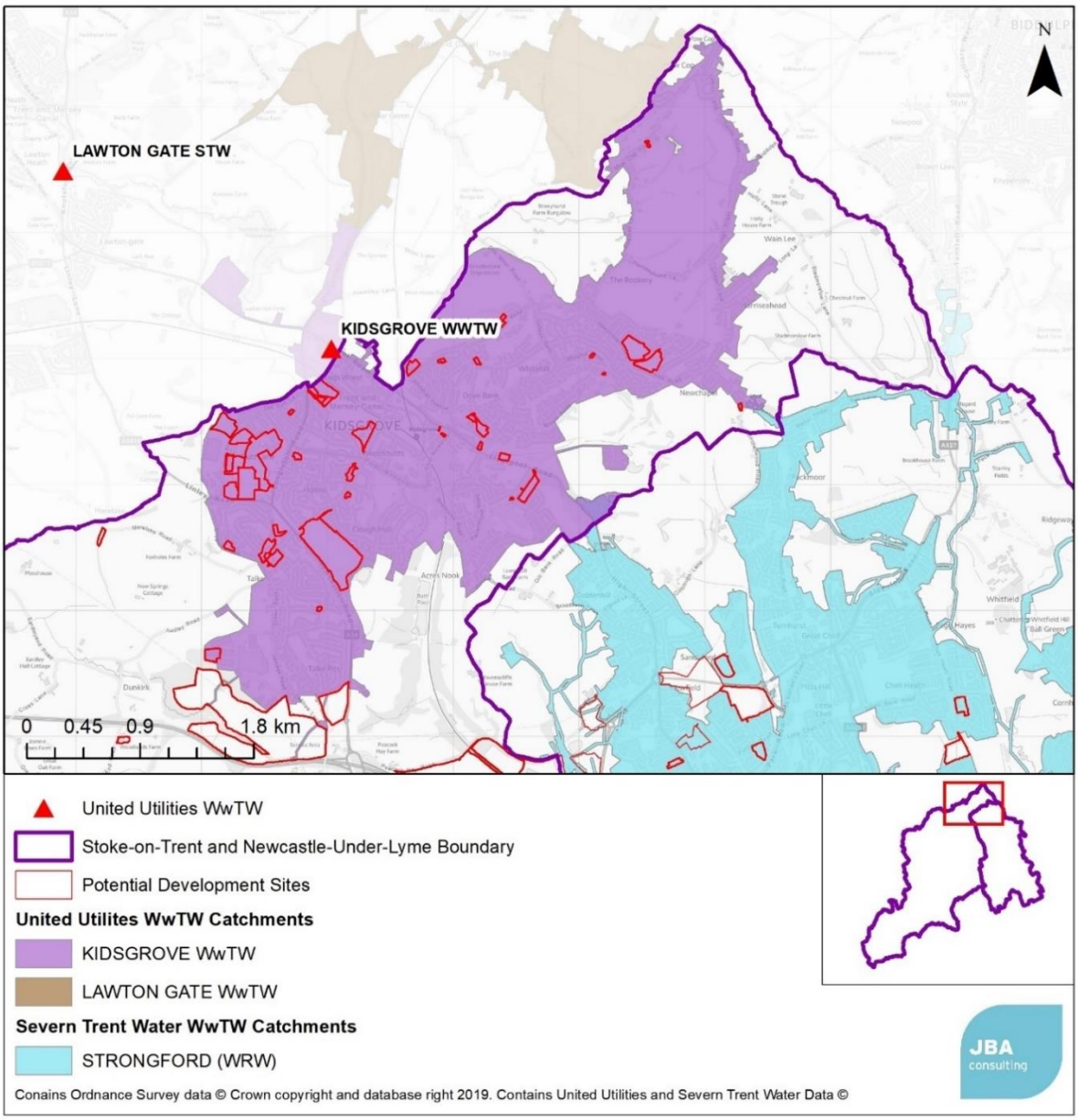

Figure 7.7 Kidsgrove WwTW catchment

The permitted DWF for Kidsgrove WwTW is 6.5 Ml/d. Figure 7.8 shows that, when accounting for the proposed developments, there is sufficient capacity to accommodate future growth identified in the Local Plan.

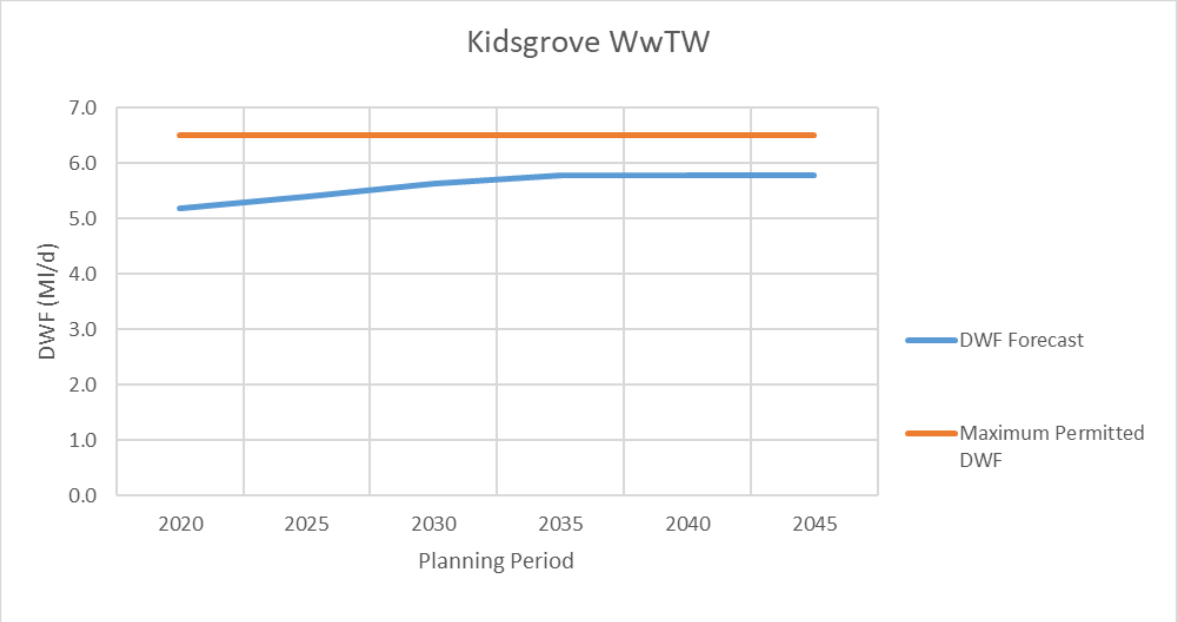

Figure 7.8 Flow permit assessment for Kidsgrove WwTW

WwTW Flow capacity RAG Score	Comments from United Utilities
Capacity available to serve the proposed growth	No comments provided

7.4.4 Madeley WwTW (United Utilities)

Madeley WwTW is located in the central area of Newcastle-under-Lyme and covers the village of Madeley, as shown in Figure 7.9. This treatment works is forecast to only serve residential properties, alongside an estimated 88 properties from windfall.

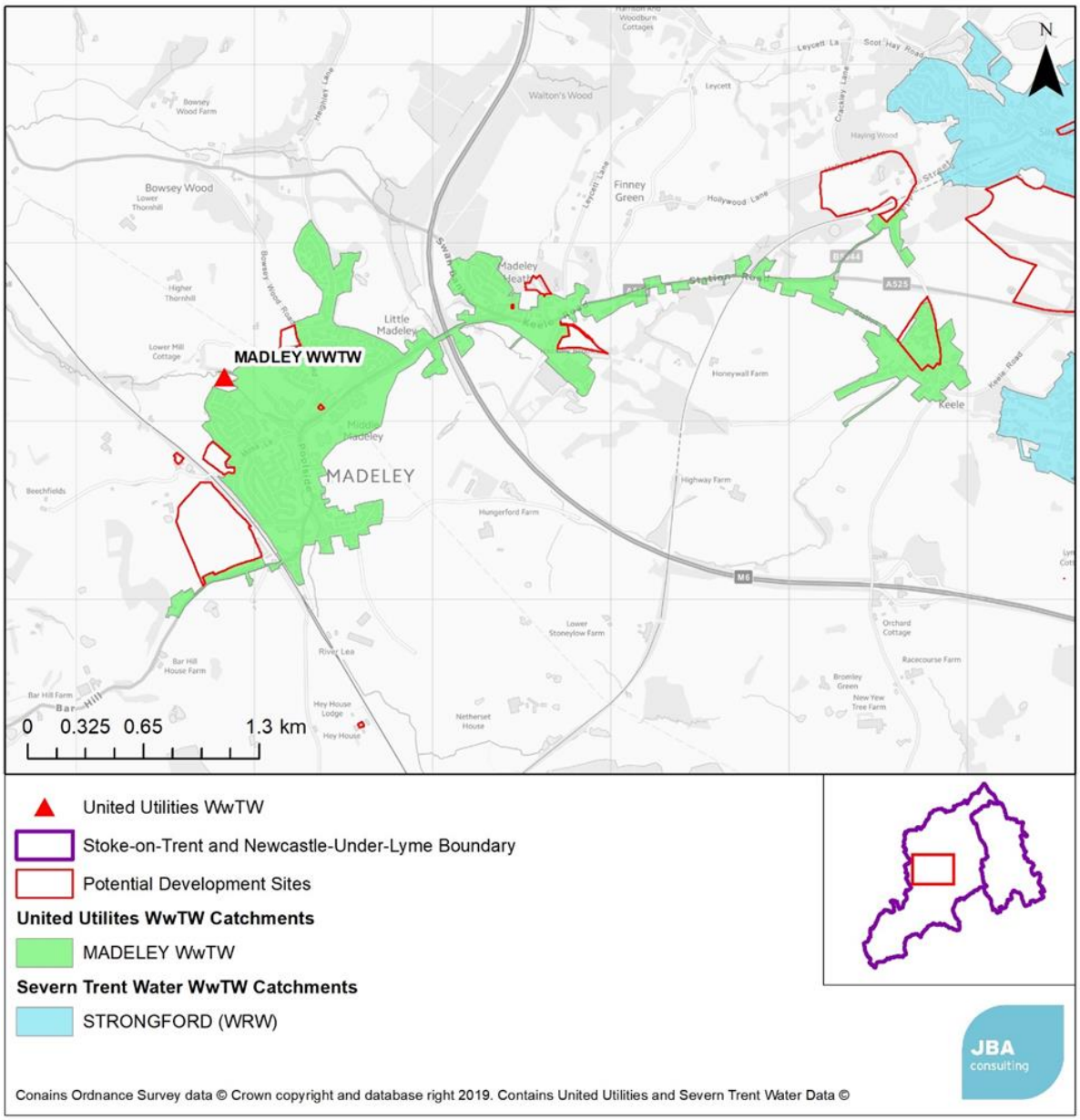

Figure 7.9 Madeley WwTW catchment

Comparing the permitted maximum DWF value of 2.77 Ml/d to the estimated future flows in Figure 7.10, shows that the WwTW has sufficient capacity to serve the proposed developments.

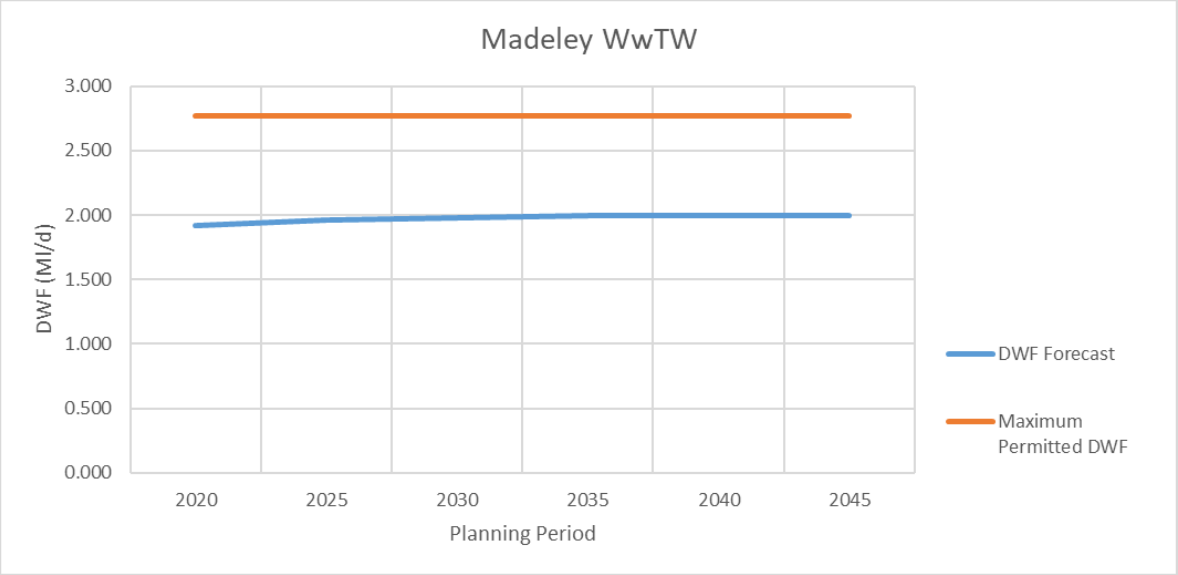

Figure 7.10 Flow permit assessment of Madeley WwTW

WwTW Flow capacity RAG Score	Comments from United Utilities
Capacity available to serve the proposed growth	No comments provided

7.4.5 Ashley WwTW (Severn Trent Water)

The Ashley WwTW catchment (Figure 7.11) is in the south of Newcastle-under-Lyme, covering the village of Ashley. This WwTW is only likely to serve one development site consisting of a single dwelling(18/00022/OUT) so has not been assessed further in this study.

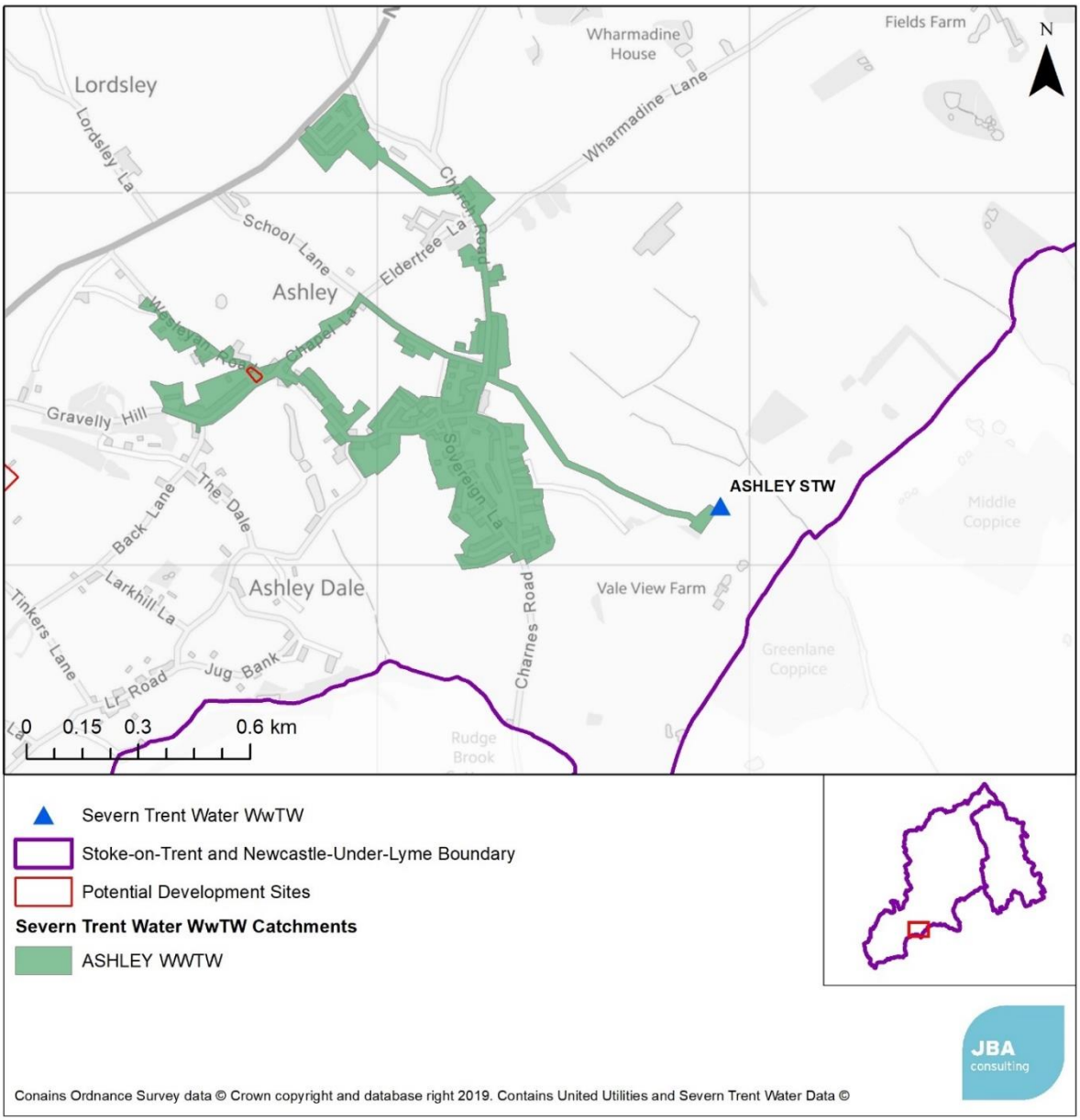

Figure 7.11 Ashley WwTW catchment

7.4.6 Baldwin's Gate WwTW (Severn Trent Water)

Baldwin's Gate WwTW catchment (Figure 7.12) extends from the southern boundary of Newcastle-under-Lyme, into the central area. It covers the hamlet of Baldwin's Gate.

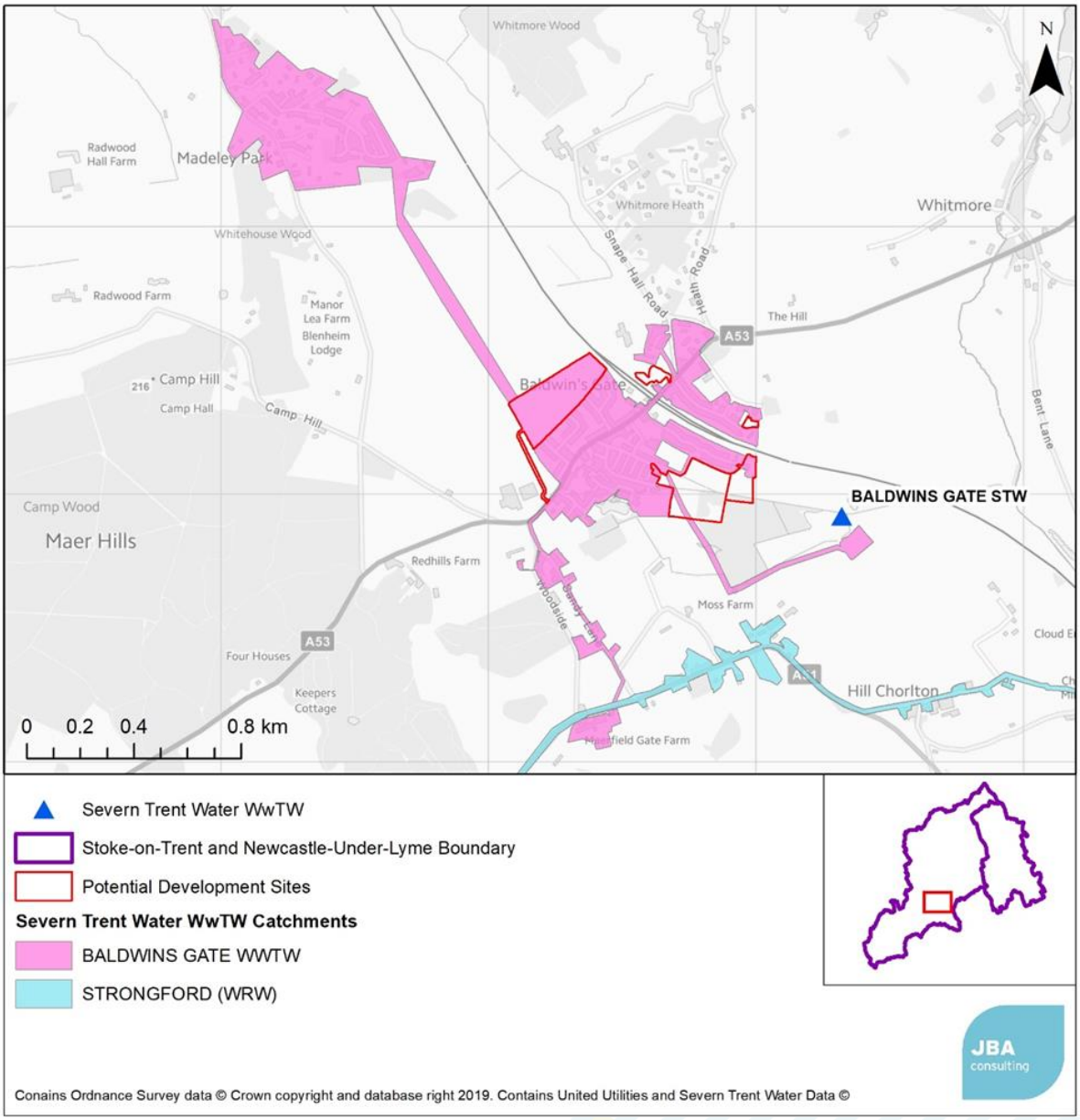

Figure 7.12 Baldwin's Gate WwTW

A comparison of the current flow from the WwTW to its permitted flow suggest that this WwTW is currently close to exceeding its permit, and STW estimate in the data they provided that there is sufficient headroom for only 40 additional houses.

Planned growth within this catchment is expected to deliver an additional 140 houses and so the flow permit is likely to be exceeded towards the end of AMP6 (2020) if no action is taken (Figure 7.13).

STW advise that an AMP6 scheme is being delivered (estimated completion late 2019) to meet a new Phosphorus limit as part of their obligations under WINEP. As these upgrades are designed there will be a horizon exercise to "ensure any improvements are fit for use for a sufficient period of time into the future."

Adjacent to the Baldwin's Gate catchment is Strongford WwTW catchment, and it may be possible to pump the additional flows to Strongford where there is sufficient volumetric capacity to take them.

An amber assessment has been given to this works, reflecting the current lack of capacity, but also the ongoing works to accommodate growth as part of the 2019 upgrade of Baldwin's Gate WwTW, and the potential alternative solution of accommodating flows at Strongford.

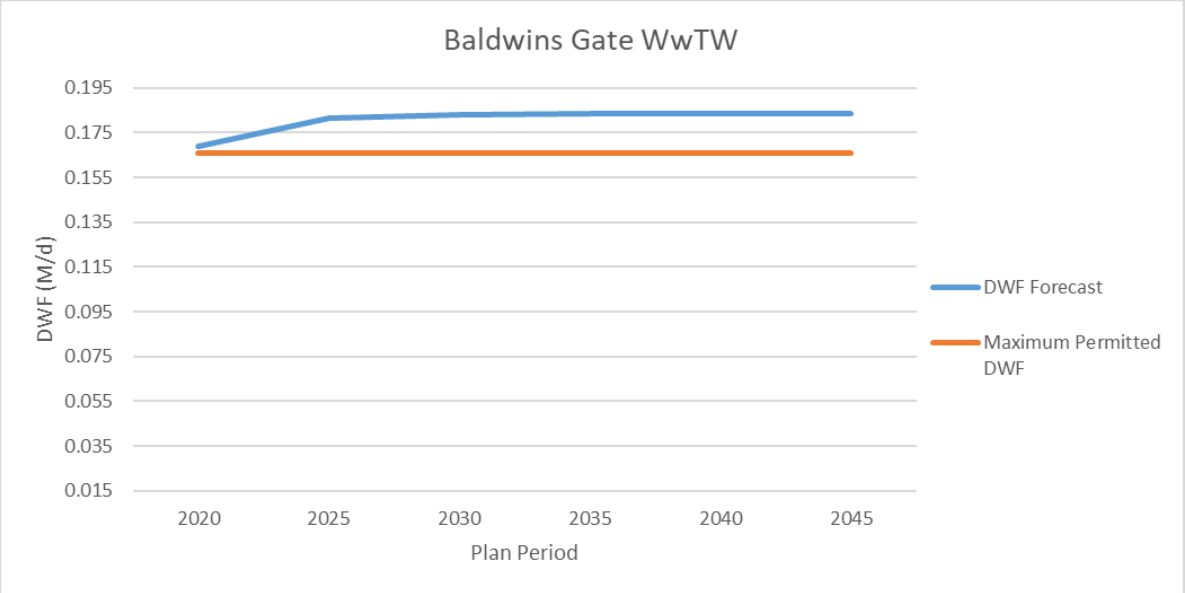

Figure 7.13: Flow permit assessment of Baldwins Gate WwTW

WwTW Flow capacity RAG Score	Comments from Severn Trent Water
Infrastructure and/or treatment upgrades may be required to serve proposed growth, but no significant constraints to the provision of this infrastructure have been identified	"It should be noted that there's no significant constraints on the capacity enhancement and we will continue to monitor the usage of the headroom as houses arrive vs water efficiency measures being implemented which create further headroom." "The 2019/20 upgrades at this site are still in the process of being delivered which will add some load capacity but won't ass hydraulic capacity which is the limited factor. When hydraulic headroom has been used up, we'll then look to modify that separately."

**Assessment by JBA. No RAG score provided by STW*

7.4.7 Checkley WwTW (Severn Trent Water)

Checkley WwTW is located outside of Stoke-on-Trent, to the south east, however the catchment extends into Stoke-on-Trent (shown in Figure 7.14) whereby it is forecast to serve two residential developments (Site Ref. 315 and 342) and one large employment site (Site Ref. ST1). It is also estimated that it will provide services for development within the Staffordshire Moorlands District Council area.

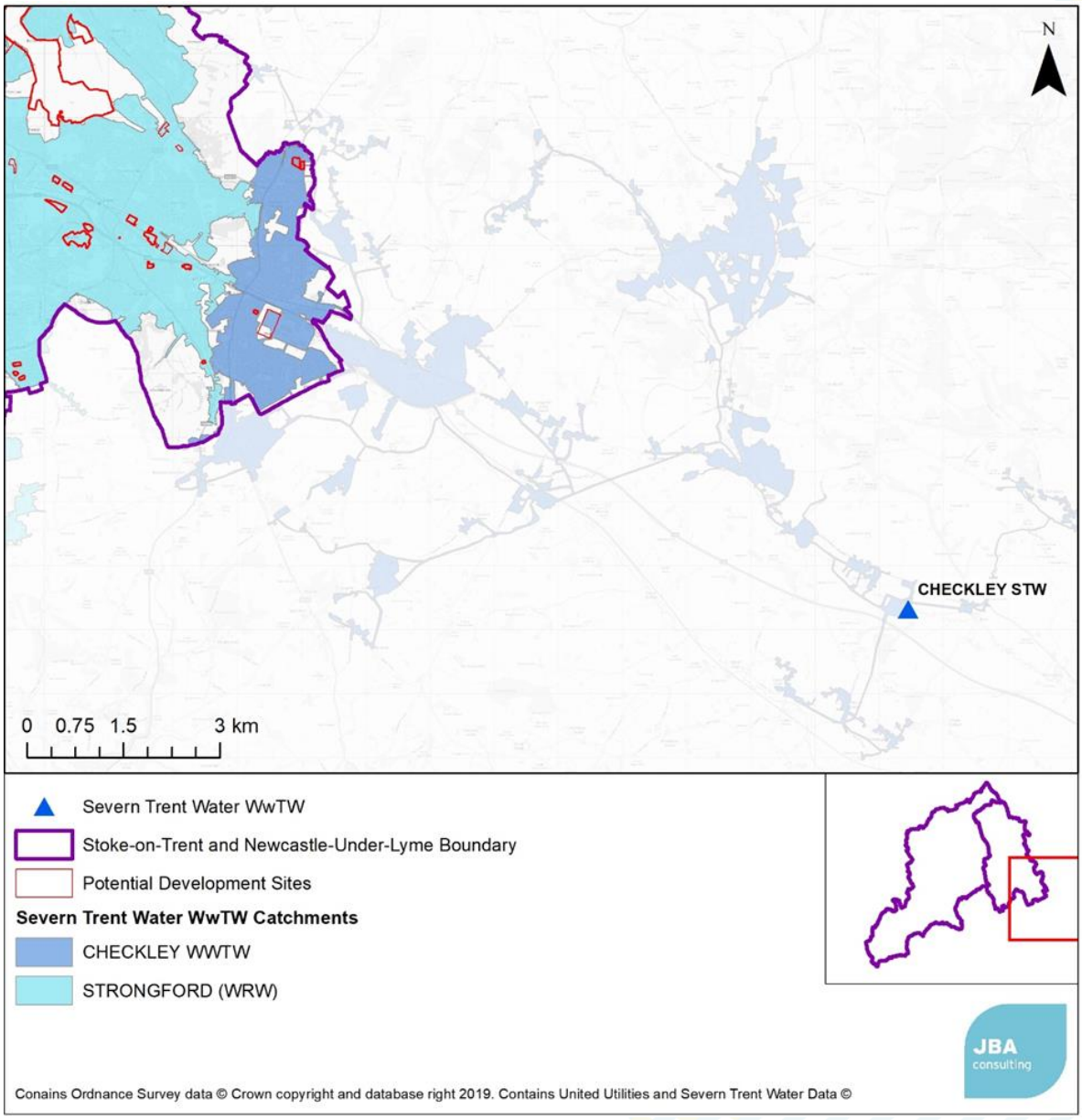

Figure 7.14 Checkley WwTW catchment

The permitted DWF for the Checkley WwTW is 17.543 Ml/d. Figure 7.15 shows that, when accounting for the proposed developments, there is sufficient capacity to accommodate future growth identified in the Local Plan. STW advise that the current hydraulic headroom would provide capacity for an estimated 22,700 homes.

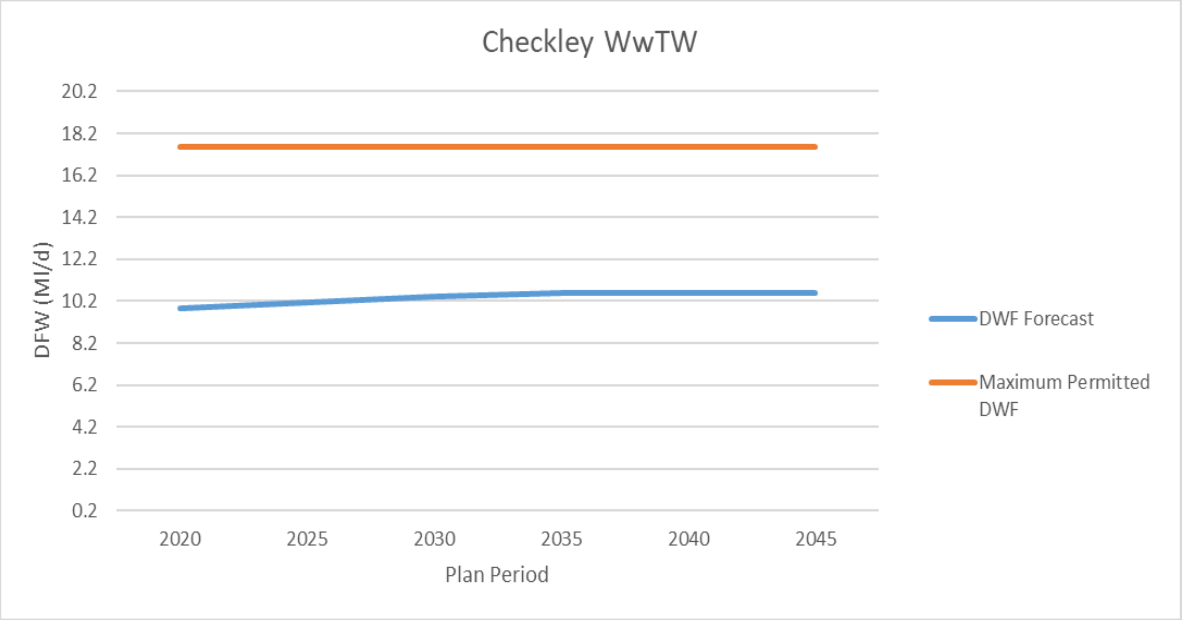

Figure 7.15: Flow permit assessment of Checkley WwTW

WwTW Flow capacity RAG Score	Comments from Severn Trent Water
Capacity available to serve the proposed growth*	No comments provided

** Assessment by JBA. No RAG score provided by STW*

7.4.8 Loggerheads Sanatorium WwTW (Severn Trent Water)

The Loggerheads Sanatorium WwTW is in the south of Newcastle-under-Lyme. It is proposed that the site will provide wastewater treatment for two developments (17/00067/DEEM4 and LW31) as well as an estimated 23 windfall sites. The catchment is shown in Figure 7.16.

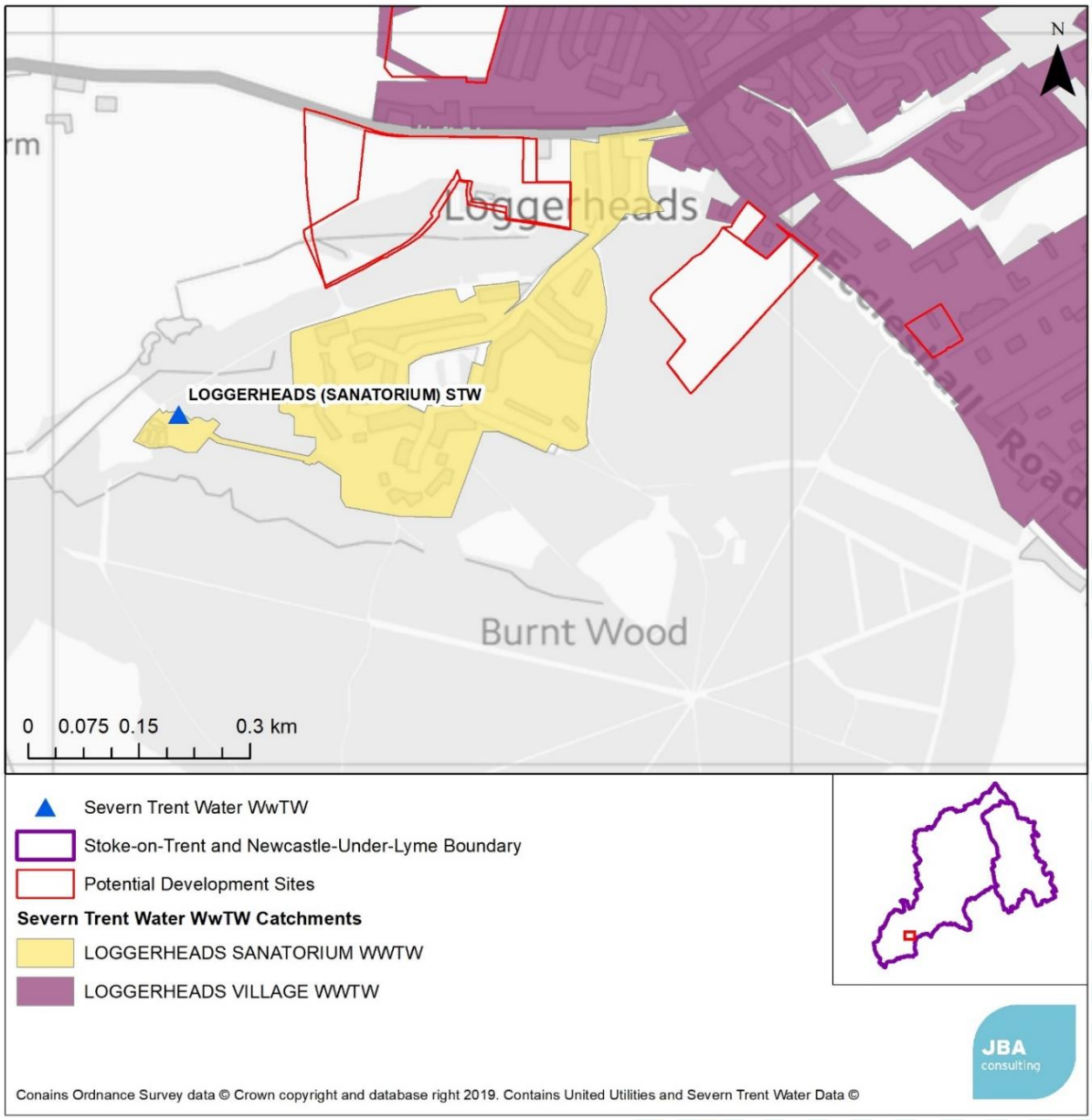

Figure 7.16: Loggerheads Sanitorium WwTW catchment

The permitted DWF for the Loggerheads Sanatorium WwTW is 0.332 Ml/d. Figure 7.17 shows that, when accounting for the proposed developments, there is sufficient capacity to accommodate future growth identified in the Local Plan. This small works is approaching its flow permit level and as it currently stands could not accommodate significantly higher levels of growth to that currently planned. STW have estimated current headroom as being sufficient for approximately 200 homes.

However, STW have advised that *"Loggerheads Sanatorium and Loggerheads Village have quality upgrade investments to meet multiple new effluent limits by December 2024, costing around £4.5m. Our notional solution is to transfer all flows to Loggerheads Sanatorium and upgrade there, adding capacity for future growth."*

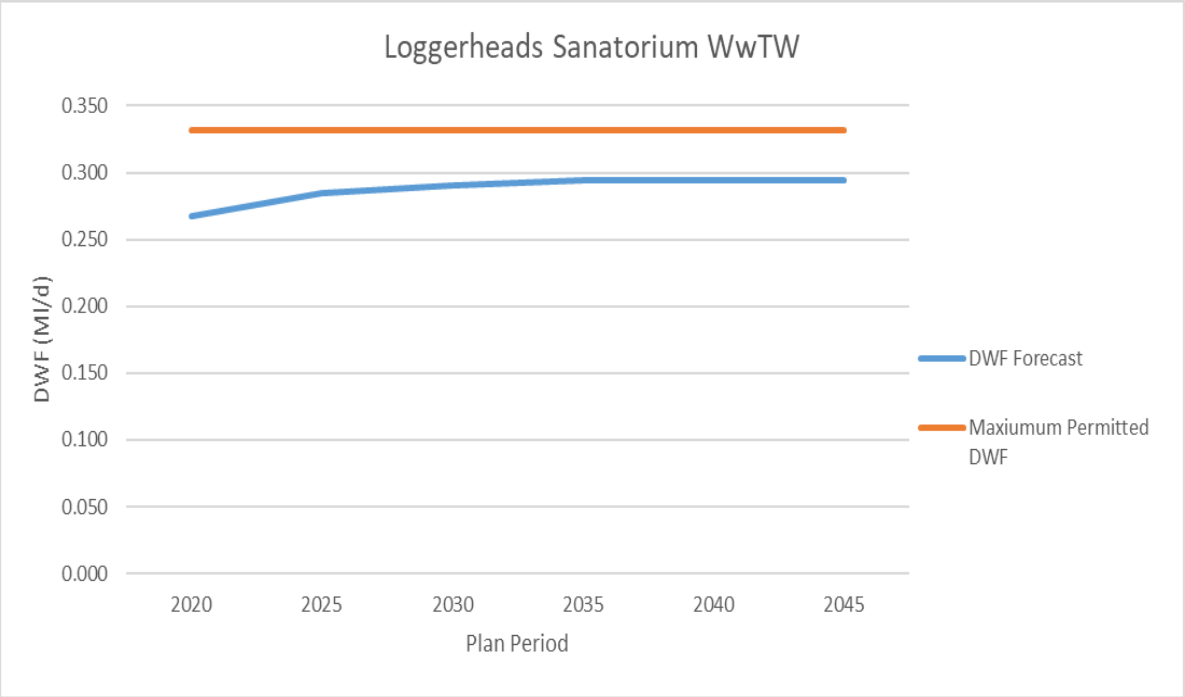

Figure 7.17: Flow permit assessment for Loggerheads Sanatorium WwTW

WwTW Flow capacity RAG Score	Comments from Severn Trent Water
Capacity available to serve the proposed growth*	No comments

** Assessment by JBA. No RAG score provided by STW*

7.4.9 Loggerheads Village WwTW (Severn Trent Water)

Loggerheads Village WwTW is located in the south of Newcastle-under-Lyme, adjacent to Loggerheads Sanatorium WwTW. The treatment works is forecast to provide for a mixture of both residential and employment developments, in addition to an estimated 80 windfall properties (across the plan period). The WwTW catchment extent is shown in Figure 7.18.

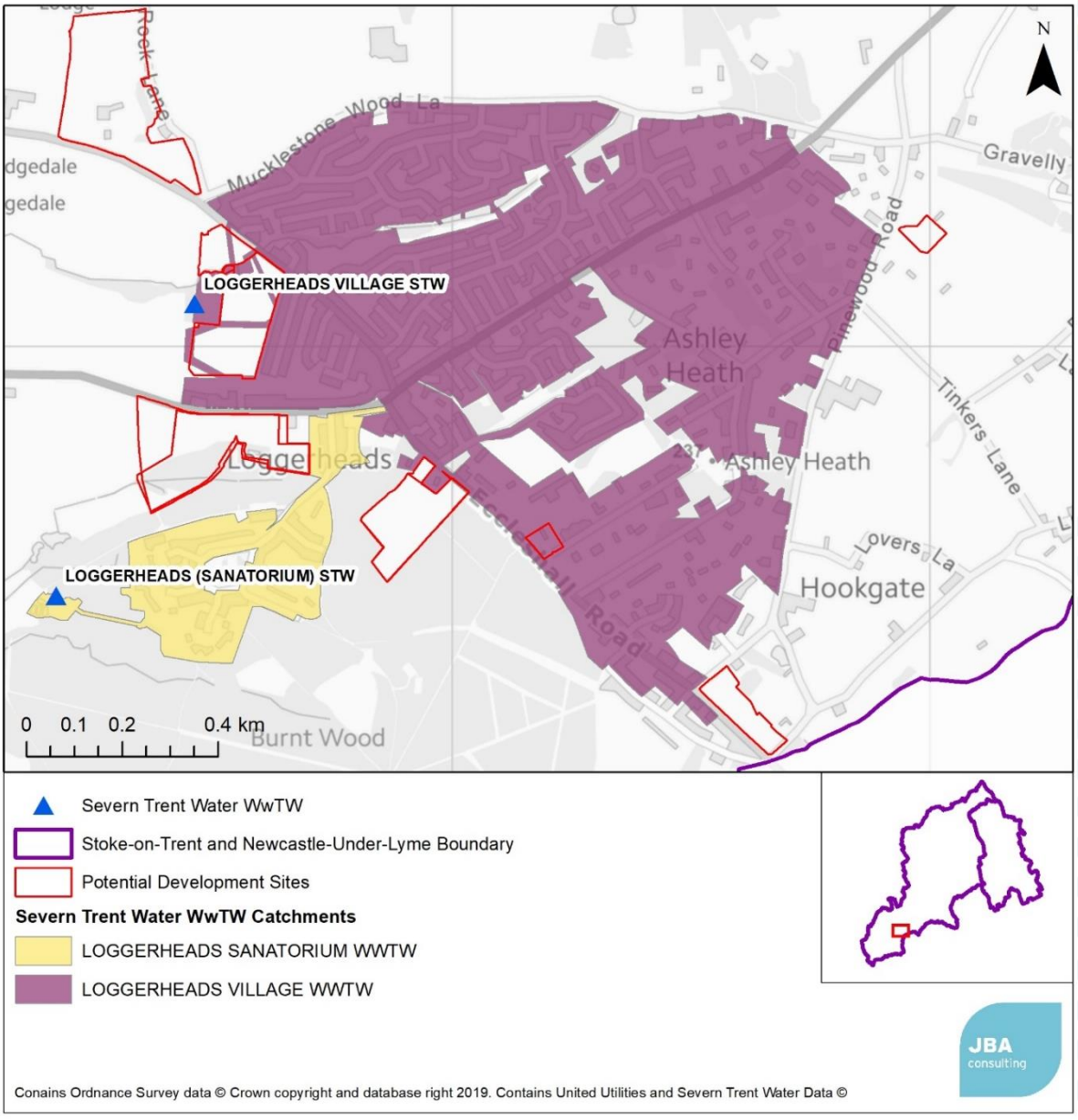

Figure 7.18: Loggerheads Village WwTW catchment

Comparing the permitted maximum DWF value of 0.318 Ml/d to the estimated future flows, in Figure 7.19, shows that the WwTW has sufficient capacity to provide for the proposed developments. This small works is approaching its permit level and as it currently stands could not accommodate significantly higher levels of growth to that currently planned. STW has estimated the current hydraulic headroom as being sufficient to provide capacity for approximately 450 homes.

However, STW have advised that *"Loggerheads Sanatorium and Loggerheads Village have quality upgrade investments to meet multiple new effluent limits by December 2024, costing around £4.5m. Our notional solution is to transfer all flows to Loggerheads Sanatorium and upgrade there, adding capacity for future growth."*

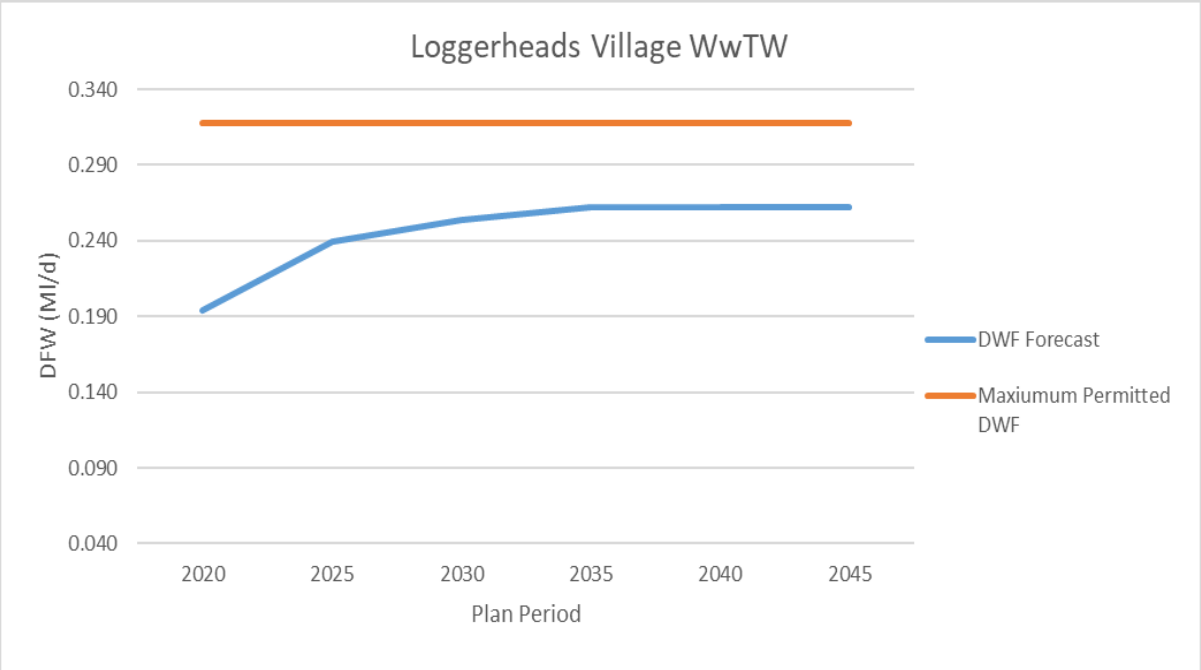

Figure 7.19: Permit flow assessment of Loggerheads Village WwTW

WwTW Flow capacity RAG Score	Comments from Severn Trent Water
Capacity available to serve the proposed growth*	No comments provided

** Assessment by JBA. No RAG score provided by STW*

7.4.10 Strongford WwTW (Severn Trent Water)

Strongford WwTW is located in the south west of Stoke-on-Trent. The catchment includes the majority of Stoke-on-Trent, as well as a large area in the east of Newcastle-under-Lyme. As a result of the catchment size, this WwTW is forecast to provide services for the majority of the proposed development contained in the Preferred Options Document. It is also estimated that it will provide services for 3,192 windfall properties over the Local Plan period, associated with Stoke-on-Trent's housing requirements, and 583 properties for Newcastle-under-Lyme. In addition to these developments, 75 residential houses will also be served by Strongford WwTW from the neighbouring Staffordshire Moorlands District. The catchment extent is shown in Figure 7.20.

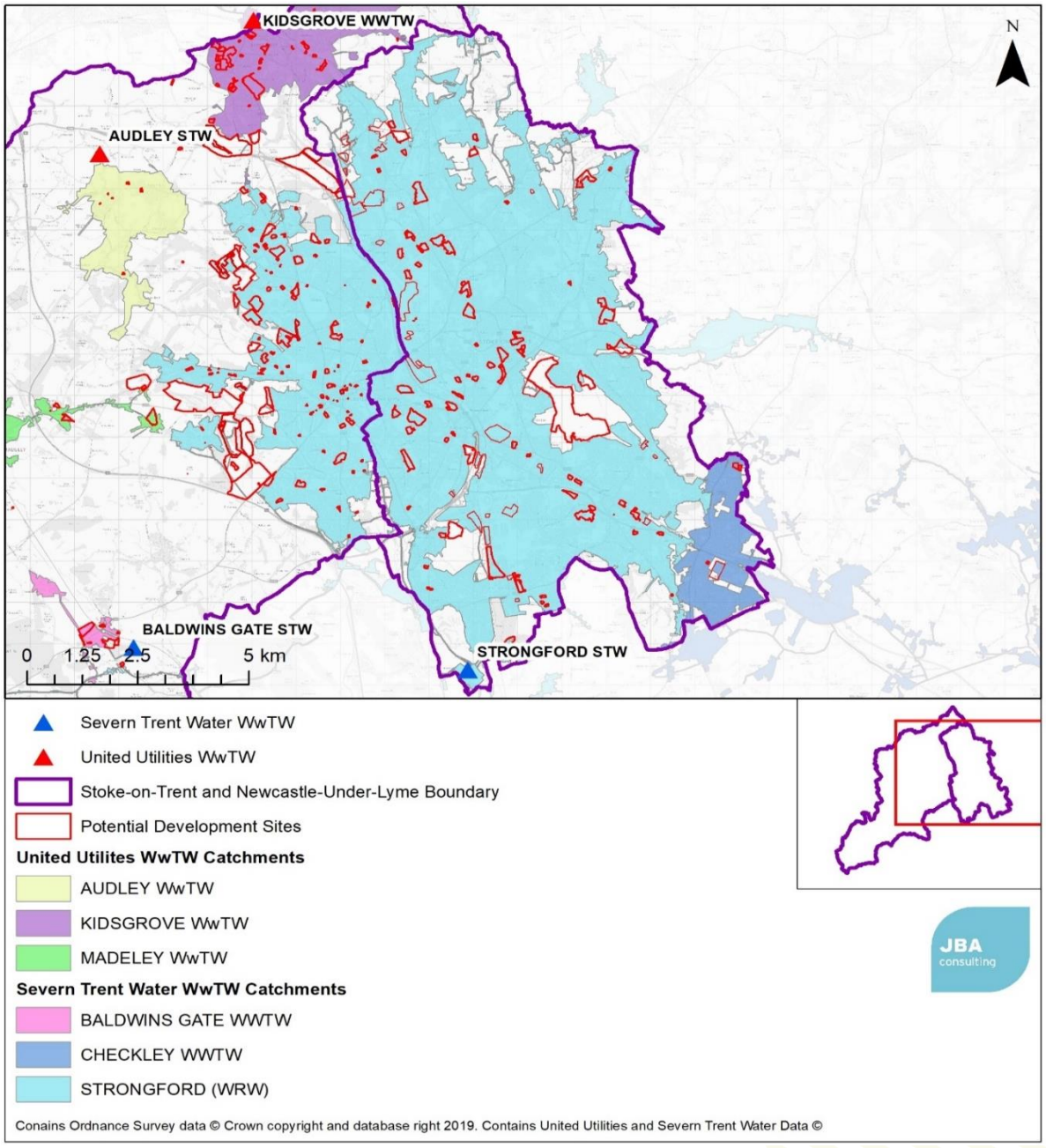

Figure 7.20 Strongford WwTW catchment

Comparing the permitted maximum DWF value of 120 Ml/d to the estimated future flows, in Figure 7.21, shows that the WwTW has sufficient capacity to provide for the proposed developments. STW have advised that there is an estimated hydraulic headroom sufficient to provide capacity for approximately 72,500 homes.

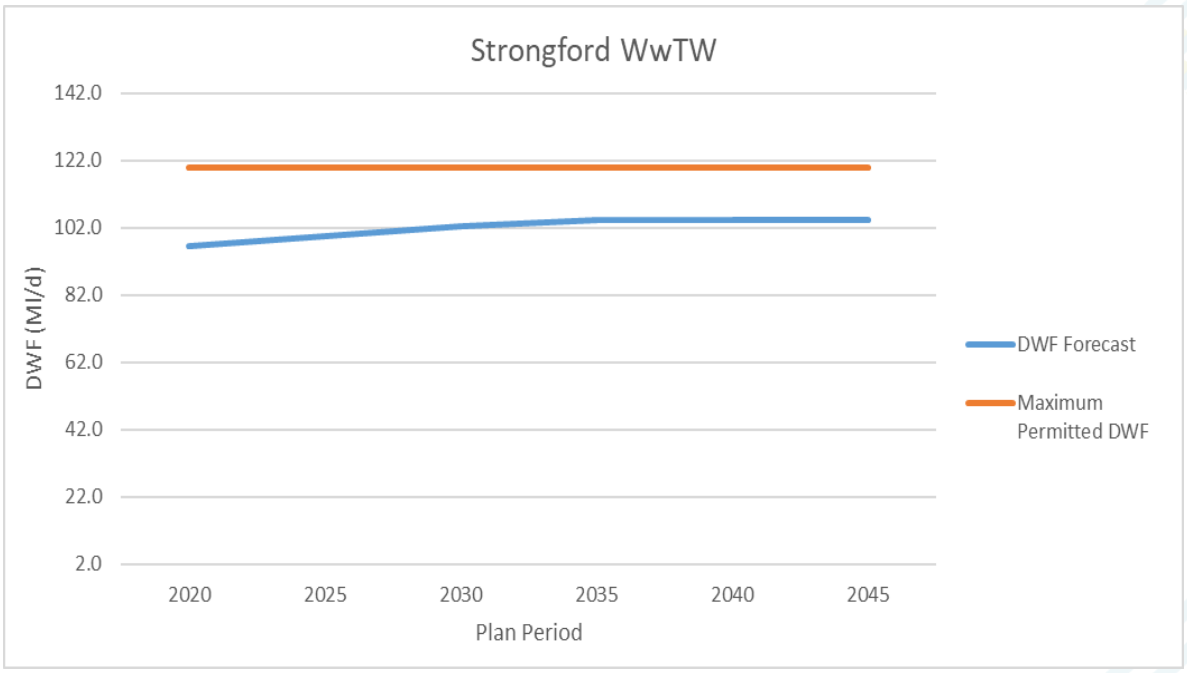

Figure 7.21: Permit flow assessment for Strongford WwTW

WwTW Flow capacity RAG Score	Comments from Severn Trent Water
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	The levels of development proposed in this catchment may result in additional treatment capacity being required, however there are no known physical constraints that would prevent additional capacity being provided at this treatment works.

7.5 Conclusions

Flow permit assessments were carried out at all of the WwTW that are expected to serve growth in the Local Plan period. All of the considered WwTW have sufficient volumetric capacity to provide for the proposed growth, with the exception of Baldwins Gate (Severn Trent Water), which is close to exceeding its permit. However, STW have advised that an upgrade to load capacity is underway and due for completion in late 2019, and they will continue to monitor the hydraulic capacity.

Capacity is limited at some of the smaller works (Betley, Loggerheads Sanitorium and Loggerheads Village) and growth exceeding that already planned for may not be able to be accommodated.

No further assessment of wastewater treatment capacity is recommended as part of a Phase 2 Outline Study.

7.6 Recommendations

Action	Responsibility	Timescale
Consider the available WwTW capacity when phasing development going to the same WwTW. This is particularly the case for developments to be served by Baldwin's Gate WwTW.	NuL SoT STW	Ongoing
Provide Annual Monitoring Reports to STW and UU detailing projected housing growth in the Local Authority.	NuL SoT	Ongoing
STW and UU to assess growth demands as part of their wastewater asset planning activities and feedback to the Councils if concerns arise.	STW UU NuL SoT	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 retro-fitted 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 odour nuisance.

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. For STW and UU, this is development sites less than 800m from the WwTW.

Another important aspect is the location of the site in respect to the WwTW. Historic wind direction records for sites around Newcastle-under-Lyme and Stoke-on-Trent indicate that the prevailing wind is from west southwest (Shawbury) to west (East Midlands), as recorded at METAR weather stations[45].

A red / amber / green assessment was applied:

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

8.3 Data Collection

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

- Site location in GIS format (provided by Newcastle-under-Lyme and Stoke-on-Trent)
- WwTW locations (from "Consented discharges to controlled waters with conditions" database)
- Site tracker spreadsheet (see Appendix A)

8.4 Results

Figure 8.1 below shows the 800m buffer applied around each WwTW in the study area. Sites that lie within this buffer are listed in Table 8.1.

45 RenSMART website http://www.rensmart.com/Weather/WindArchive#monthlyLayer accessed on: 23/01/2019

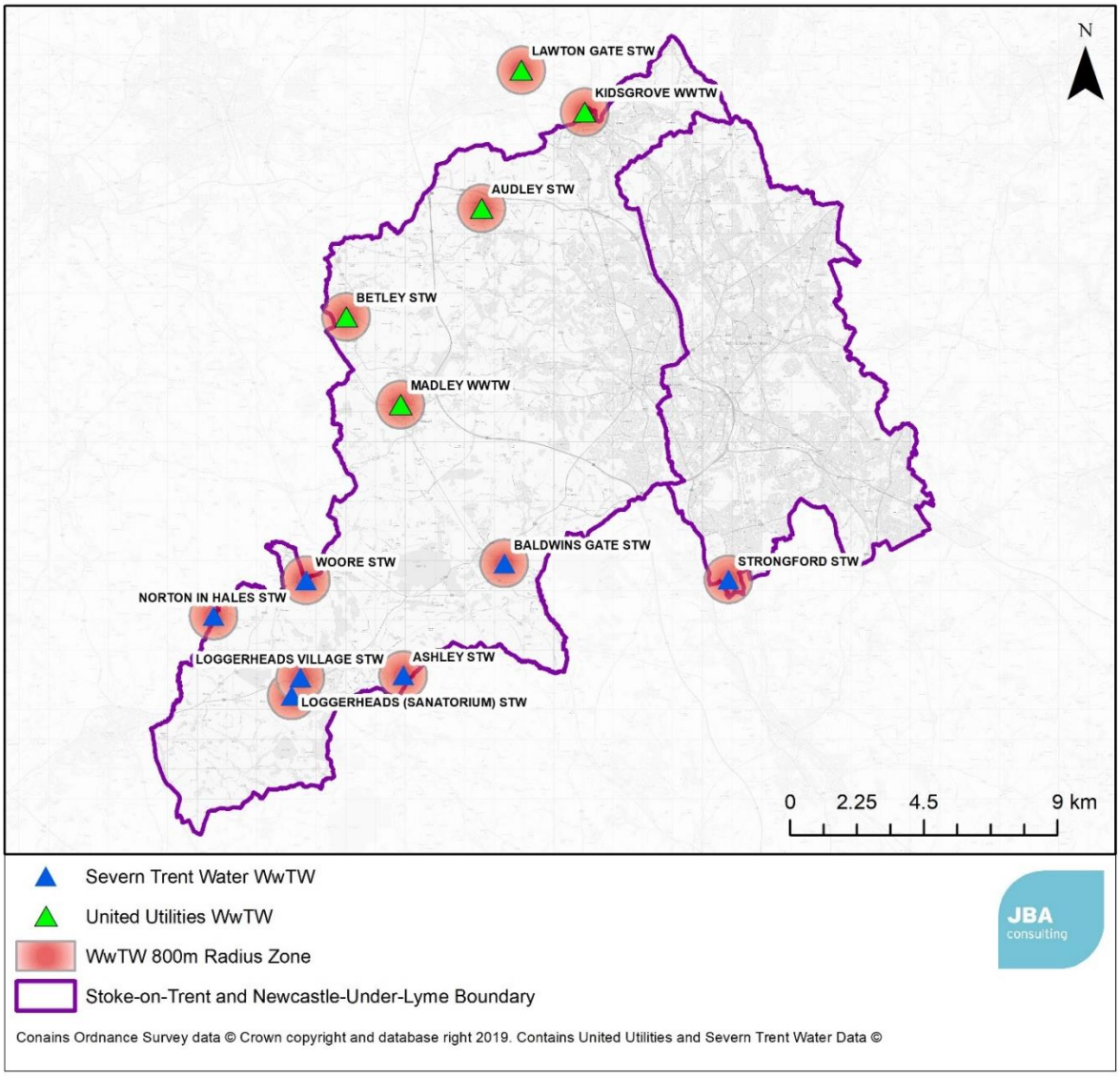

Figure 8.1 800m radius buffer zone surrounding each WwTW

Table 8.1 Sites with a potential risk of nuisance odour

WwTW	Site Ref.	Distance from WwTW (m)	Direction to WwTW	Encroaches closer than existing urban area (Y/N)
Baldwins Gate	18/00294/FUL	456	SSE	N
Kidsgrove	18/00188/FUL	235	SSW	N
	BL3	256	WNW	N
	KG9	620	WSW	N
	BL20	381	WNW	N
	BL25	578	SSE	N
Loggerheads Village	18/00315/REM	40	W	Y
	16/00866/DEEM4	566	W	Y

	17/00067/DEEM4	225	NW	Y
	LW12	230	N	N
	LW13	41	NNE	N
	LW17	566	NE	N
	LW31	219	NE	N
Madeley	MD31	347	SSE	N
	MD32	366	SSE	N
	MD35	502	SSE	N
Ashley	No sites identified at risk of nuisance odour			
Audley	No sites identified at risk of nuisance odour			
Betley	No sites identified at risk of nuisance odour			
Checkley	No sites identified at risk of nuisance odour			
Loggerheads Sanatorium	No sites identified at risk of nuisance odour			
Strongford	No sites identified at risk of nuisance odour			

8.5 Conclusions

16 sites are within 800m of a WwTW and may be at risk of nuisance odour. Where a site is within 800m it will not necessarily experience a significant level of nuisance odour, with the size of the works, and the treatment processes that it contains affecting the actual odour. An odour assessment as part of the planning process is recommended. Severn Trent Water and United Utilities recommend an odour assessment is carried out on these sites, and the cost of this should be borne by the developer.

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.

8.6 Recommendations

Table 8.2 Recommendations from the odour section

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

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[46] (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"[47] 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.

The overall WFD classification of a water body is based on a wide range of ecological and chemical classifications. This assessment focuses on three physico-chemical quality elements; Biochemical Oxygen Demand (BOD), Ammonia, and Phosphate.

BOD – Biochemical Oxygen Demand

BOD is a measure of how much organic material – sewage, sewage effluent or industrial effluent – is present in a river. It is defined as the amount of oxygen taken up by micro-organisms (principally bacteria) in decomposing the organic material in a water sample stored in darkness for 5 days at 20°C. Water with a high BOD has a low level of dissolved oxygen. A low oxygen content can have an adverse impact on aquatic life.

This determinand is frequently not recorded for a river reach.

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46 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

47 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

Ammonia

Nitrogen is an essential nutrient required by all plants and animals for the formation of amino acids. In its molecular form nitrogen cannot be used by most aquatic plants, and so it is converted into other forms. One such form is ammonia (NH3). This may then be oxidized by bacteria into nitrate (NO3) or nitrite (NO2). Ammonia may be present in water in either the unionized form NH3 or the ionized form NH4. Taken together these forms care called Total Ammonia Nitrogen.

Although ammonia is a nutrient, in high concentrations it can be toxic to aquatic life, in particular fish, affecting hatching and growth rates.

The main sources in rivers include agricultural sources, (fertilizer and livestock waste), residential sources (ammonia containing cleaning products and septic tank leakages), industrial processes and wastewater treatment works.

Phosphate

Phosphorus is a plant nutrient and elevated concentrations in rivers can lead to accelerated plant growth of algae and other plants. Its impact on the composition and abundance of plant species can have adverse implications for other aspects of water quality, such as oxygen levels. These changes can cause undesirable disturbances to other aquatic life such as invertebrates and fish.

Phosphorus (P) occurs in rivers mainly as Phosphate (PO4), which are divided into Orthophosphates (reactive phosphates), and organic Phosphates.

Orthophosphates are the main constituent in fertilizers used in agriculture and domestic gardens and provide a good estimation of the amount of phosphorus available for algae and plant growth and is the form of phosphorus that is most readily utilized by plants.

Organic phosphates are formed primarily by biological processes and enter sewage via human waste and food residues. Organic phosphates can be formed from orthophosphates in biological treatment processes or by receiving water biota.

Although it is phosphorus in the form of phosphates that is measured as a pollutant, the term phosphorus is often used in water quality work to represent the total phosphorus containing pollutants.

9.2 Methodology

A qualitative assessment was conducted using available data on WFD Cycle 2 status for the receiving watercourse, forecast growth for each WwTW and existing water quality assessments conducted on each WwTW where available.

9.3 Results

9.3.1 Overview

Figure 9.1 shows the WFD status of the waterbodies within Newcastle-under-Lyme and Stoke-on-Trent.

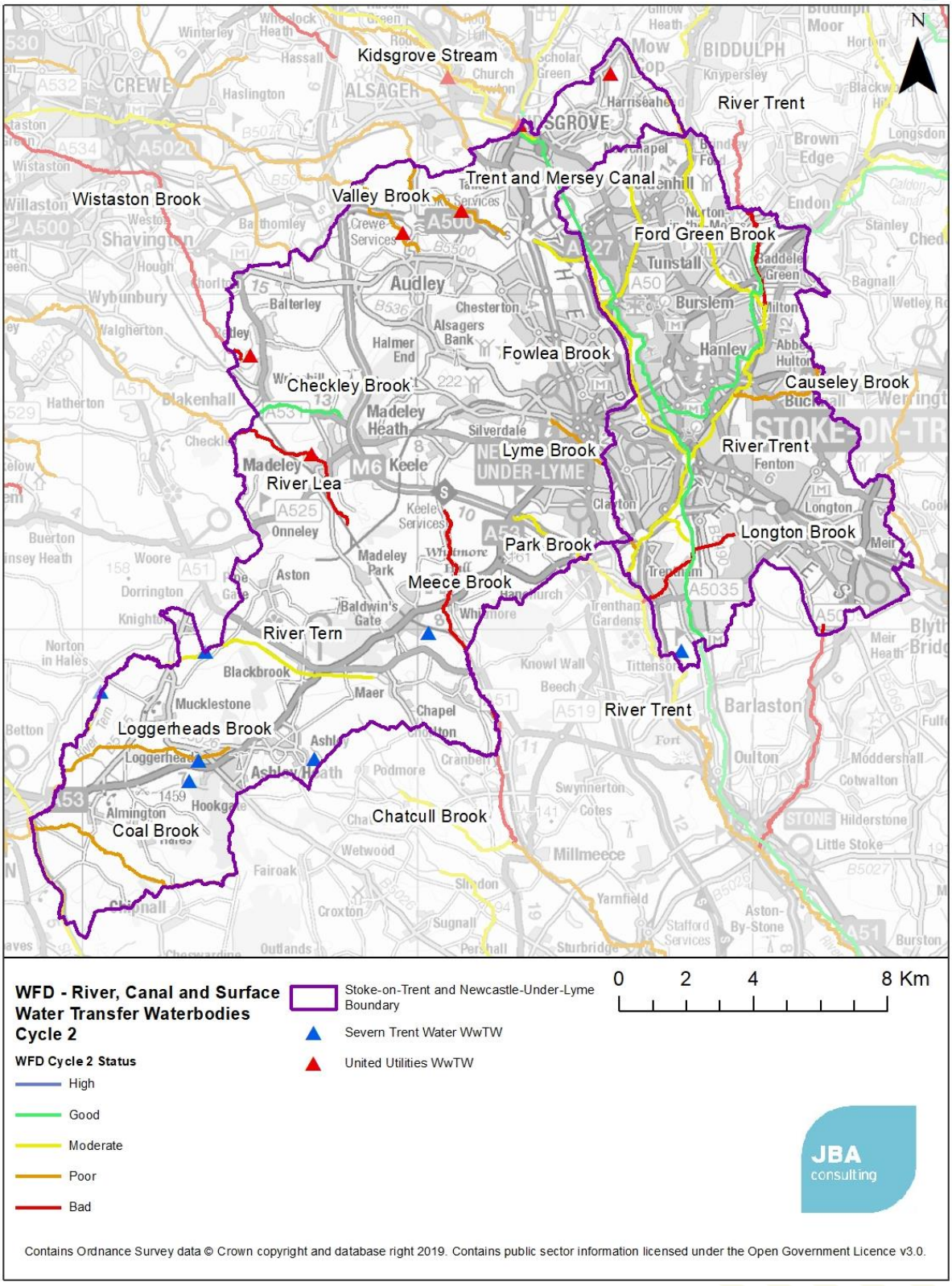

Figure 9.1 WFD status for waterbodies in the study area

9.3.2 Strongford WwTW

Strongford WwTW is located in the south of Stoke-on-Trent and discharges into a small channel which is a tributary to the Trent (from Fowlea Brook to Tittensor). The watercourse has an overall "moderate" status, and the reasons for not achieving good status for phosphate are stated as sewage discharge, and diffuse pollution from urbanisation and agriculture. The draft STW DWMP notes that Stoke-on-Trent is situated close to the source of the River Trent and its tributaries which means that the watercourses in the area are generally smaller and more sensitive than you would normally find in a large urban conurbation. An investigation is ongoing into the impact of CSO operations in this catchment on achieving WFD river water quality standards which has shown that work is required to reduce the spill frequency and volume from a selection of CSOs.

A quality upgrade project is planned to meet new Phosphorus and BOD limits by December 2024, costing around £7m.

Table 9.1 WFD classifications for River Trent

Trent (Fowlea Brook to Tittensor)	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Moderate	Not assessed	Good	Moderate
Objectives	Good by 2027	N/A	Good by 2015	Good by 2027

Table 9.2 summarises the growth that may be served by Strongford WwTW over the plan period. The majority of the growth will come from Stoke-on-Trent with additional growth from Staffordshire Moorlands District Council and Stafford Borough Council.

Table 9.2 Growth identified impacting Strongford WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within SoT/NuL**	**Within Neighbouring LPAs**	**Total**
8,999	120	9,119	1,508,374	0	1,508,374

9.3.3 Ashley WwTW

Ashley WwTW is located in the south of Newcastle-under-Lyme borough near the village of Ashley. It discharges to the Chatcull Brook, a tributary of the Meece Brook. This waterbody was classified as having a moderate classification, overall, in the Cycle 2 of the Water Framework Directive (Table 9.3). Reasons for not achieving good status for phosphate are stated as sewage discharge, and diffuse pollution from agriculture. By March 2025 the BOD limit at Ashley WwTW will be tightened, however STW do not anticipate this requiring any investment as the site is currently performing adequately to meet this new limit.

Table 9.3 WFD classification of Chatcull Brook

Chatcull Brook	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Moderate	Not assessed	Good	Poor
Objectives	Good by 2027	N/A	Good by 2015	Good by 2015

Table 9.4 Growth identified impacting Ashley WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within SoT/NuL**	**Within Neighbouring LPAs**	**Total**
1	0	1	0	0	0

9.4 Audley WwTW

Audley WwTW is in the north of Newcastle-under-Lyme and is served by Audley Brook which is a tributary to the Valley Brook. Cycle 2 of the Water Framework Directive did not include the Audley Brook and so the condition of Valley Brook has been considered. Overall, this watercourse has a "poor" status, with the reasons for not achieving good status stated as sewage discharge, and diffuse pollution from agriculture and urbanisation.

Table 9.5 WFD classification of Valley Brook

Valley Brook	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Poor	Not assessed	High	Moderate
Objectives	Good by 2027	N/A	Good by 2015	Good by 2027

Table 9.6 summarises the growth that may be served by Audley WwTW over the plan period. The entirety of the growth will come from Newcastle-under-Lyme.

Table 9.6 Growth identified impacting Audley WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within SoT/NuL**	**Within Neighbouring LPAs**	**Total**
28	0	8	70	0	70

9.4.1 Baldwins Gate WwTW

Baldwins Gate is a WwTW in the south east of Newcastle-under-Lyme borough and discharges to the tributary of the Meece Brook. The specific tributary is not named and so the condition of the Meece Brook has been considered. This waterbody was classified overall as Bad in the WFD Cycle 2 classification (Table 9.3). Reasons for not achieving good status for phosphate are stated as sewage discharge, and diffuse pollution from agriculture. The Bad overall status is being driven by the bad status for fish (land drainage, barriers / ecological discontinuity, and diffuse pollution from agriculture).

A quality upgrade project costing £1m is underway to meet a new Phosphorus limit and is due for completion late 2019.

Table 9.7 WFD classification of Meece Brook

Meece Brook	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Bad	Not assessed	High	Moderate
Objectives	Good by 2027	N/A	Good by 2015	Good by 2027

Table 9.8 summarises the growth that may be served by Baldwins Gate WwTW over the plan period. The entirety of the growth will come from Newcastle-under-Lyme.

Table 9.8 Growth identified impacting Baldwin's Gate WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within SoT/NuL**	**Within Neighbouring LPAs**	**Total**
207	0	207	0	0	0

9.4.2 Checkley WwTW

Checkley WwTW is outside of the study area, south west of Stoke-on-Trent, however, will serve development. It discharges to the River Tean which has an overall status of "poor" in Cycle 2 of the Water Framework Directive (2016). The reasons for not achieving good status for ammonia and phosphate were stated as livestock.

Table 9.9 WFD classifications for River Tean

River Tean	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Poor	Not assessed	Poor	Poor
Objectives	Good by 2027	N/A	Good by 2021	Good by 2027

Table 9.10 summarises the growth that may be served by Checkley WwTW over the plan period. Only part of the growth will originate within Newcastle-under-Lyme, with the majority associated with Staffordshire Moorlands District.

Table 9.10 Growth identified impacting Checkley WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	Within Neighbouring LPAs	Total	Within NuL/SoT	Within Neighbouring LPAs	Total
25	1887	1912	32,760	109,150	141,910

9.4.3 Loggerheads Sanatorium and Loggerheads Village WwTW

Loggerheads Sanatorium WwTW and Loggerheads Village WwTW are found in the south west of Newcastle-under-Lyme Borough and discharge to the Loggerheads Brook. This watercourse has an overall "poor" status (defined in the 2016 Cycle 2 Water Framework Directive). Reasons for not achieving good status for phosphate are stated as sewage discharge. £4.5m of investment is planned in these two WwTW in order to meet new effluent limits by December 2024. STW are currently proposing to transfer flows from Loggerheads Village to Loggerheads Sanatorium and to upgrade Loggerheads Sanatorium WwTW to meet the new quality permits and to accommodate growth.

Table 9.11 WFD classifications for Loggerheads Brook

Loggerheads Brook	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Poor	Not assessed	Moderate	Bad
Objectives	Good by 2027	N/A	Good by 2027	Good by 2027

Table 9.12 summarises the growth that may be served by Loggerheads Sanatorium WwTW over the plan period. The entirety of the growth will come from Newcastle-under-Lyme.

Table 9.12 Growth identified impacting Loggerheads Sanatorium WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within NuL/SoT**	**Within Neighbouring LPAs**	**Total**
116	0	116	0	0	0

Table 9.13 summarises the growth that may be served by Loggerheads Village WwTW over the plan period. The entirety of growth will come from Newcastle-under-Lyme.

Table 9.13 Growth identified impacting Loggerheads Village WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within NuL/SoT**	**Within Neighbouring LPAs**	**Total**
407	0	407	175	0	175

9.4.4 Madely WwTW

Madeley WwTW is found in the northern area of Newcastle-under-Lyme and discharges to the Lea. In the 2016 Cycle 2 of the Water Framework Directive, the watercourse received an overall "bad" status. This status is driven by the Bad classification for Macrophytes and Phytobenthos. The reasons for not achieving good status for phosphate are stated as sewage discharge and farm/site infrastructure, and diffuse pollution from agriculture (poor nutrient management, riparian/in-river activities such as bankside erosion, and livestock.

Table 9.14 WFD classifications for River Lea

Lea	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Bad	Not assessed	High	Poor
Objectives	Good by 2027	N/A	Good by 2015	Good by 2027

Table 9.15 summarises the growth that may be served by Madley WwTW over the plan period. The entirety of the growth will come from Newcastle-under-Lyme.

Table 9.15 Growth identified impacting Madley WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within NuL/SoT**	**Within Neighbouring LPAs**	**Total**
447	0	407	0	0	0

9.4.5 Kidsgrove WwTW

Kidsgrove WwTW is in the north of Newcastle-under-Lyme and discharges to the Kidsgrove Stream. Table 9.16 shows that, in 2016, the Water Framework Directive identified the stream as having an overall "poor" status with the reasons for not achieving good status stated as sewage discharge for phosphate and ammonia, and diffuse pollution form urbanisation and agriculture for phosphate. The objective for phosphate was to achieve bad status by 2015 as there is no "no known technical solution" available.

Table 9.16 WFD classification for Kidsgrove Stream

Kidsgrove Stream	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Poor	Good in 2015 – not recorded in 2016	Good	Poor
Objectives	Moderate by 2015	Good by 2015	Good by 2015	Bad by 2015

Table 9.17 summarises the growth that may be served by Kidsgrove WwTW over the plan period. The entirety of the growth will come from Newcastle-under-Lyme.

Table 9.17 Growth identified impacting Kidsgrove WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within NuL/SoT**	**Within Neighbouring LPAs**	**Total**
399	0	399	201,727	0	201,727

9.4.6 Betley WwTW

Betley WwTW is located in the north east of Newcastle-under-Lyme, whereby it discharges to the Wistaston Brook. This watercourse received a "bad" status in 2016 driven by the bad status for fish. Reasons for not achieving good status for phosphate are stated as sewage discharge and diffuse pollution from urbanisation and agriculture (livestock, poor soil management, poor pesticide management and nutrient management).

Table 9.18 WFD classification for Wistaston Brook

Wistaston Brook	Overall Water Body	BOD	Ammonia	Phosphate
2016 WFD Cycle 2 Classification	Bad	High	High	Poor
Objectives	Good by 2027	Good by 2015	Good by 2015	Good by 2027

Table 9.19 summarises the growth that may be served by Betley WwTW over the plan period. The entirety of the growth will come from Newcastle-under-Lyme.

Table 9.19 Growth identified impacting Betley WwTW

Housing Growth over Plan Period (housing units)			Employment Growth over Plan Period (floor space m2)		
Within NuL/SoT	**Within Neighbouring LPAs**	**Total**	**Within NuL/SoT**	**Within Neighbouring LPAs**	**Total**
12	0	12	0	0	0

9.4.7 Other WwTWs within Stoke-on-Trent and Newcastle-under-Lyme

Severn Trent Water have two additional WwTWs along the eastern boundary of Newcastle-under-Lyme, however these are not predicted to serve any new development sites. Both Norton-in-Hales WwTW and Woore WwTW discharge to the River Tern (source to confluence with Loggerheads Brook). The Water Framework Directive classified this watercourse as having a "moderate" status. This river is not used as a discharge point for any of the previously mentioned WwTWs, however it does form a confluence with Loggerheads Brook which serves Loggerheads Sanatorium and Loggerheads Village WwTWs.

United Utilities also have three additional WwTWs in the north of Newcastle-Under-Lyme, however these are also not expected to serve any new development sites. Lawton Gate WwTW is slightly beyond the Newcastle-under-Lyme border, however, also discharges to the Kidsgrove Stream (as with Kidsgrove WwTW). Fords Lane Mow Cop WwTW discharges into a tributary to the Wheelock which is classified as a "poor" watercourse. Dunkirk WwTW discharges into the Valley Brook, which is also the discharge point for Audley WwTW.

9.5 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 0 and 11.3.5.
- 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.

9.6 Conclusions

The increased discharges at the WwTWs, serving growth across Newcastle-under-Lyme and Stoke-on-Trent, have the potential to impact the downstream water quality of receiving waterbodies. Further assessment of the impact upon water quality should be undertaken, for the above WwTWs, as part of a Phase 2 Outline Water Cycle Study. In particular, consideration should be paid to those which already have a 'poor' or 'bad' status and are forecast for increased growth.

9.7 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, which is typically modelled using SIMCAT. In instances where a watercourse only receives discharges from a single WwTW, these impacts can be assessed using the EA's River Quality Planning (RQP) tool. Where applicable water quality models will be updated using the most recent available data from the following sources:

- River flow – National River Flow Archive

- River quality – EA Water Quality Data Archive
- Effluent flow
- Baseline flow from STW and UU for their WwTWs
- Future growth scenario - additional flow from development from the growth forecast defined in Phase 1
- Effluent quality – EA Water quality data Archive

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 Webservice 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 Web Service[48]

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.

48 FEH Web Service © and database right NERC (CEH) 2015. All rights reserved Accessed online at: https://fehweb.ceh.ac.uk/ Catchment descriptors extracted on: 21/01/2019

10.3 Results

Table 10.1 reports the additional flow from each WwTW as a percentage of the Q30 and Q100 peak flow. This shows 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.

Table 10.1 Summary of DWF increase as a percentage of Q30 and Q100 peak flow

WwTW	FEH Stat Q30 (m3/s)	FEH Stat Q100 (m3/s)	Additional Average DWF (Ml/d)	Additional Flow (m3/s)	Flow increase % Q30	Flow increase % Q100
Ashley	1.27	1.7	0.00	0.00	0.00%	0.00%
Audley	3.63	4.94	0.01	0.00	0.00%	0.00%
Baldwins Gate	0.09	0.12	0.03	0.00	0.42%	0.31%
Betley	0.11	0.15	0.01	0.00	0.06%	0.04%
Checkley	20.96	27.32	0.96	0.01	0.05%	0.04%
Kidsgrove	0.45	0.6	0.84	0.01	2.16%	1.62%
Loggerheads Sanatorium	0.16	0.21	0.03	0.00	0.23%	0.18%
Loggerheads Village	0.26	0.35	0.11	0.00	0.51%	0.38%
Madley	5.06	6.52	0.12	0.00	0.03%	0.02%
Strongford	96.14	112.83	10.61	0.12	0.13%	0.11%

10.4 Conclusions

The impact of increased effluent flows is not predicted to have a significant impact upon flood risk in any of the receiving watercourses.

Increases in discharges of treated wastewater effluent as a result of growth are not expected to significantly increase flood risk. No further assessment is recommended in a Phase 2 WCS.

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 UU	During design of WwTW upgrades

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 source 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 of 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 river beds 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). The definition of these sites is contained in section 3.4.2.

There are no SACs or SPAs in the study area, and only one SAC within 10km (West Midland Mosses) which is also designated as a SSSI (Wybunbury Moss).

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. SSSIs associated with the study area are shown in Figure 11.1 below.

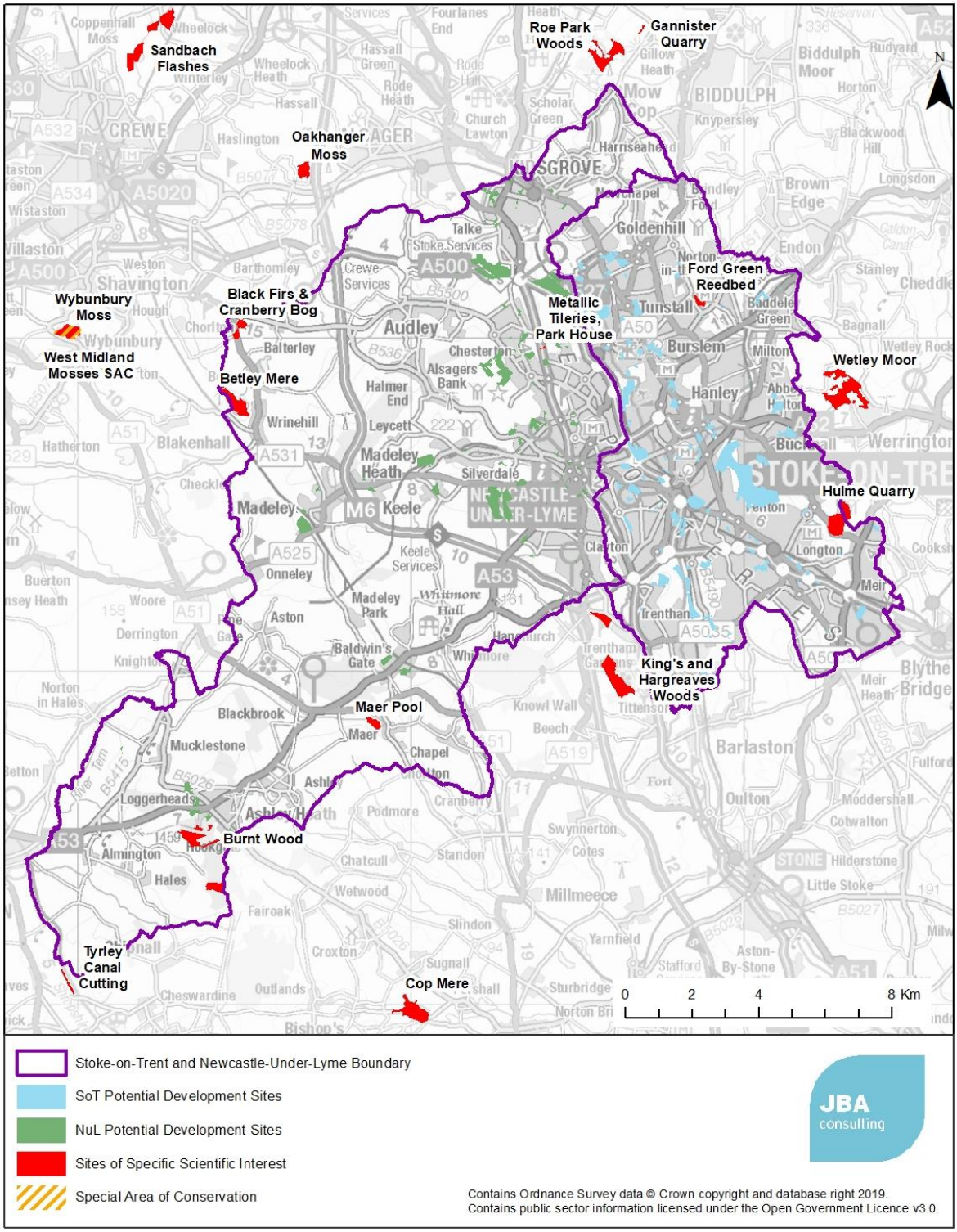

Figure 11.1 Sites with environmental designations

11.3 Point source pollution

The main sources of point source pollution in the study area are the WwTWs. The effect of additional wastewater flows on water quality is assessed in section9, and a summary of their potential impact following a source-pathway-receptor approach is presented in Table 11.1. 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.

Table 11.1 WwTW locations relative to environmental designations

Source	Pathway	Receptor	Distance downstream (km)	Potential Impact
Betley WwTW	Unnamed ordinary watercourse (tributary to Mere Gutter)	Betley Mere SSSI	WwTW adjacent to SSSI and river passes through area	The area consists of lowland neutral grassland and so changes to the water quality in the area would potentially impact the health of the habitats. The health of the waterbody, flowing through the SSSI, is also directly affected. The most recent SSSI assessment notes the poor quality of the waterbody resulting in the lack of life. The WFD Cycle 2 also classifies the Mere Gutter as 'Bad'. As a result of this classification, this channel can experience no further deterioration. This should be considered as any additional inputs from the WwTW, although predicted to be very small, will have further negative impacts upon water quality.
Fords Lane Mow Cop STW, Kidsgrove WwTW, Lawton Gate STW	Kidsgrove Stream, Wheelock	Sandbach Flashes	8-13km	This SSSI has both a physiological and biological importance. Some of the pools have high salinities which are extremely rare (inland) and are associated with unusual groups of plants and animals. The pools are surrounded by grasslands, and Fodens Flash is surrounded by particularly important wet woodland. Due to the important chemistry of the landscape here, any changed to quantity/quality as a

				result of the WwTW's will be notable.
Madeley WwTW	Lea	Wybunbury Moss	9km	A nationally important series of open water and peatland sites. This site is 400 from the river, and the risk from Madeley is likely to be negligible.

11.3.1 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. 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. A probable impact score of low, medium or high was applied to each site to provide an indication of the likely impact prior to any mitigation being applied. It should be noted that this is a desk-based assessment to highlight risk and should not replace the appropriate level assessment on a site by site basis. Other development sites not identified in the table, may still contribute to a cumulative impact within the catchment and so management of water quality of surface runoff from these sites should still be considered.

Table 11.2 Potential sources of diffuse pollution and receptors

Source	Pathway	Receptor	Distance (km)	Potential Impact
245 693	Surface water pathway to SSSI identified using RoFSW layer	Ford Green Reedbed SSSI (SJ886511)	0.8-1km	This SSSI is classified as a 'fen, marsh and swamp' and is located within the Whitfield Nature Reserve. The reedbed provides an important migratory site swallows and so maintenance of conditions is key. The maintenance of good water and sediment quality are essential to maintaining a healthy lake system. Management should minimise pollution of the river from point and diffuse sources, including discharges of domestic and trade effluent, and runoff from urban land. **Impact possible - the inclusion of SuDS and appropriate management of runoff should limit pollution risk.**
417 210 214 284 9783 NL40 NCFS19 15/00583/FUL	Surface water pathway to SSSI identified using RoFSW layer	King's and Hargreaves Woods	1.5-5km	This SSSI is an area of broadleaved, mixed and yew woodland. The recent survey (December 2018) stated the site was made up of ancient and semi-natural woodland including veteran trees. Consideration of runoff is necessary as the trees could be disrupted due to changes in the soils (caused by pollutants or change in quantity) as well as changes to the drainage. **Impact possible - the inclusion of SuDS and appropriate management of runoff should limit pollution risk.**

11.3.2

11.3.3 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[49] 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 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 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.

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49 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: 23/01/2019

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[50] for sustainable drainage systems – these should be used in conjunction with the NPPF and PPG
- and use a SuDS management treatment train (see sections 0 to 11.3.6)

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

50 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: 23/01/2019

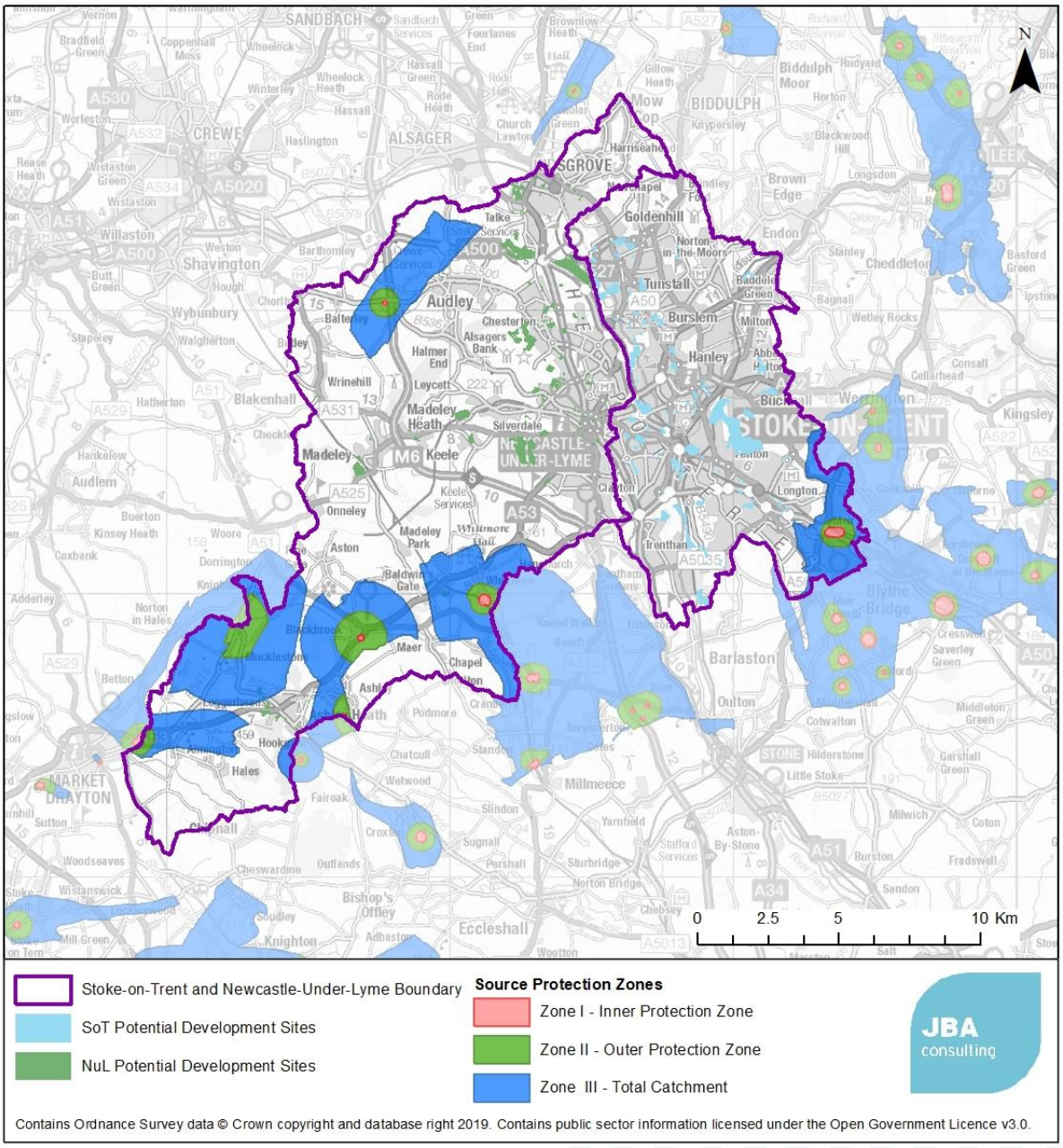

Figure 11.2 Source protection zones in the study area

Table 11.3 Development sites within Source Protection Zones

Source Protection Zone	Sites	Management advice / EA position statement
Zone 1 – Inner Protection Zone	No sites within.	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	No sites within.	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.
Zone 3 – Total Catchment	LW12, 18/00301/FUL, 18/00294/FUL, LW33, LW36	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.

11.3.4 Surface Water Drainage and SuDS

Since April 2015[51], 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).

As Lead Local Flood Authorities (LLFA), Stoke-on-Trent City Council and Staffordshire County Council (LLFA for Newcastle-under-Lyme) are statutory consultees 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[52]. Stoke on Trent City Council do not yet provide local SuDS guidance; however, Staffordshire Council have the Sustainable Drainage Systems (SuDS) Handbook[53]. The CIRIA C753 SuDS Manual[54] provides the industry best practice guidance for design and management of SuDS.

Severn Trent Water are currently working alongside the Environment Agency, Stoke-on-Trent City Council and charity Groundworks, to support a programme of retrofitting SuDS across Stoke-on-Trent. The exact scope of the project is still being developed, but the aims are aligned with STWs desire to separate and manage surface water across the city in a more sustainable way.

11.3.5 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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51 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: 23/01/2019

52 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: 23/01/20189

53 Sustainable Drainage Systems (SuDS) Handbook, Staffordshire County Council (2017). Accessed online at https://www.staffordshire.gov.uk/environment/Flood-Risk-Management/SuDS-Handbook.pdf on: 24/01/2019

54 CIRIA Report C753 The SuDS Manual, CIRIA (2015). Accessed online at: https://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx on: 23/01/2019

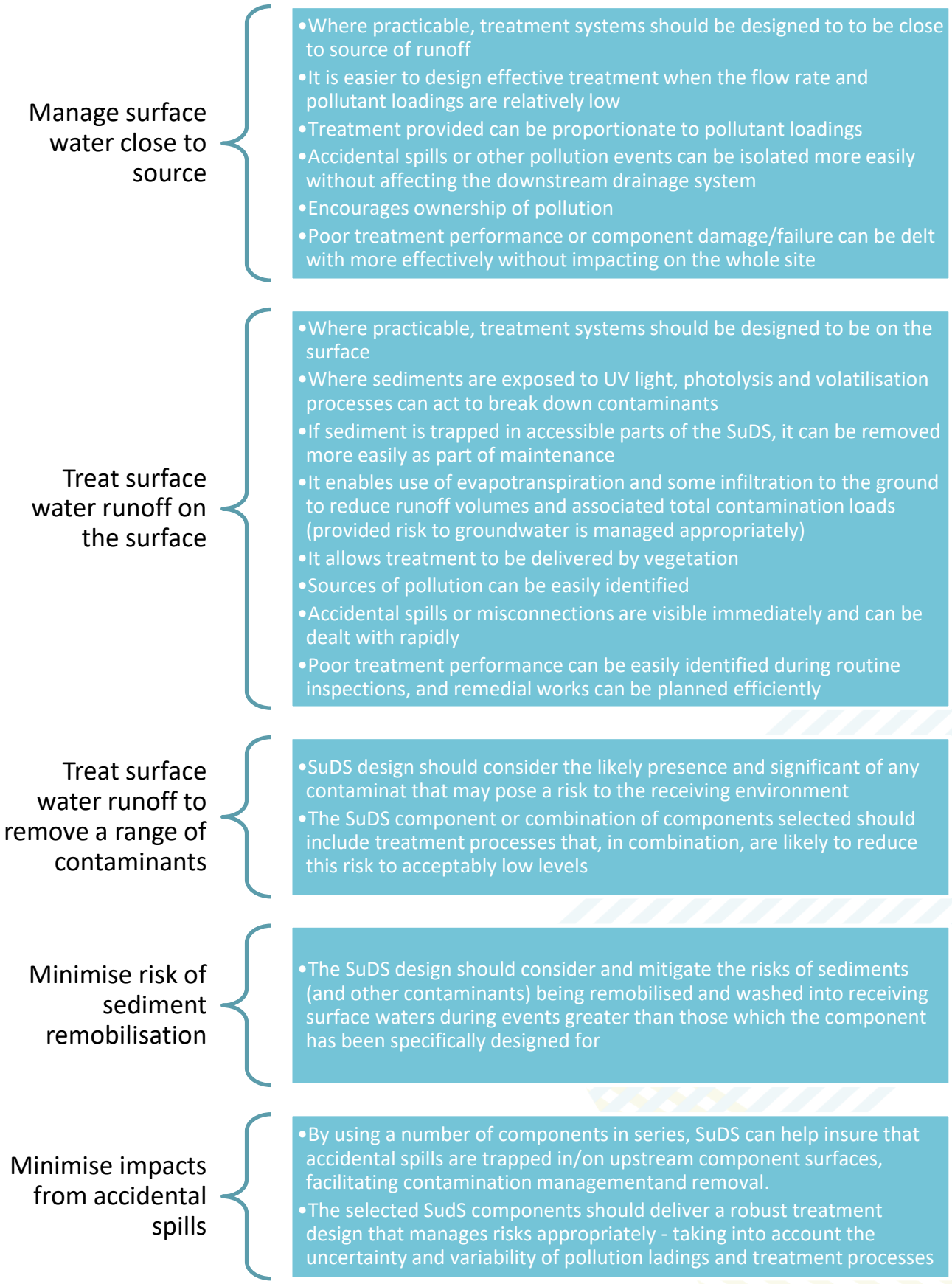

Figure 11.3 Considerations for SuDS design for water quality

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 practise 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.

11.3.6 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 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.

11.4 Conclusions

- There are numerous SSSIs within Stoke-on-Trent and Newcastle-under-Lyme which should be carefully considered in future plan-making.
- WwTWs serving growth within Stoke-on-Trent and Newcastle-under-Lyme are the most 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 0). A water quality impact assessment is recommended in a Phase 2 water cycle study to understand this further.
- Development sites within Stoke-on-Trent and Newcastle-under-Lyme 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.

11.5 Recommendations

Table 11.4 Recommendations from environmental constraints and opportunities section

Action	Responsibility	Timescale
The Local Plan should include policies that require all development sites, where a pathway exists for surface water to a site with an environmental designation, to adopt proportionate SuDS measures to manage water quality of surface runoff.	NuL SoT	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). The Staffordshire SuDS Handbook[55] provides a useful source of information on suitable SuDS schemes.	NuL SoT	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.	SoT NuL STW UU 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.	NuL SoT Developers STW UU	Ongoing

55 Staffordshire SuDS Handbook, Staffordshire Country Council (2017). Accessed online at: https://www.staffordshire.gov.uk/environment/Flood-Risk-Management/Documents/SuDS-Handbook.pdf on 15/08/2019

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 completed 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 Newcastle-under-Lyme and Stoke-on-Trent area wide basis; the available climate models are generally insufficiently refined to draw different conclusions for parts of the study area 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 Wastewater collection and treatment

Both United Utilities and Severn Trent Water have published risk assessments[56,57] for 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 each company'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. Severn Trent Water rated the North Staffordshire WRZ vulnerability as 'low'.

56 Adaptation Progress Report 2015. United Utilities (2015). Accessed online at: https://www.unitedutilities.com/globalassets/z_corporate-site/cr-images/cr-pdfs/adaptation-progress-report-uu.pdf
57 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

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 WRMP. Vulnerability assessments were carried out following the methodology described in the EA's WRPG (2012).	
Water supply infrastructure	Medium - some increased demand in hot weather	Yes - quantitative assessment within the WRMP.	
Wastewater Collection	High - Intense summer rainfall and higher winter rainfall increases flood risk	Yes – qualitative assessment in climate change adaptation reports by United Utilities and Severn Trent Water. No site-level investigations have been completed.	
Wastewater treatment	Medium - Increased winter flows and more extreme weather events reduces flow headroom	Yes – qualitative assessment in the Severn Trent Water and United Utilities climate change adaptation reports. No site-level assessment was completed.	
WwTW odour	Medium – higher temperatures will exacerbate existing odour control issues.	Severn Trent Water have not considered odour in their climate adaptation plan. United Utilities will invest in sites identified in the odour management plan.	
Water quality	Nutrients: High Sanitary determinands: Medium to High	Qualitative assessments have been included in the climate change adaptation policy papers from both Severn Trent Water and United Utilities.	
Flooding from increased WwTW discharge	Low	Not Assessed.	

12.3 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 United Utilities or 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, UU, STW, NuL and SoT	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.	NuL, SoT 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 of phase 1 scoping study

Table 13.1 Summary of conclusions and requirements for Phase 2 study

Assessment	Conclusion	Requirement for Phase 2 Study
Water resources	Within the study area, there is enough water resource to supply all the proposed developments. There is a plan to address the supply-demand deficit within the North Satffordshire Water Resource Zone, 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	No limitations on the provision of water supply infrastructure were identified by STW. A site by site assessment has not been completed as part of this study. Individual sites should be assessed as part of the planning process, and early engagement between developers and STW is recommended to ensure that the water supply network has sufficient capacity locally to accommodate the additional demand without detriment to existing customers.	No further assessment 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. Early engagement with Severn Trent Water and United Utilities is required, and further modelling of the network may be required at the planning application stage. This is particularly true for United Utilities whereby surface water drainage systems have not yet been modelled. Furthermore, in both STW and UU 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.	No further assessment of the wastewater network is recommended as part of a Phase 2 Outline study.

Wastewater Treatment Works Flow Permit assessment	Flow permit assessments were carried out at all of the WwTW that are expected to serve growth in the Local Plan period. All of the considered WwTWs have sufficient capacity to provide for the proposed growth, with the exception of Baldwins Gate (Severn Trent Water). Smaller works in the study area (Betley, Loggerheads Sanitorium and Loggerheads Village) can accommodate the planned growth but have minimum headroom to accommodate a higher level of growth than is currently planned.	No further assessment of the wastewater treatment capacity is recommended as part of a Phase 2 Outline study.
Water quality impact assessment	The increased discharges at the WwTWs, serving growth across Newcastle-under-Lyme and Stoke-on-Trent, have the potential to impact the downstream water quality of receiving waterbodies.	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	16 sites are within 800m of a WwTW and may be at risk of nuisance odour. Where a site is within 800m it will not necessarily experience a significant level of nuisance odour, with the size of the works, and the treatment processes that it contains affecting the actual odour. An odour assessment as part of the planning process is recommended. Severn Trent Water and United Utilities recommend an odour assessment is carried out on these sites, and the cost of this should be borne by the developer.	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 not predicted to have a significant impact upon flood risk in any of the receiving watercourses.	Increases in discharges of treated wastewater effluent as a result of growth are not expected to significantly increase flood risk. No further

		assessment is recommended in a Phase 2 WCS.
Environmental Constraints and Opportunities	There are numerous SSSIs within Stoke-on-Trent and Newcastle-under-Lyme which should be carefully considered in future plan-making. WwTWs serving growth within Stoke-on-Trent and Newcastle-under-Lyme are the most 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 Stoke-on-Trent and Newcastle-under-Lyme 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.	Water Quality modelling should be undertaken as part of Phase 2 Outline Study. No further assessment of Environmental Constraints is recommended as part of a Phase 2 study.

13.2 Recommendations

Table 13.2 below summarises the recommendations from each section of the report.

Table 13.2 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 emerging 2019 WRMP.	STW	Ongoing
	Provide yearly profiles of projected housing growth to water companies to inform the WRMP.	NuL / SoT	Annually
	Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Practice Guidance[58] in water-stressed areas and use the BREEAM standard to require percentage improvement over baseline building water consumption of at least 12.5%.	NuL / SoT	In Local Plan
Water supply	Undertake network modelling to ensure adequate provision of water supply is feasible	STW NuL SoT	As part of the planning process
	NuL, SoT and Developers should engage early with STW to ensure infrastructure is in place prior to occupation.	NuL SoT STW Developers	Ongoing
Wastewater collection	Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker	NuL SoT UU 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	STW, UU and Developers	Ongoing

58 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
	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. This is particularly the case for developments to be served by Baldwin's Gate WwTW where flows may need to be pumped into the adjacent Strongford catchment.	NuL SoT STW	Ongoing
	Provide Annual Monitoring Reports to STW and UU detailing projected housing growth in the Local Authority.	NuL SoT	Ongoing
	STW and UU to assess growth demands as part of their wastewater asset planning activities and feedback to the Councils if concerns arise.	STW UU NuL SoT	Ongoing
Odour	Consider odour risk in the sites identified to be potentially at risk from nuisance odour	NuL/SoT	Ongoing

Aspect	Action	Responsibility	Timescale
	Carry out an odour assessment for 'amber' assessed sites.	Site Developers	Ongoing
Flood Risk Management	Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	STW UU	During design of 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.	NuL SoT	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).	NuL SoT	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.	SoT NuL STW UU 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.	NuL SoT Developers	Ongoing

Appendices

A Site Tracker Spreadsheet

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