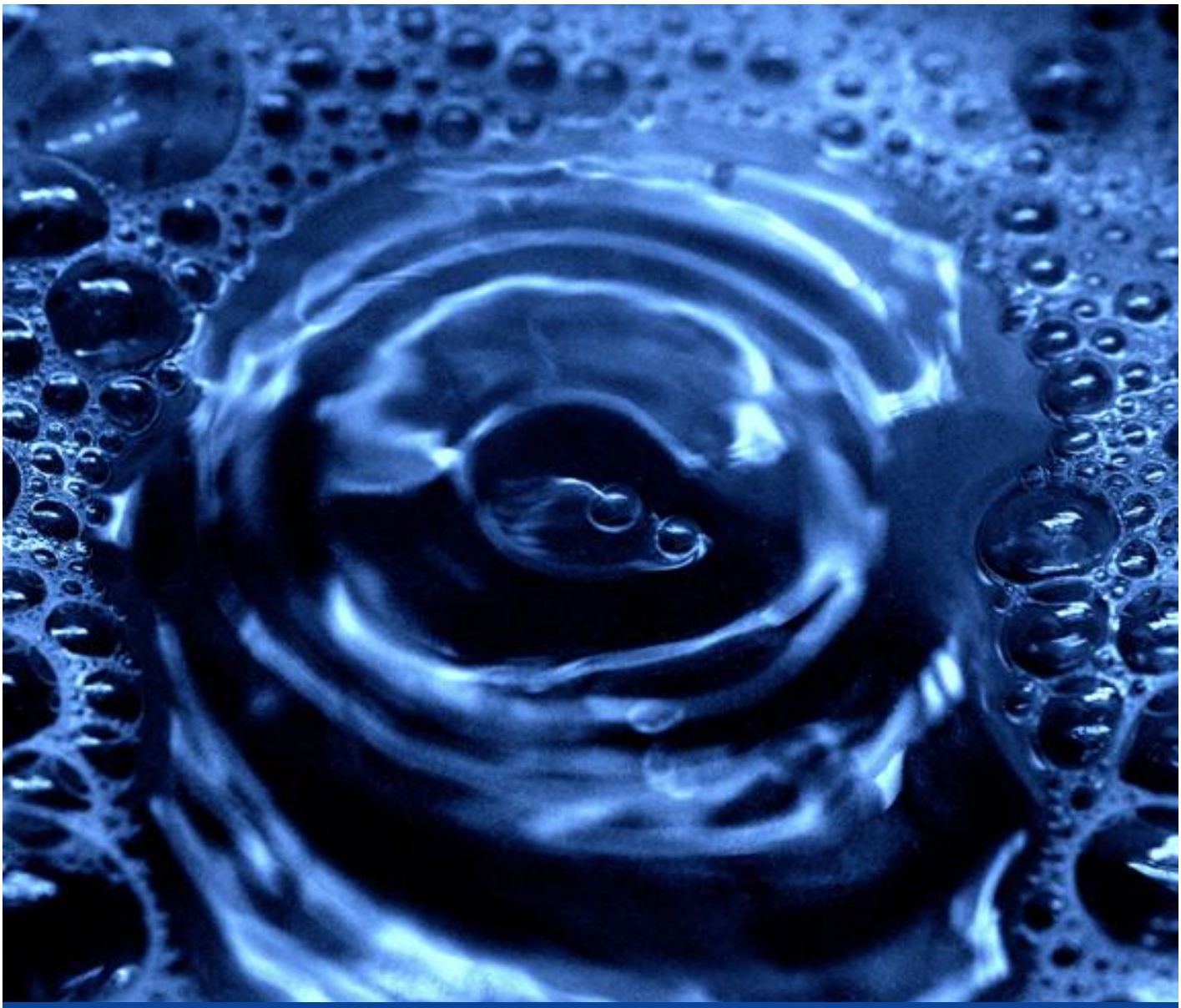

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WSP

EAST STAFFORDSHIRE WATER CYCLE STUDY

East Staffordshire Borough Council

30/10/2013

Confidentiality: Public

Quality Management

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
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EAST STAFFORDSHIRE WATER CYCLE STUDY

East Staffordshire Borough Council

30/10/2013

Client

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Executive Summary

This Water Cycle Study (WCS) for East Staffordshire Borough Council (the Council) assesses the constraints and requirements that will arise from the scale of proposed growth on the water infrastructure of the Borough as the result of the identified preferred strategy detailed in the Staffordshire Local Plan, Preferred Option (July 2012). It considers the following issues, addressing the constraints that they may pose to future development and discusses the improvements necessary to achieve the required level of development:

- Flood Risk;
- Water Resources and Water Supply;
- Wastewater Systems and Treatment; and
- Demand Management.

In addition, the WCS process also provides a benefit to the water companies by providing them with a more detailed indication of the potential development within the Borough. This will reduce the number of assumptions that are necessary in making decisions in relation to future planning of resource and infrastructure requirements.

This report focuses upon the development sites identified as the preferred option in the East Staffordshire Local Plan. This report assesses the flood risk, water supply and wastewater systems for each proposed site, assigning a traffic-light colour code to indicate the ease of development in each case. In addition water supply, wastewater treatment, river quality and demand management are discussed in more general terms.

The results of the current SFRAs have been used as the basis for the flood risk section of this report. Additional data has been obtained from South Staffordshire Water and Severn Trent Water.

The 2008 WCS produced by Royal Haskoning reviewed a large number of sites and was used to help form the Local Plan and identify the preferred option. This report updates details in relation to the preferred option to take into account policy changes, changes to water company resources. This report relies heavily on information from the original Royal Haskoning WCS and SFRA reports completed by Royal Haskoning in 2008. WSP cannot confirm the reliability of the information contained within the original Royal Haskoning reports.

Glossary

Asset Management Plans	Asset Management Planning is the process by which the Office of Water Services (Ofwat) determined the programme of water infrastructure and environmental improvements that are to be funded over a five year period and the water bill price rises that have to be allowed to fund this.
Brownfield site	Any land or site that has been previously developed.
Catchment	The area contributing flow or *runoff* to a particular point on a watercourse.
Climate change	Long-term variations in global temperature and weather patterns both natural and as a result of human activity, primarily greenhouse gas emissions.
Culvert	Covered channel or pipe that forms a *watercourse* below ground level.
Environment Agency	Government Agency charged with the protection of the environment
Flood defence	Flood defence infrastructure, such as flood walls and embankments, intended to protect an area against flooding, to a specified *standard of protection*.
Flood event	A flooding incident characterised by its level or *flow hydrograph.*
Flood Hazard	The potential risk to life and potential damage to property resulting from flooding
Flood probability	The estimated likelihood of a flood of given magnitude occurring or being exceeded in any specified time period.
Flood risk	An expression of the combination of the *flood probability* and the magnitude of the potential consequences of the *flood event*.
Flood risk assessment	A study to assess the risk of a site or area flooding, and to assess the impact that any changes or development in the site or area will have on *flood risk*.
Flood Zones	Flood Zones are defined in NPPF, they indicate land at risk by referring to the probability of flooding from river and sea, ignoring the presence of defences.
Floodplain	Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would flow but for the presence of flood defences where they exist.
Functional floodplain	Land where water has to flow or be stored in times of flood. It includes the land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes.
Greenfield	Previously undeveloped land
Groundwater	Water in the ground, usually referring to water in the saturated zone below the *water table*.
Groundwater flooding	Flooding caused by *groundwater* escaping from the ground when the *water table* rises to or above ground level.
Local planning	Body responsible for planning and controlling development,

authority	through the planning system.
Main River	A watercourse designated on a statutory map of Main rivers.
Mitigation measure	A generic term used in this guide to refer to an element of *development* design which may be used to manage some *risk* to the *development*, or to avoid an increase in *risk* elsewhere.
Ofwat	The Water Services Regulation Authority, which is the economic regulator of the water and sewerage industry in England and Wales.
Ordinary watercourse	A watercourse which is not a private drain and is not designated a *Main river*.
Regional Spatial Strategy	A document produced as part of the national planning system with the main purpose to provide a long term land use and transport planning framework for the Region. It guides the preparation of local authority development plans and local transport plans.
Return period	A term sometimes used to express *flood probability*. It refers to the estimated average time gap between floods of a given magnitude, but as such floods are likely to occur very irregularly, an expression of the *annual flood probability* is preferred.
Runoff	Water flow over the ground surface to the drainage system.
Sequential test	The Sequential Test refers to the application of this approach by Local Planning Authorities (LPAs) in determining land uses that are compatible with the level of flood risk at each allocated development site within a Local Authority area. Development should be directed to Flood Zone 1 wherever possible, and then sequentially to Flood Zones 2 and 3, and to the areas of least flood risk within Flood Zones 2 and 3, as identified by the Strategic Flood Risk Assessments (SFRA).
Standard of protection	The estimated probability of a design event occurring, or being exceeded, in any year. Thus it is the estimated probability of an event occurring which is more severe than those against which an area is protected by flood defences.
Strategic flood risk assessment	A study to examine flood risk issues on a sub-regional scale, typically for a river catchment or local authority area during the preparation of a development plan.
Sustainable drainage systems (SUDS)	A sequence of management practices and control structures, often referred to as SUDS, designed to drain surface water in a more sustainable manner. Typically, these techniques are used to attenuate rates of runoff from development sites.
Watercourse	Any natural or artificial channel that conveys surface water.
Water Cycle Strategy	Provides a plan and programme of Water Services Infrastructure implementation. It is determined through an assessment of the environment and infrastructure capacity for: water supply; sewage disposal; flood risk management; and surface water drainage.

Abbreviations

AMP	Asset Management Plan
mAOD	Metres Above Ordinary Datum
CAMS	Catchment Abstraction Management Strategy
CDWF	Consented Dry Weather Flow
CIRIA	Construction Industry Research and Information Association
DTM	Digital Terrain Model
EA	Environment Agency
LiDAR	Light Detection And Ranging – A type of DTM
LPA	Local Planning Authority
NPPF	National Planning Policy Framewor
OS	Ordnance Survey
RSS	Regional Spatial Strategy
SFRA	Strategic Flood Risk Assessment
SPZ	Source Protection Zone
SSSI	Sites of Special Scientific Interest
SSW	South Staffordshire Water
ST	Severn Trent Water
STW	Sewage Treatment Works
SuDS	Sustainable Drainage Systems
UWWTD	Urban Wastewater Treatment Directive
WCS	Water Cycle Strategy
WFD	Water Framework Directive

1 Introduction

1.1 General Overview

1.1.1 In July 2012 WSP Group UK (WSP) were appointed by the East Staffordshire Borough Council (hereafter "the Council") to produce an Outline Water Cycle Study (WCS).

1.1.2 The 2008 WCS produced by Royal Haskoning reviewed a large number of sites and was used to help form the Local Plan and identify the preferred option. This report updates details in relation to the final strategy detailed within the New Local Plan along with accounting for policy changes and changes to water company resources.

1.1.3 An updated Strategic Flood Risk Assessment for the Council has been prepared by WSP and is referred to here.

1.1.4 This Water Cycle Study (WCS) has been prepared by WSP as part of the evidence base to support the East Staffordshire Local Plan, Preferred Option (July 2012). The WCS has been completed as an outline study to consider the benefits, constraints and potential opportunities.

1.1.5 The WCS is needed to ensure that water supply, water quality, sewerage and flood risk management issues can be addressed to enable development whilst preserving and enhancing the water environment.

1.2 Scope

1.2.1 The Council needs to be in a position to respond with technical studies with regards to sites identified in the East Staffordshire Local Plan Preferred document. The WCS is one such study, required in order to assess the constraints and requirements that will arise from the scale of the proposed growth on the water infrastructure of the Borough.

1.3 Objectives of the Water Cycle Strategy

1.3.1 The WCS considers the following issues, addressing the constraints that they may pose to future development and discusses the improvements necessary to achieve the required level of development:

- Flood Risk;
- Water Resources;
- Water Supply;
- Wastewater Systems and Treatment; and
- Demand Management.

1.3.2 The WCS process also reduces the number of assumptions that are necessary in making decisions in relation to future planning of resource and infrastructure requirements.

1.3.3 This WCS has been produced in consultation with the Council, Severn Trent Water and South Staffordshire Water.

2 Data Collection and Methodology

2.1 Overview

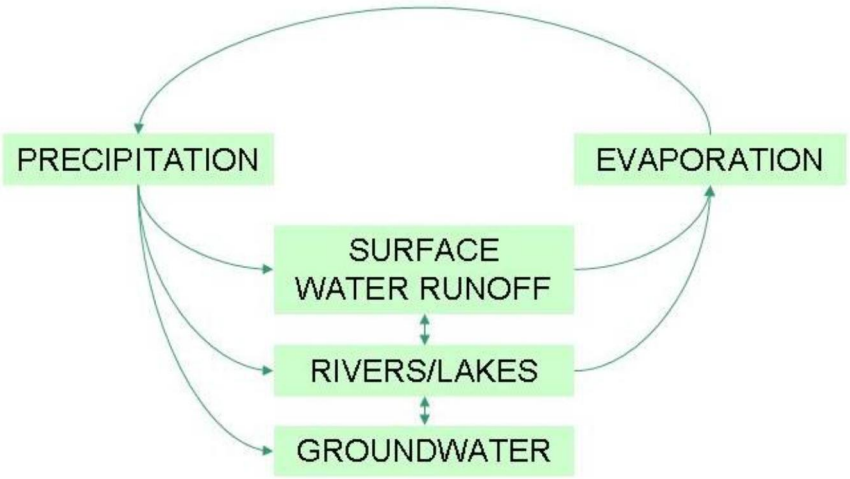
2.1.1 The development of this Scoping WCS has involved information from and consultation with the following stakeholders:

- East Staffordshire Borough Council
- South Staffordshire Water (SSW)
- Severn Trent Water (STW)

2.2 The Water Cycle

2.2.1 The natural water cycle is the process by which water is transported throughout a region. The process commences with some form of precipitation, be it rain, snow, sleet or hail. This is then intercepted by the ground and either travels overland through the process of surface runoff to rivers or lakes, or percolates through the surface and into underground water aquifers.

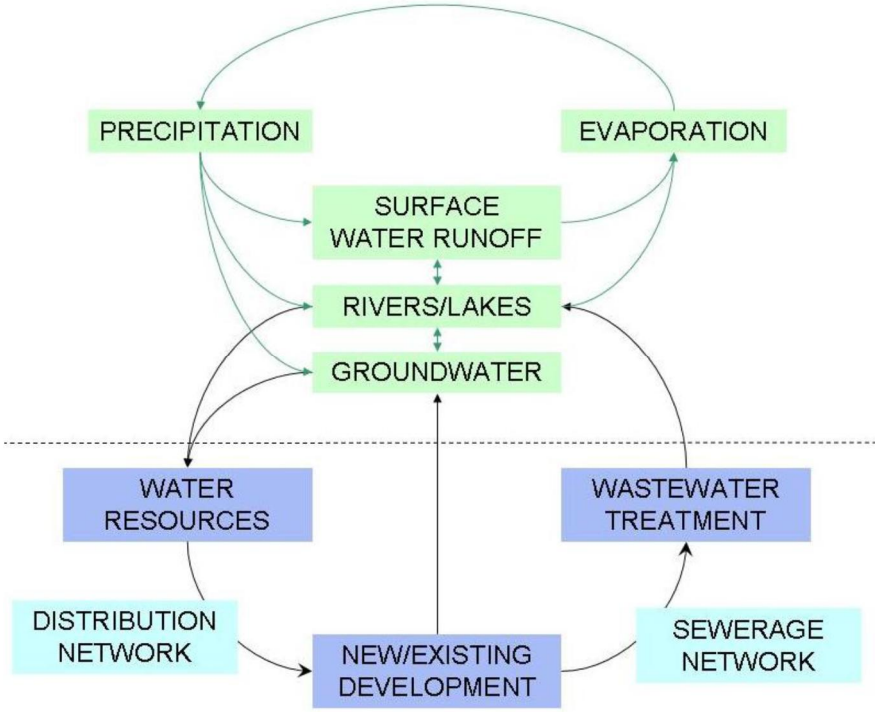
2.2.2 The presence of vegetation can also intercept this precipitation through the natural processes that plants carry out, such as transpiration and evaporation (termed evapotranspiration). The water will eventually travel through the catchment and will be evaporated back into the atmosphere along the way, or will enter the sea where a large amount will be evaporated from the surface. This evaporated water vapour then forms into clouds and falls as precipitation again to complete the cycle.



2.2.3 Urbanisation creates a number of interactions with the natural water cycle. For example, abstraction of surface water and groundwater sources for use by the local population, interacts with the water cycle by reducing the amount of water that is naturally held within the surface water features and aquifers.

2.2.4 Following treatment at a water treatment works (WTW) to make the water potable, this water is transported via trunk mains and distribution pipes to various residential, industrial and commercial uses in the area. The potable water is then used for a number of different purposes, which creates large volumes of wastewater.

2.2.5 The hard standing surfaces and buildings within the area reduce the amount of water that is able to percolate through the ground to recharge the groundwater aquifers. This therefore increases the rate of surface water runoff, which leads to flooding and increased peak discharges in rivers.



2.2.6 The wastewater from the developments is transported via the sewerage network to a wastewater treatment works (WWTW), where the water is screened, treated, and then discharged back into the rivers or groundwater.

2.3 Flood Risk

2.3.1 This WCS has been prepared in parallel with the updated Strategic Flood Risk Assessment and therefore relevant information has been taken from that document and reproduced here.

2.4 Water Resources and Supply

2.4.1 Potable water within East Staffordshire is provided by South Staffordshire Water. All information included within this report has been collected through consultation with SSW in addition to generic information contained within the 2008 WCS.

2.5 Wastewater and Water Quality

2.5.1 Wastewater collection and treatment services are provided by Severn Trent Water who has modelled the sewage network of all Growth Points within Severn Trent's area identified as the preferred option, in order to identify potential bottlenecks both now and in the future.

2.5.2 Severn Trent Water has also provided statements regarding the capacity and impact on associated Sewage Treatment Works.

2.6 Data Limitations

2.6.1 WSP are unable to confirm the accuracy of information provided by third parties. All advice provided by water companies will need modelling/consultation on a site by site basis at the time of application.

3 Policy Context

3.1 National Policy

National Planning Policy Framework (2012)

3.1.1 Section 10 of the National Planning Policy Framework (NPPF) sets out to meet the challenge of climate change, flooding and coastal change. The following briefly summarises the key sections.

3.1.2 Local Planning Authorities (LPA's) should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk. Local Plans should take account of climate change over the longer term, including factors such as flood risk and water supply, with new development planned to avoid increased vulnerability to the range of impacts arising from climate change.

3.1.3 Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Local Plans should be supported by Strategic Flood Risk Assessment (SFRA) and develop polices to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood management bodies, such as Lead Local Flood Authorities (LLFA) and Internal Drainage Boards.

3.1.4 The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding – with the SFRA providing the basis for applying this test. If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. Both of the following elements would need to be demonstrated for the Exception Test to be passed:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared; and
- A site specific- Flood Risk Assessment (FRA) must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.1.5 When determining planning applications, LPA's should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific FRA following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas at lowest flood risk unless there are overriding reasons to prefer a different location; and
- Development is appropriately flood resilient and resistant, including safe access and egress routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.

3.1.6 Technical Guidance notes provide additional guidance to ensure the effective implementation of the NPPF on development in areas at risk of flooding. This guidance retains key elements of Planning Policy Statement 25 (PPS25) on development and flood risk.

3.2 Code for Sustainable Homes

3.2.1 The Code for Sustainable Homes (CSH) was introduced in England in April 2007 (and updated in 2010), and is an environmental assessment method for rating and certifying the performance of new homes based on a national standard for sustainable design and construction. CSH sets a framework and acts as a tool for developers using nine sustainable design categories: Energy and CO2 Emissions, Water, Materials, Surface Water Run-off, Waste, Pollution, Health and Wellbeing, Management and Ecology.

3.2.2 The Code for Sustainable Homes became mandatory from 1 May 2008.

3.2.3 In April 2007, the Code replaced Ecohomes for the assessment of new housing in England. The Code is an environmental assessment method for new homes based upon BRE Global's Ecohomes and contains mandatory performance levels in 7 key areas including water efficiency and surface water management.

3.2.4 The Code for Sustainable Homes measures the sustainability of a home against design categories, rating the 'whole home' as a complete package. A design stage assessment will be carried out on each house type within any development – not every single house. Post-completion checks will be carried out on a sample basis.

3.2.5 The Code for Sustainable Homes introduces:

- minimum standards for energy and water efficiency at every level of the Code, therefore requiring high levels of sustainability performance in these areas for achievement of a high Code rating;
- a more straight forward system of awarding points, with more complex weightings removed; and
- new areas of sustainable design, such as Lifetime Homes and inclusion of composting facilities.

3.2.6 Key details from the CSH are detailed below but full details should always be sought from the relevant documents.

3.2.7 Category 4 SUR1 requires a reduction and delay of the discharge of rainfall to public sewers and watercourses. The options provided by the Code aim to reduce the increase in volume of run-off from the site include on-site infiltration or rainwater harvesting.

3.2.8 Category 3 WAT1 details water reduction requirements including mandatory levels required for specific overall Code ratings. Credits are based on reducing the calculated internal water demand of residents by either minimisation of demand, reuse or recycling.

3.3 Building Regulations

3.3.1 The Building Regulations prescribe the required performance of new dwellings (and alterations to existing dwellings) in England and Wales, with Part G of the Building Regulations being updated in April 2010. This sets a whole building standard for average Per Capita Consumption (PCC) of 125 litres per person per day for domestic buildings. This comprises internal water use of 120 litres per person per day, and in that respect is in line with Code Levels 1 and 2, plus an allowance of 5 litres per person per day for outdoor water use.

3.4 Future Water

3.4.1 Future Water is a DEFRA document that outlines how the Government envisages the water sector developing in the period up to 2030, with the overall vision being to ensure sustainable delivery of

water supplies and an improved and protected water environment. The vision for water policy and management is one where (by 2030) England has:

- Improved the quality of the water environment and the ecology which it supports;
- Continued to provide high quality drinking water from taps;
- Sustainably managed risk from flooding and coastal erosion with greater understanding and more effective management of surface water;
- Ensured a sustainable use of water resources and implemented fair, affordable, and cost reflective water charges;
- Cut greenhouse gas emissions; and
- Embedded continuous adaptation to climate change and other pressures across the water industry and water users.

3.4.2 Future Water provides information relating to existing water usage by sector, water quality, surface water drainage, river and coastal flooding, greenhouse gas emissions and water charging and provides guidance on how the performance against each of these target areas can be improved by 2030. The document sets out an aspirational target for average PCC, across all dwellings, of 130 l/p/d. DEFRA predicts that this target can be achieved by 2030 through a combination of water efficiency and demand management measures, such as low consumption appliances and fittings, and changes in metering and tariffs. DEFRA suggest that a lower average PCC of 120 l/p/d may also be achievable dependant on new technological developments and innovation.

3.5 Water for People and the Environment

3.5.1 In 2009 the Environment Agency published its strategy for managing water resources in England and Wales to 2050 and beyond, titled Water for People and the Environment. This strategy supports the 130 l/p/d PCC target aspired to by DEFRA, and shows that the average PCC for England and Wales could be reduced from around 150 l/p/d to close to 120 l/p/d by 2030. To achieve this, PCC for new dwellings would have to meet CSH Level 3 (105 l/p/d plus 5 l/p/d for outside use) and near universal metering of properties in water stressed areas would be required by 2020.

3.5.2 The Environment Agency strategy concludes that the above demand management approach has the potential to be cost effective when compared to the development of new resources or desalination plants. The Environment Agency also suggest that, as metering becomes more widespread and incentives to use water efficiently increase, rainwater harvesting and grey water recycling systems will become more cost-effective and could play an increasingly important part in managing water resources in the future. In addition, the Environment Agency strategy suggests that all planning applications for significant new housing developments should be accompanied by a Water Cycle Strategy.

3.6 Regional Policy

3.6.1 The West Midlands Regional Spatial Strategy (WMRSS) was initially published by the Office of the Deputy Prime Minister (ODPM) in June 2004. Following the publication of the Phase One Revision in respect of the Black Country sub-region by Communities and Local Government (CLG) a revised WMRSS was issued in January 2008.

3.6.2 Through the Localism Act 2011, the Government is seeking to abolish all RSS's, including the WMRSS. However, this process is subject to the outcome of a strategic environmental assessment for each RSS, and any revocation will not be undertaken until the Secretary of State and Parliament have had the opportunity to consider the findings of this assessment.

3.6.3 In this interim period, the WMRSS continues to be a material planning document, with this containing three relevant polices to this WCS: Policy CC1 (Climate change); Policy QE3 (Creating a high quality built environment for all); and Policy QE9 (The water environment).

3.6.4 Policy CC1 promotes the use of sustainable drainage techniques and sustainable buildings.

3.6.5 Policy QE3 promotes sustainability consideration in many areas including drainage and water efficiency.

3.6.6 Policy QE9 requires co-ordinated plans across local and regional boundaries to:

- protect or improve water quality and where necessary significantly reduce the risk of pollution especially to vulnerable surface and groundwater in order to improve health and well-being;
- manage demand, conserve supply, promote local recycling of water and the multiple use of water resources;
- protect and enhance wetland species and habitats, particularly those subject to local biodiversity partnerships;
- ensure that abstraction from watercourses and aquifers does not exceed sustainable levels;
- reduce any adverse effects of development on the water environment by encouraging consideration of sustainable drainage systems where appropriate at an early stage in the design process;
- ensure the timing and location of development respects potential economic and environmental constraints on water resources; and
- maintain and enhance river and inland waterway corridors as key strategic resources, particularly helping to secure the wider regional aims of regeneration, tourism and the conservation of the natural, built and historic environment.

3.6.7 Policy QE9 also states that Development that poses an unacceptable risk to the quality of groundwater or surface water in this or other regions should therefore be avoided.

3.7 Local Planning Policy

The New East Staffordshire Local Plan

3.7.1 The New East Staffordshire Local Plan is the planning policy framework for delivering development and managing change within the borough. It contains a set of overarching strategic policies that set out broad principles for guiding development supplemented and supported by detailed policies which will address specific development issues. In order to deliver the Plan strategic development site allocations are made in this Local Plan.

3.7.2 This document follows the earlier Issues and Options consultation undertaken in 2007 by the Council on the main planning issues facing East Staffordshire and a Strategic Options Consultation document (August 2011) which considered a number of spatial options for the Borough's future development. In July 2012 the council consulted on the Preferred Option. This consultation asks specific questions on the soundness of the final strategy as set out in the Pre-Submission Local Plan.

3.7.3 This document, in addition to setting out the final strategy and site allocations, also seeks to:

- set out clearly the issues and spatial portrait of the Borough and the key planning challenges which it faces;
- define clearly the Strategic Objectives of the Local Plan and how these express the vision and relate to draft policies;
- clarify how options have been generated and assessed taking into account the evidence base, previous consultation responses and the sustainability appraisal; and
- set out a suite of draft policies that support the development of the preferred spatial strategy.

3.7.4 The final strategy detailed in this document is discussed in greater detail later within this report.

3.7.5 Policy SP27: Climate Change, Water Body Management and Flooding states that in considering all development proposals the following principles will be applied:

- Development and service provision must ensure that communities and the environment are not adversely affected by flooding and whilst there is therefore is an expectation that all development should fall within flood zone 1 the special circumstances of Burton upon Trent and its existing flood prevention measures will mean that as redevelopment sites are brought forward exception tests will need to be considered, in line with government guidance.
- Where land in Flood Zones 2 or 3 is involved a comprehensive Flood Risk Assessment will be required to be submitted by the applicant.
- Measures that manage and control water runoff through the use of Sustainable Urban Drainage Systems (SUDS) - for example, storm water diverted to soakaways, green roofs, permeable paved surfaces etc. will be sought in all schemes.
- Measures to reduce demand for water will be required, such as the use of grey water recycling and rainwater harvesting.
- All proposals which may affect water quality in watercourses because of run-off from the development or from building works affecting underground water sources must be accompanied by an explanation of how these effects will be avoided, or the quality of water restored.

Supplementary Planning Document (SPD) – Pirelli Site

3.7.6 This SPD has been produced for the Pirelli site land located in Burton upon Trent. This document is intended to provide guidance which will ensure that a high quality and sustainable development is achieved and one that will be sympathetic to surrounding uses. Regarding drainage the document states:

3.7.7 "In support of the proposal it will be demonstrated that there is adequate waste water capacity and surface water drainage both on and off the site to serve the development and that it would not lead to problems for existing or new users. All sustainable drainage methods will be considered in line with the Environment Agency's guidance for helping deliver sustainable development and reducing flood risk including addressing flood probability and consequences, improving water quality and minimising the impacts of climate change in accordance with advice set out in PPS25. Any surface water attenuation will be provided within the site boundary and take into account the three treatment trains required to deliver the necessary improvements in water quality. A financial contribution will also be made through a S106 to cover the cost for the installation of an automated storm water pumping

station to relieve the Horninglow Channel. This runs adjacent to the Trent and Mersey Canal and through a culvert below Beech Avenue and under the railway to an outflow into the River Trent."

Supplementary Planning Document – Bargates Site

3.7.8 This SPD has been prepared by East Staffordshire Borough Council to guide the redevelopment of the Bargates opportunity site in Burton upon Trent town centre. The SPD has been prepared to provide guidance to landowners, developers and their design teams in achieving the council's objectives for the site. The document states that:

3.7.9 "East Staffordshire Borough Council undertook a Strategic Flood Risk Assessment (Levels 1: Feb 2008 & 2: Aug 2008) and the Bargates Site was identified as being at risk. Flood defences however run the length of this section of the Trent and this affords protection of the town to the level of 1 in 200 years. Other parts of the flood defences in Burton have been further upgraded but the defences in this location have yet to be improved. Early discussions with the Environment Agency are recommended."

Supplementary Planning Document – Design

3.7.10 This SPD provided a design guide for developers and include outline guidance on drainage and water use, including:

- Larger buildings will need water collection facilities, for example rain-water harvesting from roofs via water-butts;
- Incorporate sustainable drainage measures through building and landscape design to reduce surface water run-off into the sewer network;
- Ensure development is designed to address potential flooding issues where development on site is agreed in principle through planning policy;
- The Council encourages developers to demonstrate environmental performance through recognised environmental rating systems. For residential development the Council encourages the use of 'Code for Sustainable Homes' and for other development the use of the Building Research Establishments Environmental Assessment Method (BREEAM).

3.8 Guidance

3.8.1 Water policy in England and Wales is set by the Department for Environment, Food and Rural Affairs (DEFRA) whilst the Environment Agency is responsible for maintaining or improving the quality of fresh, marine and underground waters (i.e. groundwater). The Environment Agency aims to achieve this through the enforcement of legislation, by regulation of industry and through its powers as a statutory consultee in the planning process.

3.8.2 The management of surface water run-off is within the jurisdiction of the Environment Agency. It is their policy to promote Sustainable Drainage Systems (SuDS), where possible, such as through the adoption of permeable surfaces and infiltration ponds to control surface water run-off at source (i.e. source control). This is further enforced by the NPPF, which sets out stringent restrictions on development within or adjacent to a floodplain.

3.8.3 The Environment Agency's approach to the management of groundwater is outlined in Principles and Practice for the Protection of Groundwater (GP3). This document contains the conceptual method for risk-based decision making and developing strategy statements in areas such as the control of groundwater abstraction and diffuse pollution of groundwater. GP3 is presented as a framework

within which decisions should be made and sets out the Environment Agency's broad approach to existing risks and new developments. GP3 is underpinned by groundwater vulnerability maps and designated groundwater Source Protection Zones (SPZs).

3.8.4 GP3 has recently been updated to ensure that the guidance and strategies presented are in accordance with the requirements of the Water Framework Directive and the management of the water environment through River Basin Management Plans (RBMP).

3.8.5 The protection of key groundwater resources, and in particular, those used for public drinking water supply, is accomplished by the establishment of SPZ. These SPZ provide an indication of the potential risk of pollution, based on the local soil and geological conditions and the depth of the water table. Generally the closer a polluting activity or release is to a SPZ, then the greater the risk of contamination. There are three SPZ zones (an inner, outer and total catchment) which are usually defined, although a fourth (zone of special interest) can also be defined. These zones are used to control activities and discharges in the local area to protect the aquifer.

4 East Staffordshire Water Cycle Catchment

4.1 East Staffordshire Borough

4.1.1 The Borough of East Staffordshire lies to the North East of the West Midlands conurbation and covers an area of 150 square miles. The 2011 census show that the population totalled 113,900 with the key population focused on the principal town of Burton upon Trent (including the parishes of Branston, Outwoods and Stretton) and the second largest settlement, Uttoxeter. These two main towns lie at opposite ends of the Borough, with Burton on the boundary in the South East corner and Uttoxeter to the North West. They are surrounded by a number of outlying villages and hamlets, the largest of which are concentrated along the southern and eastern borders.

4.1.2 Figure 1 shows the boundary of East Staffordshire and includes key features such as main towns, villages, watercourses, roads and railways.

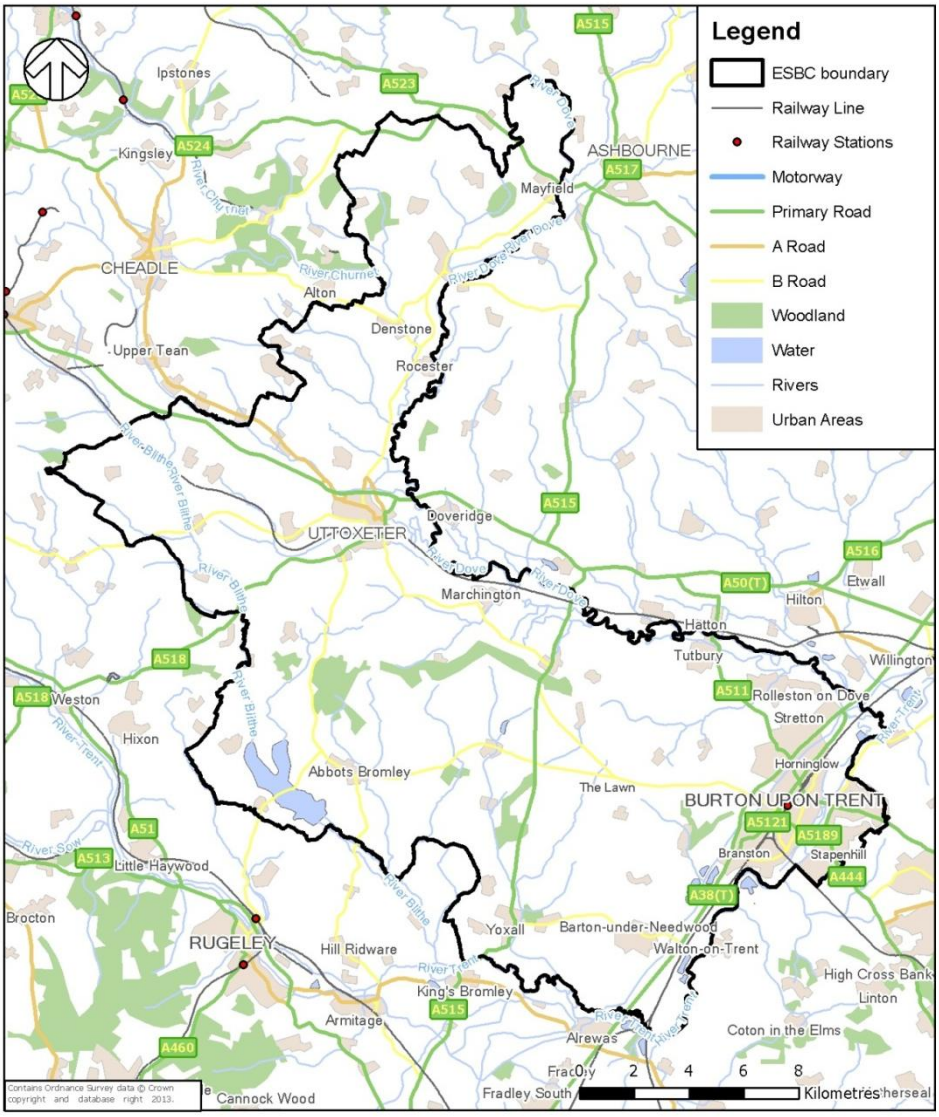


Figure 1 - Location Plan

4.2 Water Cycle Infrastructure

Water Supply

4.2.1 Potable water is supplied to East Staffordshire by South Staffordshire Water. The urban areas within the Borough are therefore connected by a network of water supply mains. This is discussed in detail in Section 6 of this report.

4.2.2 One of the main features of water supply infrastructure within the Borough is Blithfield Reservoir, an impoundment reservoir with a capacity of approximately 18,224 megalitres of water. Besides its primary water supply function, the reservoir has significant recreational and amenity value. The reservoir is a haven for wildlife, particularly birds, a fact that was recognised in 1988 when the reservoir and most of its surrounding woodland was designated as a Site of Special Scientific Interest, (SSSI).

Wastewater

4.2.3 Wastewater collection and treatment within the Borough is the responsibility of Severn Trent Water. The wastewater produced within the Borough is treated at two sewage treatment works, Clay Mills and Uttoxeter. The issues relating to wastewater collection and treatment are discussed in detail in Section 7 of this report.

Watercourses

4.2.4 The principal town of Burton is located along the River Trent, which flows through the main town centre, separating the Stapenhill and Winshill areas to the South of the river from the Branston, Shobnall, Horninglow and Stretton areas to the North. There are also a number of tributary streams and brooks draining the surrounding fields and hills which flow through the areas mentioned above, discharging into the Trent in the centre of the town. The Trent and Mersey Canal follows a similar route to the River Trent through the Borough, lying roughly parallel to the A38.

4.2.5 Uttoxeter, the second largest settlement is drained by a number of watercourses. Most notable is the Picknall Brook which flows through the Southern part of the town, joined by a network of streams draining the steep hillsides to the South and forming the confluence with the Picknall Brook in the middle of its course through Uttoxeter, which subsequently discharges into the River Dove to the east of the town. The River Dove, a tributary of the River Trent, flows to the east of the main town and the River Tean forms the Northern border of the urban extent, joining the Dove to the Northeast.

4.2.6 The Borough also contains a network of streams, pools and brooks. Blithfield Reservoir is located on the River Blithe to the west of the Borough, just upstream of its confluence with the River Trent. In addition, Branston Water Park is located just outside Burton next to the River Trent, consisting of a number of water-filled sand and gravel pits.

5 Growth and Development within East Staffordshire

5.1 Introduction

5.1.1 The East Staffordshire Local Plan details the preferred options for development across the borough. This includes a summary of the option selection process.

5.1.2 The final option is for urban extensions to Burton upon Trent and Uttoxeter, along with development in selected rural villages. The option provides a balanced approach to growth, addressing rural needs whilst placing the majority of growth in the main urban centres and areas of need. Details on the sites selected are provided in the following sections, with further information provided within the Local Plan.

5.1.3 In order to assess the capacity of the water cycle infrastructure to meet the likely requirements of future development, it is necessary to assume development projection and water usage scenarios across the borough and wider area. The development scenarios that are assessed within this WCS are detailed below

5.2 Burton upon Trent

5.2.1 Table 1 details the final development sites in Burton upon Trent, along with the type of development and approximate location. These are shown on Figure 2, along with the locations of developments within the rural villages of Barton-under-Needwood, Tutbury and Rolleston-on-Dove.

Table 1 - Burton upon Trent preferred option development sites

Type	Name	Location	Site type	Approx. number of residential units / hectares of employment
Brownfield	Pirelli	Directly south of the canal, between Princess Way and Beech Lane	Mixed	300
	Branston Depot	Off Burton Road, Mellon Road and Arnot Road	Mixed	483
	Bargates	Riverside Centre car park off Bridge Steet and High Street	Mixed	350
	Derby Road	Redevelopment in the area around Derby Road	Residential	250
	Coors – Middle Yard, Hawkins Lane	Little Burton Industrial Estate	Residential	300
Greenfield	Guinevere	North of Stretton	Residential	100
	Harehedge	North of Harehedge Lane between Tutbury Road and Rolleston Road	Mixed	500
	Beamhill	East of Outwood Lane, north of Field Lane and south of Beamhill Lane	Residential	950
	Branston Locks	Between the A38, Forest Road, and Branston Road	Mixed	2,580
	LSOB	South of Branston, between the railway and Lichfield Road	Mixed	660

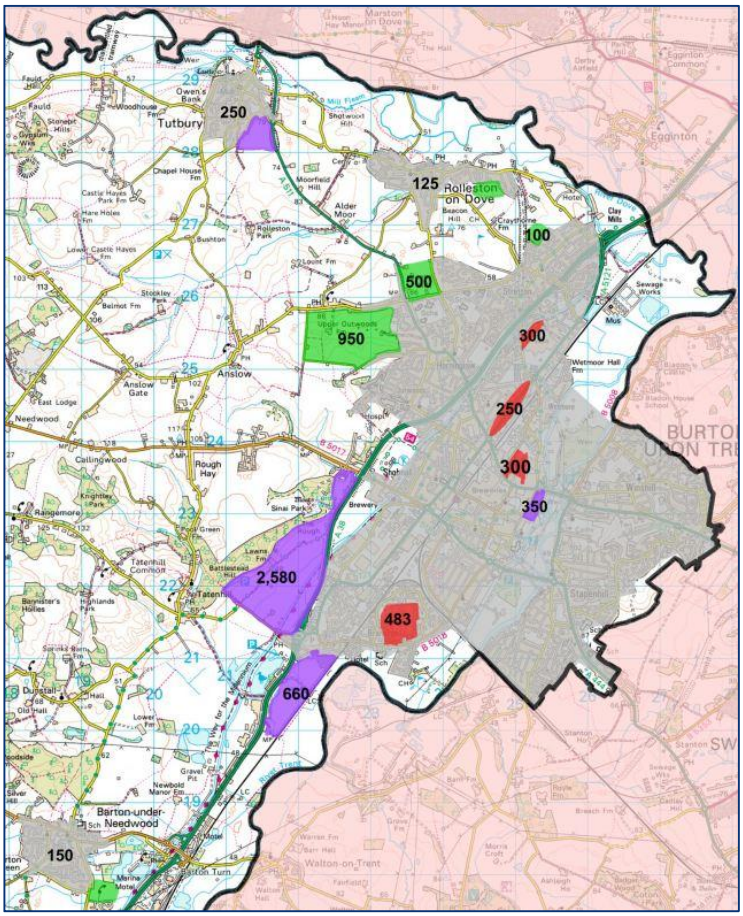


Figure 2 - Burton upon Trent preferred option development sites (extract from Local Plan)

5.3 Uttoxeter

5.3.1 Table 2 details the final development sites in Uttoxeter, along with the type of development and approximate location. These are shown on Figure 3.

Table 2 - Uttoxeter preferred option development sites

Type	Name	Location	Site type	Approx. number of residential units / hectares of employment
Brownfield	Brookside Road	Between Brookside Road and Town Meadows Way	Residential	150
	JCB	Between the railway, Hockley Road and Bridge Steet	Residential	257
Greenfield	Stone Road	Mount Pleasant area	Residential	100
	Hazelwalls – Site 1	South of Uttoxeter, east of the B5013	Residential	250
	Hazelwalls – Site 2	South of Uttoxeter, south of Sorrel Close	Residential	100

Type	Name	Location	Site type	Approx. number of residential units / hectares of employment
	West of Uttoxeter	South of the A50, north of Bramshall Road	Mixed	700

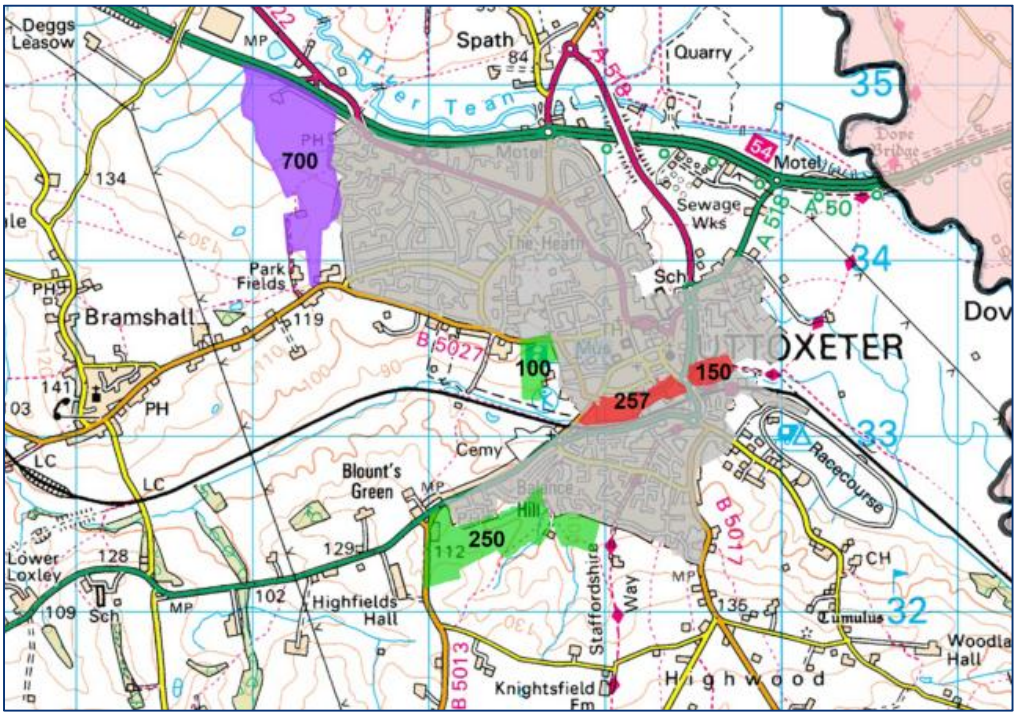


Figure 3 - Uttoxeter preferred option development sites (extract from Local Plan)

5.4 Rural areas

5.4.1 Table 3 details the preferred option development sites in the rural villages, along with the type of development and approximate location. These are shown on Figure 2 and Figure 4.

Table 3 - Rural villages preferred option development sites

Type	Name	Location	Site type	Approx. number of residential units / hectares of employment
Greenfield	Efflinch Lane	In the south of Barton-under-Needwood, off Mill Lane	Residential	130 (plus ~25 windfall)
	South of Tutbury	Tutbury – between the A511 and Green Lane	Mixed	224 (plus ~26 windfall)
	College Fields	Rolleston-on-Dove, sports field south of Twentylands	Residential	100 (plus ~ 25 windfall)
Detailed Application Site	Rocester	Land south of Main Street	Mixed	90 (plus ~ 25 windfall)

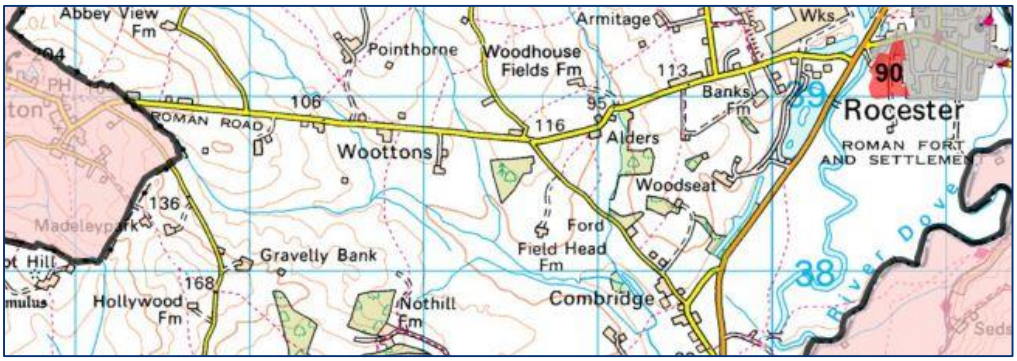


Figure 4 - Extract from the Uttoxeter preferred option showing the development in Rocester

5.4.2 In addition to the development sites detailed in Table 3 there is also expected to be windfalls in the following villages:

- Abbots Bromley (~40 units)
- Yoxall (~40 units)
- Draycott in the Clay (~20 units)
- Mayfield (~20 units)
- Marchington (~20 units)
- Denstone (~20 units)

6 Flood Risk

6.1 Introduction

6.1.1 The NPPF identifies flood risk as a material planning consideration, which should be addressed at all stages of the planning process. The issue of flood risk in respect to new development should be considered in terms of:

- Direct flood risk to the new development.
- Increased flood risk to other areas as a result of an increase in surface water runoff rate.

6.1.2 This section considers the potential development sites in terms of the impact of flood risk through summarising the findings of the Strategic Flood Risk Assessment (SFRA) which was completed in conjunction with this study. A summary of the flood risk to the strategic sites is provided below, with further more detailed information on each site along with the potential impacts on nearby land and ther required mitigation is contained within the SFRA.

6.2 Flood Risk to the development sites

Burton upon Trent

6.2.1 Burton upon Trent lies within the River Trent and River Dove catchments. The majority of the sites have a low percentage of their site area within Flood Zone 3. Provided the developments are

designed so that the areas of floodplain are avoided, particularly for the higher vulnerability uses, then these sites satisfy the NPPF criteria for residential or mixed use developments.

6.2.2 A number of the sites are shown to be entirely within Flood Zone 2. However, these areas are generally protected by flood defences and therefore are Areas Benefitting from Defences.

6.2.3 There are a few sites that do not fall within a modelled area and therefore no results are provided. Furthermore, there are small ordinary watercourses / ditches that flow through the Beamhill and Branston Locks sites and a small watercourse to the east of the Harehedge sites. These watercourses are too small to be picked up by the Environment Agency Flood Map and have not been modelled as part of this study. The risk from these watercourses should be considered as part of a site specific Flood Risk Assessment.

6.2.4 Generally the flood risk due to surface water appears to be low for all the development, with only small parts of the development sites at risk from surface water flooding of greater than 300mm. Surface water flow routes, on to, through and off site should however still be considered, and how they will be accommodated should be demonstrated as part of a site specific flood risk assessment.

6.2.5 The flood risk to the strategic sites in Burton upon Trent is outlined in Table 4 summarises the flood risk to the development sites and the impact on the surrounding area, with green showing no issues, yellow it needs to be considered, and orange could have impacts on the Masterplan for site.

6.2.6

Table 4 - Summary of Burton upon Trent development sites

Site name	Flood Zone 3	1 in 100yr+CC defended	Surface Water	Groundwater	Safe access / egress	Flood compensation required	Finished Floor Levels
Derby Road	5%	0%	Moderate	Moderate	Yes	No	Ground level
Pirelli	5%	0%	Moderate	Significant	Yes	No	Ground level
Branston Depot	100%	75%	Moderate	Significant	Via moderate	Yes	>46.81mODN
Coors - Middle Yard	90%	40%	Moderate	Significant	Via low	Yes	>45.2mODN
Harehedge	0%	-	Moderate	Low	Yes	No	Ground level
Beamhill	0%	-	Moderate	Low	Yes	No	Ground level
Guinevere	0%	-	Low	Significant	Yes	No	Ground level
Bargates	2.5%	0%	Low	Significant	Yes	No	Ground level
Branston Locks	10%	15%	Moderate	Significant	Yes	Yes	>46.74mODN
LSOB	10%	12%	Low	Significant	Yes	Yes	>48.4mODN

Uttoxeter

6.2.7 Uttoxeter lies within the Dove catchment and its tributaries; River Tean, Uttoxeter Brook and the Picknall Brook. The majority of the sites have a low percentage of their site area within Flood Zone 3. Provided the developments are designed so that the areas of floodplain are avoided, particularly for the higher vulnerability uses, then these sites satisfy the NPPF criteria for residential or mixed use developments.

6.2.8 The one site that is shown to have a significant fluvial risk is Brookside Road, which is almost entirely within Flood Zone 3. In addition, the JCB site is shown to be 100% within Flood Zone 2 with only limited areas benefiting from defences. Some of the sites do not fall within a modelled area and therefore no results are provided. Additionally due to the flood risks identified at the Brookside Road site the exception test would need to be passed for this site to be developed. Furthermore, there is

an ordinary watercourse that runs between the two Hazelwall sites that has not been modelled for the EA Flood Map. The risk from this watercourse is therefore unknown and should be considered as part of a site specific Flood Risk Assessment.

6.2.9 There is a significant flood risk to the Brookside Road site, with parts of the site at risk during the 1 in 20 year event, suggesting that area is functional floodplain. The development should avoid these areas where possible and instead utilise the areas as green open space. The same applies to the JCB site however for a smaller area and generally a lower hazard rating. The flood risk to both sites increases with increasing return periods and therefore a sequential approach should be utilised for both sites as part of the Master plan design stage.

6.2.10 Generally the flood risk due to surface water appears to be low for all the development sites listed above, with only small parts of the development sites at risk from surface water flooding of greater than 300mm. Surface water flow routes should however still be considered as part of a site specific flood risk assessment.

6.2.11 The majority of the sites have a potential to be susceptible to groundwater flooding, particularly the JCB and Brookside Road sites. This would therefore need to be included within a detailed Flood Risk Assessment for each site, and factored into the choice of SUDS utilised within the development.

6.2.12 Table 5summarises the flood risk to the development sites and the impact on the surrounding area, with green showing no issues, yellow it needs to be considered, and orange could have impacts on the Masterplan for site.

Table 5 - Summary of Uttoxeter development sites

Site name	Flood Zone 3	1 in 100yr+CC defended	Surface Water	Groundwater	Safe access / egress	Flood compensation required	Finished Floor Levels
JCB	40%	35%	Significant	Significant	Yes	Yes	>78 – 80mODN
Brookside Rd	90%	25%	Moderate	Significant	Yes	Yes	>76.7 – 77.4mODN
Stone Road	0%	0%	Low	Moderate	Yes	No	Ground level
Hazelwalls - site 1	0%	0%	Moderate	Moderate	Yes	No	Ground level
Hazelwalls - site 2	0%	0%	Low	Moderate	Yes	No	Ground level
West of Uttoxeter	0%	0%	Low	Moderate	Yes	No	Ground level

Rural Villages

6.2.13 Efflinch Lane lies within the Trent and Barton Brook catchments, whilst the other three development sites are within the Dove catchment. Rocester is also affected by the River Churnet. All of the rural village sites are within Flood Zone 1 and therefore the proposed developments are suitable in terms of fluvial flood risk.

6.2.14 Generally the flood risk due to surface water appears to be low for all the development sites listed above, with only very small areas thought to be at risk from flooding greater than 300mm in depth. Surface water flow routes should however still be considered as part of a site specific flood risk assessment.

6.2.15 The SFRA shows that the sites, and potential windfall sites, in Rocester and Barton-under-Needwood show a high susceptibility to groundwater flooding, whilst Tutbury and Rolleston-on-Dove have a low susceptibly. This risk would therefore need to be included within a detailed Flood Risk Assessment for Rocester and Barton-under-Needwood, and factored into the choice of SUDS utilised within the development.

6.2.16 The SFRA confirms that the fluvial flood risk is low to the development sites identified for the Rural Villages (except in Rocester) with no hazard up to and including the 1 in 1,000 year event. In Rocester the fluvial risk is still low, however there is some risk during the 1 in 1,000 year event.

6.2.17 There is a small drain that runs along the southern edge of the site at Efflinch Lane. This drain is not covered by the Environment Agency Flood Map or the hydraulic modelling however could present a risk to the site, particularly at the LIDAR suggests the site is relatively flat. The flood risk from this drain should be access as part of a site specific FRA.

6.2.18 Table 6summarises the flood risk to the development sites and the impact on the surrounding area, with green showing no issues, yellow it needs to be considered, and orange could have impacts on the Masterplan for site.

Table 6 - Summary of Rural Villages development sites

Site name	Flood Zone 3	1 in 100yr+CC defended	Surface Water	Groundwater	Safe access / egress	Flood compensation required	Finished Floor Levels
College Fields (Rolleston-on-Dove)	0%	0%	Low	Low	Yes	No	Ground levels
Efflinch Lane (Barton-under-Needwood)	0%	0%	Moderate	Significant	Yes	No	Ground levels
South of Tutbury (Tutbury)	0%	0%	Low	Low	Yes	No	Ground levels
Rocester	0%	0%	Low	Significant	Yes	No	Ground levels

7 Water Resources and Water Supply

7.1 Introduction

7.1.1 South Staffordshire Water (SSW) is responsible for providing potable water to East Staffordshire Borough. The assessment of water resources and water supply included in this WCS has therefore been primarily based on consultation with and data provided by SSW, together with documentation produced by Ofwat and the Environment Agency.

7.1.2 SSW supplies a population of nearly 1.25 million, over an area of almost 1,490 km^2. SSW's area of supply stretches from the edge of Ashbourne in the North, to Halesowen in the South, and from Burton on Trent in the East to Kinver in the West, as shown in Figure 5 below.

Figure 5 - South Staffordshire Water supply area

7.2 Water Resources Plans

7.2.1 Water companies have a duty to maintain the security of their supplies. In order to help achieve this, water companies produce Water Resource Plans. Water Resource Plans set out forecasts of supply and demand over a twenty-five year horizon and address how they intend to provide sufficient water to meet the needs of the customer whilst protecting the environment.

7.2.2 SSW produced a Final Water Resource Management Plan (FWRMP) in 2009, covering the period from 2010 to 2035. Its principal findings are:

- The existing levels of service are expected to be maintained through the period, with hosepipe bans and non-essential use bans an extreme rarity. The security of supply index for SSW remains at the maximum of 100 throughout the period.
- SSW are to increase the number of households using metering to allow a reduction in the amount of water pumped and a greater understanding of water usage for customers.
- Climate change and environmental obligations are not expected to have a material impact to supply over the period.
- SSW has sufficient resources to meet forecast demand plus target headroom for annual average and peak week conditions throughout the plan period. There is no requirement for either supply or demand interventions.

7.2.3 The FWRMP is reviewed annually and the latest review showed that SSW were still expected to meet the targets set out in 2009.

7.3 Water Resources

7.3.1 A Water Resource Zone is the largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource failure. SSW is unusual in that its entire supply area is derived from just one Water Resource Zone.

7.4 Water Sources and Availability

7.4.1 SSW obtains its water resources from three sources: Blithfield Reservoir, the River Severn and groundwater from 25 sites across the SSW area of supply. Approximately 40% of the total water available to SSW is taken from groundwater sources and the remaining 60% from the two surface water sources.

7.4.2 Groundwater is abstracted from around 62 boreholes in the Triassic Sandstone aquifer. On average there are three boreholes at each groundwater site. Triassic sandstone has large water storage capacity within the structure of the strata and it does not tend to react rapidly to periods of low rainfall or short periods of high rainfall. Therefore, it gives a relatively reliable and constant supply of water.

7.4.3 Blithfield Reservoir is an impoundment reservoir with a capacity of approximately 18,224 megalitres of water. It was formed in 1953 by the construction of a dam across the River Blithe. The raw water is taken out of the reservoir by pipeline to the treatment works at Seedy Mill near Lichfield before going into the distribution network. SSW uses the level in Blithfield Reservoir as the main indicator of resource availability. Regular analysis of refill scenarios for Blithfield Reservoir is routinely undertaken during the refill season and the levels are monitored continuously

7.4.4 The River Severn is a regulated river i.e. flows in the river are augmented by inputs from both groundwater and reservoirs (Clywedog and Vyrnwy) at its head at times of low flows. The regulation

of the River Severn is controlled and operated by the Environment Agency who monitor and report on the situation regularly. SSW takes water from the River Severn at Hampton Loade where it is stored in Chelmarsh Reservoir before being treated and distributed.

7.4.5 Further details on the current water availability can be examined through SSW's website at http://www.south-staffs-water.co.uk/community_environment/water_resources.asp

7.5 Water Supply Infrastructure and Impact of Development

7.5.1 The capacity of the infrastructure used to pipe water to existing and new development, both residential and commercial, could potentially have a significant impact on the timing of development. For example, in order to serve a significant increase in population it may be necessary to undertake significant improvements to the existing infrastructure. Similarly, the type of employment land intended for development is also an important consideration as the water supply requirements for a brewery or food processing plant are much greater than for an office block, which again may result in a requirement for significant improvements to be made to the existing infrastructure. The lead in time necessary to make these improvements would of course impact on the delivery of the new development.

7.5.2 For the purposes of the WCS, SSW provided information about the current water supply infrastructure with the demand estimates forecast during the summer peaks to ensure that regulatory levels of service are maintained to customers. However, they do state that all the information provided is for indicative purposes only as it is not feasible at this stage to undertake detailed analysis in order to determine more accurately the infrastructure requirements and associated capital costs, especially due to the long term phasing of developments and uncertainty at this time.

7.5.3 For clarification purposes the information has been simplified so as to only show the significant features of the network. The schematic diagrams of the Borough provided by SSW are presented in Appendix A.

7.5.4 SSW was consulted and plans of the development scenarios for Burton and Uttoxeter were explained. Copies of the plans were provided for comment on issues relating to water supply and the potential need for improvements to the existing infrastructure. The sites have been assessed by SSW in combination with others (both within and outside of the borough) within their Water Supply Zones (WSZ). The WSZ that have been assessed are (the locations in blue correspond to the SFRA locations):

- Outwoods
  - Pirelli (Burton-Upon-Trent)
  - Branston Depot (Burton-Upon-Trent)
  - Bargates (Burton-Upon-Trent)
  - Branston Locks (Burton-Upon-Trent)
  - College Fields (Rolleston-on-Dove) (Rural Villages)
  - Efflinch Lane (Rural Villages)
- Uttoxeter
  - JCB
  - Stone Road
  - West of Uttoxeter

- Rocester (Rural Villages)

- Hanbury
  - Harehedge (Burton-Upon-Trent)
  - South of Tutbury (Rural Villages)

7.5.5 Since the full consultation with SSW, additional sites have been allocated within the final option of development sites. Further consultation has been undertaken with SSW which has confirmed that there is sufficient water resources to supply potable water to these additional sites. However, there may still be the need for off-site local or strategic improvements to the potable mains infrastructure, this will be determined by SSW once the developers of these sites enter into direct consultation with them. The additional sites are:

- Coors Middle Yard (Burton-Upon-Trent)
- Beamhill (Burton-Upon-Trent)
- Guinevere (Burton-Upon-Trent)
- LSOB (Burton-Upon-Trent)
- Brookside Road (Uttoxeter)
- Hazelwells – site 1 (Uttoxetter)
- Hazelwells – site 2 (Uttoxeter)

7.5.6 However, the scale of development and the associated increase in demand is a significant consideration. The SSW FWRMP used the Nathaniel Lichfield scenarios for the West Midlands Regional Spatial Strategy (RSS) to ensure demand forecasts are suitable. However, the RSS was revoked in May 2013 but the allocations of housing numbers in the New Local Plan are slightly more conservative than the RSS. Therefore, the FWRMP is believed to still be a suitable guide as it was based on a larger demand.

7.5.7 The demand forecasts include anticipated improvements in the efficiency of household water using appliances and therefore the consumption of water per person and per household includes integral efficiencies. This will be supported by the adoption of the Code for Sustainable Homes in all new housing developments.

7.5.8 The FRWMP assesses the current availability of water from the existing reservoirs and abstraction consents. If there is found to be an imbalance between supply and demand the FRWMP will provide a strategy to overcome the shortfall, either through a reduction in demand, an increase in supply, or a combination of the two (twin track approach).

7.5.9 The FRWMP states that there is a balance between supply and demand through the 25 year plan period (2010-2035).

7.6 Water Infrastructure

7.6.1 The infrastructure necessary to supply water throughout the Borough has the potential to influence the timing of development depending on the location. SSW has made allowances for infrastructure improvements in the FWRMP based on projected development figures. However, as the precise locations and phasing of development is not known, it is not feasible for the water companies to provide detailed costs for necessary improvements for hypothetical scenarios. SSW explained the process by which such improvements would be introduced. SSW would not undertake calculations and design until approached by a developer, who would be required to pay an infrastructure charge. SSW would then undertake the necessary upgrade in infrastructure.

7.6.2 SSW were however happy to comment at a strategic level on the final option for development within the Borough. The limiting factor is the capacity of the existing network to carry the potential additional increase in supply. The system can be likened to a road system, with the motorway network representing the trunk mains. Away from the trunk mains the pipe network becomes smaller and more branched, similar to A-roads, B-roads and small country lanes. At the fringes of the existing development, and hence the supply system, the capacity is considerably reduced.

7.6.3 Therefore development that is proposed close to the trunk mains can be more easily accommodated than developments on the fringes of the system. In addition the capacity of the booster stations must also be considered.

7.6.4 Table 7 outlines the ease with which they could be accommodated within the existing infrastructure, using the colour code outlined below:

Easily accommodated within the existing system/ Little or no infrastructure upgrade required (i.e. very minor local upgrades)

Minor infrastructure upgrade required (i.e. local upgrades/cross connections etc.)

Major infrastructure upgrade required (i.e. trunk mains/service reservoirs)

Table 7 Water supply infrastructure capacity

Site Name	SSW Reference	Supply Zone	Peak Flow	Water Capacity
Pirelli	Pirelli	Outwoods	168	
Branston Depot	Branston Depot	Outwoods	328	
Bargates	Bargates	Outwoods	46	
Branston Locks	Lawns Farm & Land South of Branston	Outwoods	2004	
Harehedge	Tubury Road/Harehedge Lane	Hanbury	194	
JCB	JCB	Uttoxeter	148	
West of Uttoxeter	West of Uttoxeter (SUE)	Uttoxeter	373	
Stone Road	Stone Road	Uttoxeter	59	
South of Tutbury (Tutbury)	Tutbury - Burton Road	Hanbury	162	
College Fields (Rolleston-on-Dove)	College Site	Outwoods	70	
Effinch Lane (Barton-under-Wood)	Effinch Lane	Outwoods	80	
Rocester	Rocester	Uttoxeter	58	

7.6.5 Additional information provided by SSW states

- All proposed domestic developments within the Outwoods supply zone, namely Burton-Upon-Trent (excluding Tutbury Rd - see Hanbury WSZ), Rolleston-On-Dove (Tier 1) & Barton-Under-Needwood (Tier 1) have been hydraulically analysed collectively to replicate forecasted peak day peak hour demands (worst case scenario).

- There is considerable additional growth forecasted within the Burton-On-Trent area (significant additional employment/commercial growth as well as growth identified by South Derbyshire & Lichfield Council's) and this combined with the Burton developments detailed by East Staffs impacts upon the overall resource and infrastructure capacity for the Outwoods WSZ (including the Hanbury & Castleway sub-zones). Thus, contributions from the developments within the Outwoods WSZ may also be required as part of any trunk mains upgrades etc. identified to accommodate the overall forecasted growth in Burton and surrounding areas. The magnitude of these contributions would be dependent upon additional analysis which would be required to assess the respective funding contributions for each site.
- All of the proposed domestic developments within the Uttoxeter supply zone have been hydraulically analysed collectively to replicate forecasted peak day peak hour demands (worst case scenario).
- Given that these developments (JCB, Stone Rd & West of Uttoxeter) combined results in a significant reduction in system pressures then infrastructure upgrades will be required with each site contributing to the cost. Additional analysis will be required at the time of planning applications in order to determine the respective developer contributions.
- The proposed domestic developments within the Hanbury supply zone (south of Hanbury and Harehedge) have been hydraulically analysed collectively to replicate forecasted peak day peak hour demands (worst case scenario). Given that the developments combined results in a significant reduction in system pressures then the additional infrastructure outlined will be required with each site contributing to the cost. Additional analysis will be required in order to determine the respective developer contributions.

7.6.6 Although the impacts of potential windfall sites within the urban areas have not been assessed by SSW as by their nature the precise locations of these are not known. However, incremental infill developments of this nature are unlikely to have any major impact on existing supply infrastructure. Individual developments falling into this category will need to and modelled by SSW at the planning application stage.

7.6.7 There are no developments within the preferred strategy that result in the requirement for significant strategic infrastructure upgrades to the existing water supply system.

7.7 Water Resources Summary

7.7.1 The SSW Water Resources Plan provides an assessment of the current and future reliability of the SSW resource zone. The plan also presents management options to deal with any shortfalls, either through demand reduction measures, the introduction of new resource supplies or a combination of the two. Overall, there is found to be a balance between supply and demand.

7.7.2 Even with an ‘unlimited’ supply of water at a strategic level, ‘bottle-necks’ in the water supply infrastructure could constrain development. Large scale developments on the margins of the existing supply network would require significant investment in infrastructure upgrade. Given the lead in time associated with the design and construction of infrastructure improvements it is essential that the timing of infrastructure upgrades be factored into the planning of new developments. For example, it may not be feasible to plan for immediate development in the more marginal Greenfield sites where significant upgrade would be necessary.

7.7.3 It must also be borne in mind that any development application will require a formal submission to SSW outlining the water usage requirements in order that the application can be assessed in detail to identify the potential impact upon the water distribution system and any upgrades that may be required. As mentioned, the water requirements are extremely sensitive to the type of employment land intended for development, details of which have not been provided or reviewed within this WCS.

8 Wastewater Collection and Treatment

8.1 Introduction

8.1.1 Wastewater collection and treatment within East Staffordshire is undertaken and managed by Severn Trent Water (ST). The assessment of the wastewater infrastructure, as presented in this WCS, has been based on consultation with ST together with information produced by Ofwat and the Environment Agency.

8.1.2 This section will address the capacity of the existing wastewater infrastructure to deal with the increase in flow as a result of the proposed increase in population, both in terms of pipe network and in the capacity of the sewage treatment works. This section also addresses the environmental quality of the receiving watercourses and the potential limiting impact of this due to legislation relating to water quality.

8.2 Wastewater Collection

8.2.1 ST has modelled each of the sites contained within the Preferred Option, assessing the impact they have. ST requires that brownfield sites with existing combined sewer connections be designed to discharge surface water separately, ideally through an on-site SuDS system. Surface water will not be allowed to enter the combined systems at any of the sites where alternative methods of discharge are feasible.

8.3 Wastewater Treatment

8.3.1 There are three main Sewage Treatment Works (STW) which require attention within this WCS; Clay Mills STW, which serves Burton upon Trent and Uttoxeter STW, serving Uttoxeter and the immediate surrounding area and Barton under Needwood which serves Efflinch Lane. There are a number of other small works which are also addressed in case windfall sites require them.

8.3.2 Since the full consultation with ST, additional sites have been allocated within the final option of development sites. The consultation identified that ST are currently undertaking major capital improvements to Clay Mills STW (which serves Burton-upon-Trent) to ensure that long term capacity is available. As the numbers of proposed units which would drain to this STW have increased by 2,010 it is considered likely the additional flows would be able to be accommodated, with only minor improvements.

8.3.3 In terms of the Uttoxeter sites there will be an increase of 400 units plus the yet to be confirmed number at Hazelwells 2. The information from ST is that should higher levels of development then there should be no significant issues associated with providing the additional treatment capacity

8.3.4 However, there may still be the need for off-site local or strategic improvements to the sewer system, this will be determined by ST once the developers of these sites enter into direct consultation with them.

8.3.5 The additional sites are:

- Coors Middle Yard (Burton-Upon-Trent)
- Beamhill (Burton-Upon-Trent)
- Guinevere (Burton-Upon-Trent)

- LSOB (Burton-Upon-Trent)
- Brookside Road (Uttoxeter)
- Hazelwells – site 1 (Uttoxetter)
- Hazelwells – site 2 (Uttoxeter)

8.3.6 The capacity of the sewer network for each of the Preferred Sites is outlined in Table 8 below, which identifies only Branston Locks as requiring major infrastructure upgrades. This information has been based upon desktop assessments and detailed hydraulic modelling may be required to determine the exact constraints.

8.3.7 In all instances the developments should take the opportunity to ensure any surface water currently connected to the foul sewer is separated. This relieves pressure on existing infrastructure by freeing up capacity from conveyance and treatment of foul flows. This will also reduce the number instances where combined sewer overflows operate (CSO), reducing the risk of river quality issues.

Table 8 Foul sewer capacity

Brownfield site - Little or no infrastructure upgrade required

Minor infrastructure upgrade required / Mitigation of additional surface runoff is achievable with SuDS to accommodate all the additional runoff

Major infrastructure upgrade required - Major drainage upgrade is required to accommodate the additional runoff in addition to SuDS

Ref.	Treatment Works	Key Constraints (if any)	Potential Impact
Pirelli	Clay Mills	None	
Branston Depot	Clay Mills	The location and ground topography indicates that this development could potentially connect to one of several connection points, all of which involve pumping.	Low-Medium (potential pumping station capacity improvements)
Bargates	Clay Mills	None	
Branston Locks	Clay Mills	Development in this locality is expected to have major drainage issues as there are no suitable sewers to the west of the Trent & Mersey Canal. Whilst there is a small diameter sewerage system serving the small village of Tatenhill (which pumps to Barton under Needwood) this would not have capacity to accommodate 2,750 new dwellings. The nearest existing public sewer draining towards Burton is a small diameter sewerage system serving properties to the east of Branston Bridge which eventually drains to a small pumping station off Old Road in Branston. Again this system will not have capacity to accommodate 2,750 new dwellings. The ground topography indicates that this site is relatively flat	High (Significant development with no suitably sized sewers in the immediate vicinity)

Ref.	Treatment Works	Key Constraints (if any)	Potential Impact
		it is expected that the site would need to be pumped, it is therefore recommended that the site be pumped northwards towards Shobnall to a sewer with sufficient spare capacity. Due to the scale of the development proposed in this area detailed hydraulic modelling will be required to identify a suitable connection point to minimise downstream capacity improvements.	
Harehedge	Clay Mills	There is a combined sewer overflow on Rolleston Road which would need to be modelled to ensure the additional foul only flows does not unduly affect its performance.	
JCB	Uttoxeter	None	
West of Uttoxeter	Uttoxeter	This site is located at top of the existing sewerage system and is on the opposite side of the town in relation to Uttoxeter sewage treatment works. Ground topography suggests that most of the site would need to be pumped in order to connect to the adjacent public sewerage system which is also pumped by existing pumping stations located off Torrance Grove. Subject to pump assessments it is envisaged that this pumping station would need to be replaced/upsized to accommodate the additional foul flows from this development. Capacity improvements may also be required to the sewers downstream of the pumping main. Further modelling work will be required to assess the potential capacity implications and determine the scope of any capacity improvements.	Medium (Site located upstream of small pumped catchment which is unlikely to have sufficient spare capacity)
Stone Road	Uttoxeter	None	
South of Tutbury	Clay Mills	The village of Tutbury drains to a sewage pumping station off Bridge Street which pumps to another pumping station at Rolleston before being pumped directly to Clay Mills sewage treatment works. There are known internal flooding issues in Mains Street, Tutbury associated with sewer capacity issues affecting multiple properties. A capital project is currently appraising solutions to alleviate flooding in this area. The additional foul only flows from the site identified to the south east of the village is not envisaged to have a significant impact on the known flooding issues although it is recommended that this development be deferred to allow time for capacity improvements to be completed. Additional localised capacity improvements may also be required. Due to the topography of the site this site is likely to require pumping in order to connect to the existing public sewers. It is assumed that surface will be managed sustainably although there are some limited existing surface water sewers in Tutbury.	Medium (Known internal flooding problems in Tutbury)

Ref.	Treatment Works	Key Constraints (if any)	Potential Impact
College Fields (Rolleston-on-Dove)	Clay Mills	None	
Efflinch Lane	Barton under Needwood	None	
Rocester	Uttoxeter	None	

8.3.8 The constraints to the preferred sites associated sewage treatment works that serve the borough are identified in Table 9. The main constraints foreseen by ST are detailed below, however there are also water quality considerations in the receptor, these are discussed further in Section :

- **Clay Mills** - Severn Trent are currently undertaking major improvements at Clay Mills STW to ensure long term capacity is available to accommodate new development in Burton and its upstream catchments.
- **Uttoxeter** - Whilst comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is sufficient spare hydraulic capacity there is limited headroom in the secondary treatment process which might require some improvements to accommodate the eventual 1100 dwellings being planned in the Uttoxeter STW catchment. Should additional treatment capacity be required to accommodate higher levels of development then we do not envisage any issues in dealing with future growth demand.
- **Barton-under-Neewood, Abbots Bromley, Yoxhall, Marchington and Mayfield** - Comparison of current measured dry weather flow against the consented dry weather flow consent indicates that there is minimal spare capacity at Barton under Needwood STW, however there are no land constraints that would prevent additional capacity being provided.

Table 9 Sewerage treatment works constraints

Sewage Treatment Works	Estimated spare capacity (@2.4hd/dwelling)	Estimate headroom based on current quality performance (RAG)	Future quality issues (RAG)	Physical constraints regarding provision of additional treatment capacity (RAG)
Clay Mills	31,252	Significant	Not expected to be an issue	No land or other constraints preventing expansion
Uttoxeter	2,385	Limited	Not expected to be an issue	No land or other constraints preventing expansion
Barton under Needwood	Minimal	Limited	Not expected to be an issue	No land or other constraints preventing expansion
Abbots Bromley	125	Significant	Not expected to be an issue	No land or other constraints preventing expansion
Yoxall	112	Limited	Not expected to be an issue	No land or other constraints preventing expansion

Sewage Treatment Works	Estimated spare capacity (@2.4hd/dwelling)	Estimate headroom based on current quality performance (RAG)	Future quality issues (RAG)	Physical constraints regarding provision of additional treatment capacity (RAG)
Marchington	690	Limited	Not expected to be an issue	No land or other constraints preventing expansion
Mayfield	23	Limited	Not expected to be an issue	No land or other constraints preventing expansion

9 Water Quality

9.1.1 Water quality and is governed by the Water Framework Directive (WFD) this requires that all surface and ground waters need to meet good status (or good potential for Heavily Modified Waterbodies – HMWB) by 2027. The EU Water Framework Directive (2000) transposed into English and Welsh legislation by the The Water Environment (Water Framework Directive) (England and Wales) Regulations, 2003).

9.1.2 Development can impact the status of the waterbodies through various means, such as culverting, changing the flow characteristics, discharge of pollutants and changes to groundwater flow paths. Where a development may have an adverse impact upon the status of the water body a WFD assessment will be required. Development can have a beneifical impact as many watercourses require improvement to help them to achieve good status, therefore development sites should aim to help deliver the mitigation measures for each catchment as identified in the River Basin Management Plan (RBMP)

9.1.3 The WFD requires a management plan to be drawn up for each river basin district (East Staffordshire falls within the Humber RBMP), with these plans reviewed and updated every six years (from their first publication in 2009). The Environment Agency has advised that the plans are currently being updated, although they have been able to provide a 2012 progress update. The latest results based on surveys taken mainly between 2009 and 2011 show that there have been no significant change (deterioration or improvement) in the number of surface water bodies at good status in England in Wales compared to when first reported in 2009.

9.1.4 The current Overall Status and Overall Objective for the waterbodies within the East Staffordshire area of the Humber RBMP can be summarised as:

- There are 24 designated watercourses and these are within the Staffordshire Trent Valley, Dove and Lower Trent and Erewash Catchments.
- The last update of the plan, thirteen water courses have been assessed as Moderate in their Current Overall Status, six of them as Poor Status and two with Good Status, being three of them not yet assessed.
- To meet the WFD objectives these water courses have to reach an Overall Objective of Good Status or Good Potential (depending if they have been heavily modified or not) by 2027 or 2015. Seven of these twenty four water courses have to reach a Good Status by 2015 as it was initially established by the WFD and the rest of them (seventeen) by 2027.

9.1.5 The RBMP outlines mitigation measures for each watercourse that are considered technically and economically feasible, the main ones are outlined below which should be considered for inclusion/contribution to by all developments. For further details and applicability to each watercourse the RBMP should be consulted.

- Maintain sediment management regime to avoid degradation of the natural habitat characteristics of the downstream river.
- Appropriate channel maintenance strategies and techniques - minimise disturbance to channel bed and margins.
- Retain marginal aquatic and riparian habitats (channel alteration)
- Preserve and where possible enhance ecological value of marginal aquatic habitat, banks and riparian zone.
- Set-back embankments.
- Alteration of channel bed (within culvert).
- Re-opening existing culverts.

- Increase in-channel morphological diversity.
- Preserve and, where possible, restore historic aquatic habitats.
- Removal of hard bank reinforcement / revetment, or replacement with soft engineering solution.
- Reduce sediment re-suspension.
- Bank rehabilitation / reprofiling.
- Awareness raising / information boards (boat wash / sources of fine sediment).
- Appropriate vegetation control techniques, considering the appropriate timining for management and removal of invasive species
- Sediment management.

9.1.6 Should the proposed development require increases to the discharge consents for the STW, then it is likely the Environment Agency will place more stringent conditions on the discharge parameters. This would require additional capital investment by ST in order to meet the higher require effluent standard, particularly with regards to the level of phosphates discharged. The Urban Wastewater Treatment Directive (UWWTD) is designed to make sure all wastewater in the EU is treated to the appropriate standard. An essential element of the Directive is that quality standards for effluent fall into categories depending on the size of the treatment works and the sensitivity of the receiving watercourse. As populations grow, some sewage treatment works may exceed the UWWTD threshold that requires nutrient removal. In locations where households cannot be connected to existing sewers, particularly of concern in the rural areas of the Borough, this may result in additional septic tank discharges to water bodies in which levels of phosphates and nitrates are already very high. Under the Water Resources Act a 'consent to discharge' must be obtained from the EA before any polluting material is legally discharged into a watercourse.

9.1.7 However, SuDS can be implemented as part of new developments with the resulting effect of improving water quality and reducing additional rate and volume of surface water run-off. In the instances where the surface water for brownfield sites currently discharge to the combined sewer, this would have multiple benefits.

9.1.8 The CAMS reports classify the Rivers Trent and Blithe as having 'No Water Available' and the River Dove and Churnet as 'Over-abstracted'. This means that there is no water available for further licensing at low flows on the Rivers Trent and Blithe and that existing abstraction is causing unacceptable damage to the environment at low flows on the River Dove and River Churnet. However, on all these rivers water may still be available at high flows with appropriate restrictions. These restrictions must be taken into account when considering the new employment sites, especially with regards to factory based manufacture.

10 Water Supply Demand Reduction and Management

10.1 Introduction

10.1.1 Government has stated a greater need for higher regional standards of water efficiency in response to the regional water resources position and the Water Act 2003 requirements place a duty on undertakers to achieve further water conservation and on public authorities to take into account the desirability of conserving water supplied to premises.

10.1.2 Development will increase the water requirement within the Borough, but through managed water usage, wastage can be reduced and the developments made more sustainable in the long term to meet the Government requirements outlined above.

10.1.3 Reducing the on-site demand for water has a clear benefit to the borough as a whole as each individual site will have a smaller impact on existing local water resources. Demand can be reduced in a number of ways. This section investigates the options available for the site.

10.2 Water Demand Reduction Options

10.2.1 There are typically five ways to reduce potable water demand in the homes, these include:

- Provision of efficient fittings and appliances
- Rainwater harvesting
- Grey water reuse
- Education of the end user
- Tiered tariffs and smart visible metering

10.2.2 In general water users who are not metered use more water on average than metered customers. Metering helps to give users a signal and incentive to manage their own demand for water and, on average, water savings are reported within a range of 5-15% compared to unmetered use. All new properties are metered and further savings can be expected as more existing customers are metered and, in the long run, through the introduction of smart meters and changes to tariffs. Such changes can be promoted by both SSW and the Council, but will have to be made alongside protection of vulnerable customers.

10.2.3 User awareness can have a great impact if people take on board the advice given. Turning off taps while brushing teeth is one example of how water can be saved easily. The installation of water meters can also have an impact on user awareness, as homeowners will have a financial incentive to save water.

10.2.4 Of the five methods above, the last two cannot be quantified at a property level as each user will be different. As such, the CSH takes into account savings made by physical intervention through efficient fittings and appliances, rainwater harvesting and grey water reuse, these are explored further below.

Typical Baseline Demand

10.2.5 Based on standard fittings and appliances, typically found in existing UK properties, the average demand is around 145 l/person/day.

Efficient Fittings and Appliances

10.2.6 Efficient fittings can take the form of low flow showers and taps, dual flush toilets and smaller baths and basins.

10.2.7 Water-efficient appliances in the form of low consumption dishwashers and washing machines can be used to further reduce demand for potable water.

Rainwater Harvesting and Grey water Reuse

10.2.8 It is possible to recycle water for use within the home. This can take the form of rainwater harvesting and/or grey water reuse.

10.2.9 Both rainwater harvesting and grey water systems are made up of a collection, storage and a distribution system. With basic treatment and filtration, both are suitable for WC flushing, garden watering and as a washing machine supply.

10.2.10 Rainwater recycling systems typically collect rainwater falling on the roof and as such, are dependent on there being sufficient rainfall to maintain water levels in the storage tank. The Code takes local rainfall, roof area, run-off coefficient and occupancy rate into account when calculating the amount of water available per person. Typically 14 l/person/day is collected (based on a typical 2 bedroom home with an occupancy rate of 3); however this figure can vary considerably, and should be considered on a case by case basis.

10.2.11 Grey water systems redirect water from baths, showers, bathroom sinks and in some cases, the washing machine, through a filter and treatment system to a storage tank.

10.2.12 Both rainwater and grey water are unsuitable for bathing or human consumption. Grey water should not be used to irrigate produce in the garden destined for human consumption, although nutrients contained within recycled water can help promote plant growth.

10.2.13 Both systems require a mains water backup, overflows to appropriate sewers and regular maintenance. A dual pipework system is required to be installed within properties where recycling will occur. These pipes will need to be clearly labelled so that inadvertent connections are not made resulting in human consumption.

10.2.14 In domestic properties, grey water production typically exceeds its requirement for use in toilet flushing and washing machines, therefore an excess of grey water will usually be available.

10.2.15 Rainwater recycling at this site is not a desirable option as the Environment Agency has requested that low flows be maintained in the summer months. In order to satisfy this requirement, all flows will be routed to attenuation structures to maximise the available volume. Refer to SUDS strategy later in this report.

10.3 Potable Water Supply

10.3.1 Potable water will be provided by SSW. The connection to the sites should take into account topography to ensure that excessive pressure is not provided to the properties. Excessive pressure increases use and leakage.

10.3.2 Booster stations (where required) should include efficient variable speed pumps to adjust delivery pressure to maintain a minimum head at the highest connection point being supplied.

10.3.3 Where supplied by gravity, excessive head can be reduced using pressure reduction valves (PRVs).

10.3.4 Creating District Meter Areas (DMAs) of typically 2,000 properties each will help water South East Water locate leaks by metering flows to each DMA and assessing:

- New data against historic data
- Reviewing night-time low flows (which should remain consistent)
- Comparing against expected demand based on estimates

10.3.5 These options will be specified by South Staffordshire Water and the developers should work with them to ensure a sustainable approach to supplying each site is adopted.

10.4 Suggested Water Supply Strategy for New Developments

10.4.1 Across the borough it is desirable but not essential to reduce the consumption as water supply is not currently perceived to be a key constraining factor for growth. However, consideration of the wider water cycle and links, i.e. the direct correlation between water consumption and the water sent to STW along with discharge from the STW, make it relevant and pertinent to consider the reducing water demand within new developments.

10.4.2 It is possible to reduce demand to less than 105 l/p/d by minimising water demand through the specification of low flow and efficient water fittings and/or appliances. It is not necessary to implement recycling or reuse in order to achieve this target, however under WAT2, an additional non-mandatory credit is given for the provision of a rainwater butt for external irrigation requirements. Therefore, water butts should installed at every property where possible.

10.4.3 The following BRE Water Demand Calculator (Table 7) shows the specific fitting requirements in order to reduce water demand to less than 105 l/person/day. It does not include efficient appliances and therefore uses the default figures for these. It also does not include recycling or reuse.

Table 10 Potential Code Level 4 potable water demand (less than 105 l/p/d – 3 credits)

The Water Calculator for New Dwellings					
Installation Type	**Unit of measure**	**Capacity/ flow Rate**	**Use factor**	**Fixed use (litres/ person/ day)**	**Litres/ person/day**
WC (single flush)	Flush volume (litres)		4.42	0.00	0.00
WC (dual flush)	Full flush volume (litres)		1.46	0.00	0.00
	Part flush volume (litres)		2.96	0.00	0.00
WCs (multiple fittings)	Average effective flushing volume (litres)	3.06	4.42	0.00	13.53
Taps (excluding kitchen taps)	Flow rate (litres/ minute)	6.00	1.58	1.58	11.06
Bath (where shower also present)	Capacity to overflow (litres)	150.00	0.11	0.00	16.50
Shower (where bath also present)	Flow rate (litres/ minute)	8.00	4.37	0.00	34.96
Bath only	Capacity to overflow (litres)		0.50	0.00	0.00
Shower only	Flow rate (litres/ minute)		5.60	0.00	0.00
Kitchen sink taps	Flow rate (litres/ minute)	8.00	0.44	10.36	13.88
Washing machine	Litres/kg dry load	8.17	2.10	0.00	17.16
Dishwasher	Litres/place setting	1.25	3.60	0.00	4.50
Waste disposal unit	Litres/use	0.00	3.08	0.00	0.00
Water softener	Litres/person/day	0.00	1.00	0.00	0.00
		Total calculated use (litres/person/ day)			111.59
		Normalisation factor			0.91
		Total water consumption (litres/person/day)			101.55

10.4.4 Based on the above example, in order to reduce demand to less than 105 l/person/day, the following water efficient fittings would be required.

- Efficient dual flush 4/2.6 litre WCs
- Low flow showers at around 8 l/min
- Low flow/Aerator taps in bathrooms at around 6 l/min

- Low flow kitchen taps at 8 l/s
- Efficient (smaller) baths typically no bigger than 150 litres to the overflow

10.4.5 Efficient appliances can be specified to further reduce demand. However; if bathroom and kitchen fittings are carefully selected, it is possible to achieve without the extra expense of providing appliances. The above calculations are based on default figures where appliances are not provided by developers.

10.5 Leakage Control

10.5.1 Water companies have to meet leakage targets set by Ofwat related to economic level of leakage. The EA expectation is that companies will continue to strive for higher standards and use new technology to drive leakage down further in future, especially where water resources are scarce. Government states that it does not expect water companies to allow leakage to rise.

10.5.2 The SSW Water Resources Plan made a target in line with the Government expectations to maintain the level of leakage and therefore not allow wastage from the pipes to increase.

10.5.3 Given that about 25% of all water supply is lost to leakage across the UK, more effort at a strategic scale by SSW at property level scale through education would be of benefit.

10.6 Summary

10.6.1 A tap left running for just 15 minutes, the time it takes to brush your teeth seven times, could use the same amount of water an efficient house uses in a day. By educating water users, a significant reduction in water demand could easily be made.

10.6.2 Demand management could be seen as an alternative to the sourcing of new water supplies. By reducing the current demand by 25% on 1,000 dwellings, 250 new dwellings could be supplied without increasing the quantity of water required. Therefore the impact of the management of existing demand should not be underestimated as a method for accommodating future growth.

11 Sustainable Drainage Systems

11.1 Introduction

11.1.1 All new development as well as most older urban areas have a positive drainage systems. It is now known that these systems have led to vast changes of how out small streams operate often leading to various forms of local flooding.

11.1.2 Sustainable Drainage Systems (SUDS) have the potential to reduce the surface water which requires discharge to the sewer network either through the preferential use of infiltration or attenuation and treatment prior to discharge to a surface watercourse. This will reduce the frequency of Combined Storm Overflows (CSO) operating as well as reducing the loading at the STW which will also improve the quality of the waterbodies in accordance with the WFD. The use of SUDS within surface water strategies for the development sites will also increase the water quality and reduce the flood risk within the receiving water body.

11.1.3 Within new developments, the incorporation of a suitably designed drainage system will be necessary in order to mitigate the risk of surface water and overland flooding as well as the risk posed by the overloading of local sewers and watercourses. Such a system should ideally be based upon Sustainable Drainage principles aimed at simulating natural processes and mitigating the impact of polluted surface water runoff upon the environment.

11.1.4 Not only should SUDS be designed to ensure that the surface water system for developments attempts to replicate the greenfield regime (i.e. attenuation at source), they will also increase the water quality through various treatment approaches. However, it is important within the design of these systems to give appropriate consideration of safe exceedence flows. For example, to account for the predicted impact of climate change and possible blockages.

11.1.5 Moreover, full advantage should be made of the opportunities for environmental enhancement posed by the utilisation of these systems. Proposed SuDS schemes should also consider operation and maintenance issues. The system should be robust in design in order to prevent blockages, allow ease of maintenance and reduce long term maintenance costs. Moreover, a suitable maintenance scheme should be proposed although the operation of the system should not be overly reliant upon maintenance being carried out.

11.1.6 It is essential to consider source control within the surface water drainage proposals; techniques which aim to manage the surface water at or close to the receiving surface should be utilised as widely as possible. For example, paved surfaces (e.g. car parks and access roads) should be of permeable construction allowing water to be stored prior to discharge. Other areas should ideally be drained using a network of grassed swales which will serve to improve the quality of the surface water and reduce the flow rate, whilst directing it to the attenuation area or discharge point.

11.1.7 Furthermore, it is recommended that rainwater re-use schemes be utilised, such as, rainwater harvesting for domestic use, such as toilet flushing, as well as the encouragement of the use of water butts and rainwater storage tanks.

11.1.8 Further source control techniques would include the installation of green roofs where practical. Incorporation of such measures would serve to greatly reduce the volume of surface water requiring discharge, reduce water demand, and would also further satisfy the Code for Sustainable Homes.

11.1.9 Soil maps for East Staffordshire indicate the majority of the area possesses a variable to negligible permeability. The permeability of the subsoil beneath a proposed development site influences the range of applicable techniques; permeable soils lend themselves to the application of infiltration

based SuDS whilst the application of a SuDS system to a site with a soil of low permeability will necessitate the presence of a watercourse in which to discharge attenuated flows. As the soil maps are based upon a coarse data set as they cover a wide area, site specific geo-environmental testing will be required to inform the selection and design of the drainage system.

11.1.10 However, in the absence of a watercourse, an agreement could be possible with the surface water regulating authority to discharge attenuated flows into a nearby surface water drain. Within an assessment of the feasibility of SuDS for a development site, it is recommended that an infiltration test be conducted.

11.1.11 Depending upon the proposed catchment and estimated surface water runoff pollutant load, the application of SuDS, especially those based upon infiltration, must be done so with care, especially within areas designated as Source Protection Zones (SPZ). Within East Staffordshire, there are several areas designated as SPZs which could affect the proposed development sites. SuDS schemes serving these catchments must fully integrate the management train concept and be lined in the upper stages (i.e. where the pollutant load is likely to be at its highest) in order to minimise the potential for pollutant laden surface water to infiltrate the ground.

11.1.12 The shape and size of the zones depends upon the condition of the ground, how the groundwater is removed and other environmental factors. The three zones are defined as below:

- **Zone 1 (Inner protection zone)** - Any pollution that can travel to the borehole within 50 days from any point within the zone is classified as being inside zone 1. This applies at and below the water table. This zone also has a minimum 50 metre protection radius around the borehole. These criteria are designed to protect against the transmission of toxic chemicals and water-borne disease.
- **Zone 2 (Outer protection zone) -** The outer zone covers pollution that takes up to 400 days to travel to the borehole, or 25% of the total catchment area – whichever area is the biggest. This travel time is the minimum amount of time that we think pollutants need to be diluted, reduced in strength or delayed by the time they reach the borehole.
- **Zone 3 (Total catchment) -** The total catchment is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.

11.2 The SuDs Approving Body (SuDS Adoption)

11.2.1 Section 32 Schedule 3 to the Flood and Water Management Act (2010), requires construction work with drainage implications to have its drainage systems for managing surface runoff approved before construction may begin. Upon implementation of this Section a SuDS Approving Body (SAB) will need to be established within Staffordshire County Council as LLFA for the borough.

11.2.2 In order for drainage applications to be approved, the SAB must ensure that the applicant has designed the SuDS in accordance with the National Standards. Once approved, the SAB must adopt and maintain those SuDS that are functioning properly and serve more than one property.

11.2.3 At the time of writing the guidance from Defra is that the National Standards will be published and commenced on 1 April 2014.

11.2.4 The Government are currently considering phasing in the SAB duties starting with different development thresholds. This is likely to be for the categories outlined below that do not have a valid planning application on the commencement date:

- Large-scale major development of 200+ dwelling houses
- Major development of 10+ dwelling houses
- Minor development of 1+ dwelling houses

- All development with drainage implications (includes permitted development)

11.2.5 These options include any development with a footprint of more than 100m^2.

11.2.6 The SAB must determine an application for approval within 12 weeks where it relates to major development or a county matter and within 7 weeks for other applications. Both of these limits are one week less than those under the planning system. These timescales will need to be confirmed following Defra's review of the consultation responses.

11.3 Approval Processes

11.3.1 Developers are strongly encouraged to have pre-application discussions with the SAB to enable the best drainage plan for the area and development to be prepared.

11.3.2 The SAB must consult the statutory consultees (Severn Trent Water, the Environment Agency, the highway authority and the Canals and Waterways Trust (formerly British Waterways), they are likely to have at least 21 days in which to respond to the SAB. This response period and responses will need to be managed.

11.3.3 The SAB will need to consider the responses from the statutory consultees, review the drainage strategy to ensure it complies with the national and any local standards, is appropriate for the site, can easily and cost effectively be maintained as well as performing as indicated.

11.3.4 It is likely that applications to the SAB could be through one or two routes:

- Direct to the SAB
- Via the LPA, in which case the LPA must consult the SAB in determining the application for planning approval.

11.3.5 The SAB's decision on the drainage plan is independent of the LPA's decision on planning permission.

11.3.6 To ensure that construction works are not taking place without SAB permission, and that the SuDS features are being constructed as agreed, some site/as built inspections will be required to ensure that the LLFA do not become liable for improving SuDS features, which do not perform as intended and agreed.

11.3.7 Where works are being undertaken without SAB permission or do not comply with the agreed design the SAB/LPA can undertake enforcement to stop works or rectify the constructed features.

11.3.8 The SAB will be required to adopt and maintain SuDS systems which are constructed and function in accordance with the SAB approval to ensure functional drainage over the life of the development. However the SAB will not be responsible for the drainage and maintenance of publicly maintained roads which falls to the highway authorities. However, the LLFA may choose to merge these roles for the applicable highways.

11.3.9 The SAB will also need to arrange for all SuDS on private land, eligible for designation, to be designated as a flood risk feature. This means that the SuDS may not be altered, removed or replaced without the consent of the designating authority. (Further detail provided in the Upcoming/Outstanding elements required to comply with legislation section).

11.3.10 The SuDS and the different types of SuDS measures available should be assessed in accordance with the National Standards and CIRIA C697 until Staffordshire County Council as the LLFA have developed local guidance.

12 Conclusions

12.1.1 This study shows that in general East Staffordshire is in a good position to accommodate growth. There are local limiting factors to many of the development sites, but as outlined in this WCS, many of these are already being addressed by SSW and ST. These will, however, have an effect on the timing of growth, especially with regards to flood risk mitigation measures.

12.2 Constraints Matrix

12.2.1 A constraints matrix has been prepared to summarise the constraints to the development of the preferred sites in terms of the three main areas detailed within this Water Cycle Study (i.e. flood risk, water supply and waste water disposal). The constraints matrix is provided in Table 11which adopts the following colour coded approach:

	Low levels of development constraints in terms of flood risk/water resources/quality and waste water
	Medium levels of development constraints in terms of flood risk/water resources/quality and waste water. This may involve minor infrastructure improvement/mitigation measures
	Major levels of development constraints in terms of flood risk/water resources/quality and waste water. This may involve major infrastructure improvement/mitigation measures
	Information not currently available, will be addressed through an addendum to this WCS

Table 11 Preferred Sites Development Constraint Matrix

Description	Overall Flood Risk	Water Supply	Foul Drainage
Pirelli			
Branston Depot			
Bargates			
Branston Locks			
Harehedge			
JCB			
West of Uttoxeter			
Stone Road			
South of Tutbury (Tutbury)			
College Fields (Rolleston-on-Dove)			
Effinch Lane (Barton-under-Wood)			
Rocester			
Derby Road			
Coors – Middle Yard			
Beamhill			
Guinevere			
LSOB			
Brookside Rd			
Hazelwalls – site 1			
Hazelwalls – site 2			

12.2.2 The summary table indicates that flood risk is a significant issue for several locations, especially within Burton-upon-Trent as a large proportion of the proposed development land is classified as being at high risk. It may be possible to reduce the risk through the incorporation of a number of flood risk management measures have been suggested, such as ground raising and/or improving the drainage through the Ordinary Watercourses. An extension of the Burton flood alleviation scheme to the south of Burton would aid in reducing the high level of direct flood risk to the southerly development sites, although the results of overtopping and breach scenarios would have to be taken into consideration. This would be addressed during the preparation of a FRA for the site and impacts on third party land would need to be considered.

12.2.3 The summary table also indicates that water supply is less of a constraint than flooding. East Staffordshire has a comprehensive trunk water main network and SSW does not anticipate the supply of water being a limiting factor for development within the Borough. However, potential limitations are posed from the connection of developments to the trunk mains. Most of the core housing and employment sites are located on Brownfield land close to the main pipelines. The Greenfield sites to the west of Burton and on the outskirts of Uttoxeter are more problematic and will require the implementation of new infrastructure, in terms of both pipe lines and booster station upgrades.

12.2.4 The summary table also indicates that foul drainage also is less of a constraint than flooding. however foul drainage could be a significant constraint for the Branston Locks site. The capacity of the foul water sewers within Burton upon Trent is not thought to pose a significant constraint upon development on the whole. However, the capacity of the surface water sewers to the west of Burton,

in particular to the south of the town, is a limiting factor and will require a degree of infrastructure upgrading. To a degree this problem can be alleviated with the implementation of SUDS schemes. The Sewage Treatment Works have limited capacity in both Uttoxeter and Burton-under-Needwood, depending upon the exact development details and the magnitude of the incorporation of water reduction measures will influence the extent of any contributions required.

12.3 Preferred Strategy

12.3.1 The Burton upon Trent area does not have significant water infrastructure issues preventing development, although flood risk is a big consideration, this is detailed in the accompanying SFRA.

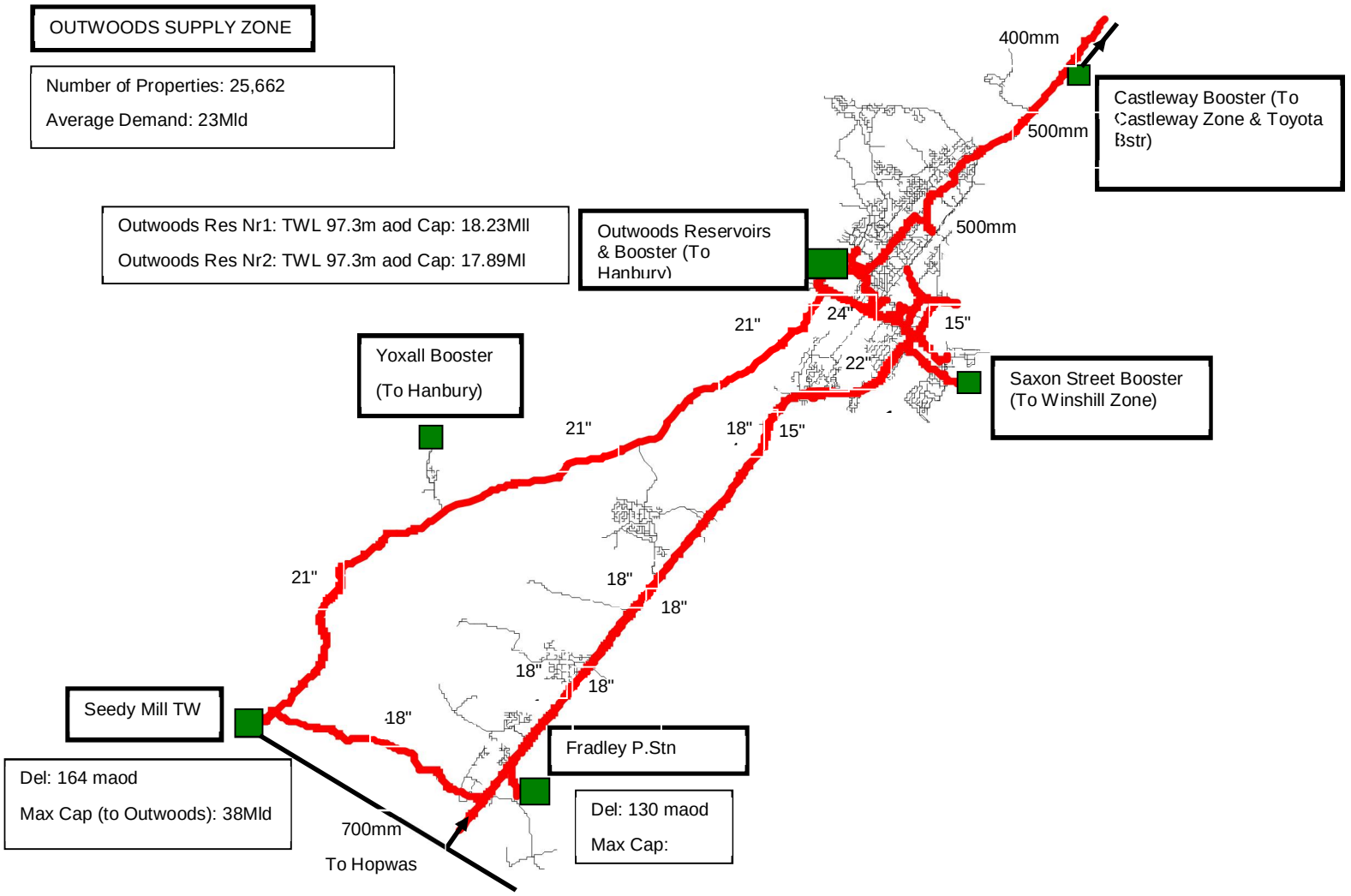
12.3.2 The surface water infrastructure is an issue to the south of the town, although this can be overcome with the improvement of the infrastructure and implementation of appropriate SuDS techniques.

12.3.3 The Branston Locks site is the only site where foul drainage conveyance infrastructure is a major constraint to development, although the treatment works associated with this catchment does have capacity available.

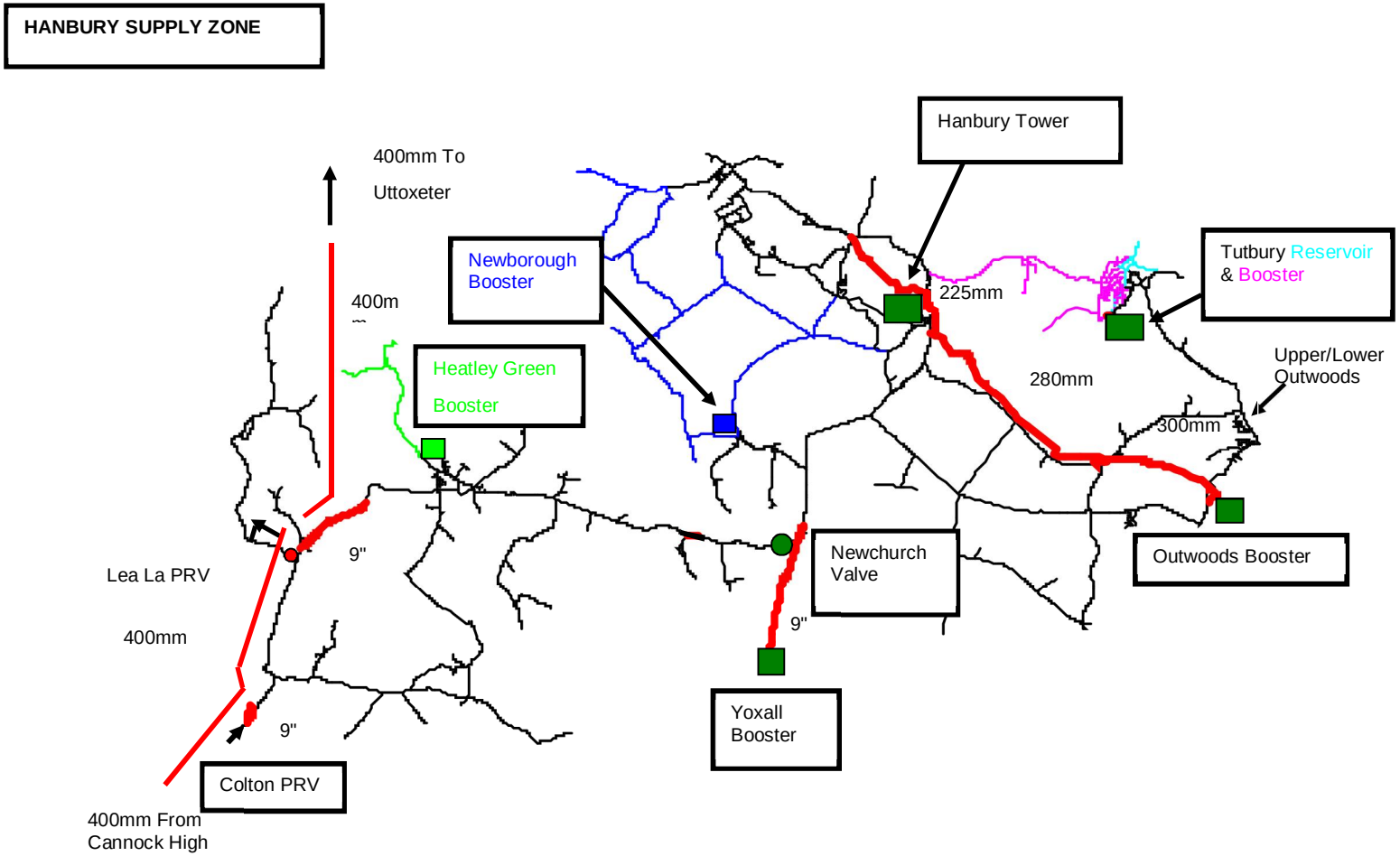
Appendices

Appendix A Schematic of Water Infrastructure

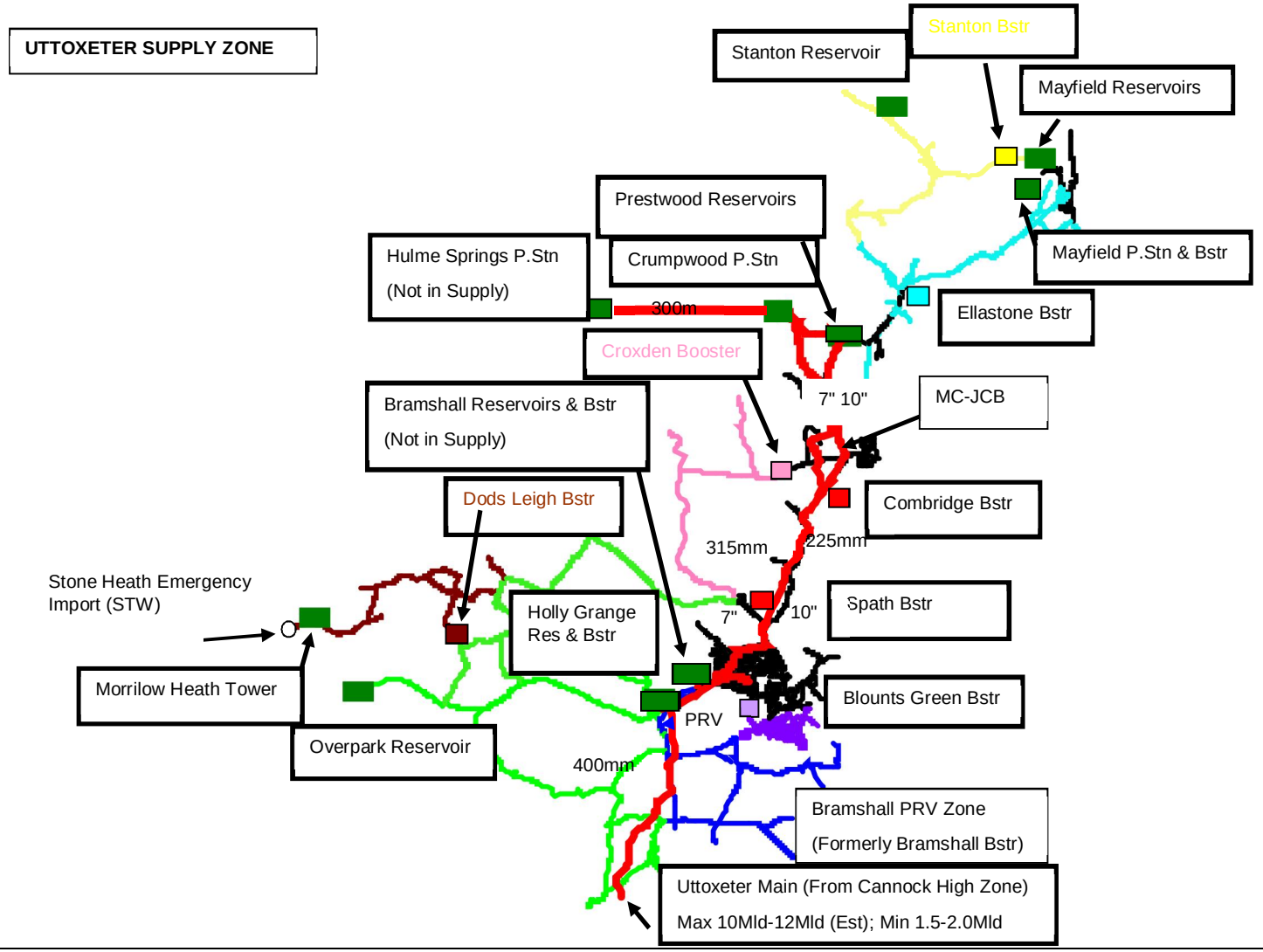
12.3.4 Burton upon Trent – main town and villages to south



12.3.5 Burton upon Trent (Outwoods North) and Rural East Staffordshire



12.3.6 Uttoxeter



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