



Redditch Borough Council and Bromsgrove District Council

Outline Water Cycle Study

Contract Ref: DP/SFRA/10

Final Report

May 2012



Redditch Borough Council and Bromsgrove District Council

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Final Report for Outline Water Cycle Study

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Glossary

Area of Development Restraint	Sites identified by the Councils and reserved to meet future housing and employment needs.
Asset Management Plan	Asset Management Planning is the process by which the Office of Water Services (Ofwat) determines 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.
Basin	A ground depression acting as a flow control or water treatment structure that normally is dry and has a proper outfall, but which is designed to detain storm water temporarily.
Brownfield Site	Any land or site that has been previously developed.
Catchment	The area contributing flow or <i>runoff</i> to a particular point on a watercourse.
Catchment Flood Management Plan	A strategic planning tool through which the Environment Agency seeks to work with other key decision-makers within a catchment to identify and agree policies for sustainable flood risk management.
Climate Change	Long-term variations in global temperature and weather patterns both natural and as a result of human activity.
Culvert	Covered channel or pipe that forms a <i>watercourse</i> below ground level.
Development	The carrying out of building, engineering, mining or other operations in, on, over or under land or the making of any material change in the use of any buildings or other land.
Enmained	Watercourse designated as a <i>Main River</i> .
Environment Agency	Government Agency charged with the protection of the environment.
Exception Test	The final process of the Planning Policy Statement 25 Sequential Test (TIERS 3 and 4). It is required when a development application is made for a site within Flood Zones 2 and 3 and no other site of lower flood risk is available.
Flood Defence	Flood defence infrastructure, such as flood walls and embankments, intended to protect an area against flooding, to a specified <i>standard of protection</i> .
Flood Event	A flooding incident characterized by its level or <i>flow hydrograph</i> .
Flood Hazard	The potential risk to life and potential damage to property resulting from flooding.
Flood Probability	The estimated probability of a flood of given magnitude occurring or being exceeded in any specified time period.
Flood Risk	An expression of the combination of the <i>flood probability</i> and the magnitude of the potential consequences or the <i>flood event</i> .

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 <i>flood risk</i> .
Flood Storage	The temporary storage of runoff or river flow in ponds, basins, reservoirs, or on the <i>floodplain</i> during a flood event.
Flood Zones	Flood Zones are defined in Table D.1 of Planning Policy Statement 25: Development and Flood Risk. They indicate land at risk by referring to the probability of flooding from river and sea, ignoring the presence of defences. The fluvial Flood Zones are usually derived using a two-dimensional hydraulic model into which a national coarse Digital Terrain Model is fed. However, in some instances, more detailed modelling can be undertaken, using refined information.
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.
Freeboard	The distance from the water level to the top of the channel's sides.
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 Local Planning Authority 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.
Growth Points	The Growth Points initiative was designed to provide support to local communities who wish to pursue large scale and sustainable growth, including new housing, through partnership with the Government.
Highway Authority	A local authority with responsibility for the maintenance and drainage of highways maintainable at public expense.
Strategic Housing Land Availability Assessments	Independent assessments of land availability which considers the options for meeting the Regional Spatial Strategy housing targets.
Hydrograph	A graph that shows the variation with time of the level or discharge in a watercourse.
Local Development Documents	Documents that set out the spatial strategy for local planning authorities which comprise development plan documents.

Local Development Framework	Framework which forms part of the statutory development plan and supplementary planning documents which expand policies in a development plan document or provide additional detail.
Local Planning Authority	Body responsible for planning and controlling development, through the planning system.
Main River	A watercourse designated on a statutory map of Main rivers, maintained by Department for Environment, Food and Rural Affairs (DEFRA).
Major Urban Areas	Urban areas which are identified for the focus of Urban Renaissance which will underpin the Regional Spatial Strategy.
Mitigation Measure	A generic term used to refer to an element of development design which may be used to manage 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.
Overland Flow Flooding	Flooding caused by surface water runoff when rainfall intensity exceeds the infiltration capacity of the ground, or when the soil is so saturated that it cannot accept any more water.
Pond	Permanently wet depression designed to retain storm water above the permanent pool and permit settlement of suspended solids and biological removal of pollutants.
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. This occurs if the ground is impermeable or saturated, or if rainfall is particularly intense.
Sequential Test	A risk-based approach to flood risk assessment in accordance with Planning Policy Statement 25, applied through the use of flood risk zoning, where the type of development that is acceptable in a given zone is dependent on the assessed flood risk of that zone and flood vulnerability of the proposed development.

Settlement of Significant Development	Towns identified for the focus of growth beyond the Major Urban Area. These are identified as being capable of balanced and sustainable growth, with development primarily aimed at meeting the economic and social needs of the area rather than attracting out-migration from the Major Urban Areas.
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 of local authority area during the preparation of a development plan.
Source Protection Zone	Defined areas showing the risk of contamination to selected groundwater sources used for public drinking water supply, from any activities that might cause pollution in the area.
Sustainable Drainage Systems	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.
Urban Renaissance	The objective of addressing the challenges facing urban areas in the region and to maintain viable and sustainable urban communities.
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

ADR	Area of Development Restraint
AMP	Asset Management Plan
ASR	Aquifer Storage and Recovery
BDC	Bromsgrove District Council
BREEAM	Building Research Establishment Environment Assessment Methodology
BSWE	Base Service Water Efficiency
CAMS	Catchment Abstraction Management Strategy
CDD	Cistern Displacement Devices
CDWF	Consented Dry Weather Flow
CEMP	Construction Environmental Management Plan
CFMP	Catchment Flood Management Plan
CSH	Code for Sustainable Homes
CSO	Combined Sewer Overflow
CDWF	Consented Dry Weather Flow
DAP	Drainage Area Plans
DCLG	Department for Communities and Local Government
Defra	Department for Food and Rural Affairs
DPD	Development Plan Documents
DSR	Distribution Storage Reservoir
DVA	Derwent Valley Aqueduct
DWF	Dry Weather Flow
EA	Environment Agency
EiP	Examination in Public
FRA	Flood Risk Assessment
FFT	Flow to Full Treatment
GCR	Geological Conservation Review

GIS	Geographic Information System
GWMU	Groundwater Management Unit
HPA	Headroom Performance Analysis
ID	Unique Identification
LA	Local Authorities
LBAPs	Local Biodiversity Action Plans
LDD	Local Development Documents
LDF	Local Development Framework
LGS	Local Geological Sites
LNR	Local Nature Reserve
LPA	Local Planning Authorities
MTP	Market Transformation Programme
MUA	Major Urban Areas
NCC	Nature Conservancy Council
NCR	Nature Conservation Review
NEP	National Environment Programme
NNR	National Nature Reserve
PCC	Per Capita Consumption
PE	Population Equivalent
PPS	Planning Policy Statements
PSG	Project Steering Group
RBC	Redditch Borough Council
RBMP	River Basin Management Plan
RPA	Return Period Analysis
RQO	River Quality Objective
RSA	Restoring Sustainable Abstraction
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal

SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SEEDA	South East England Development Agency
SELWE	Sustainable Level of Water Efficiency
SAC	Special Areas of Conservation
SFRA	Strategic Flood Risk Assessment
SFRA L2	Level 2 Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SPA	Special Protection Areas
SPS	Sewage Pumping Station
SPZ	Source Protection Zone
SSSI	Sites of Special Scientific Interest
SSW	South Staffordshire Water
STWL	Severn Trent Water Limited
STW	Sewage Treatment Works
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
SWS	Special Wildlife Site
TPS	Terminal Pumping Station
UKBAP	UK Biodiversity Action Plan
UKWIR	UK Water Industry Research
UWWTD	Urban Wastewater Treatment Directive
WCS	Water Cycle Study
WFD	Water Framework Directive
WMRSS DP2	Draft Phase Two Revision of the West Midlands Regional Spatial Strategy
WRMP	Water Resources Management Plan
WRZ	Water Resource Zone
WTW	Water Treatment Works

1 Introduction

1.1 General Overview

1.1.1 This Outline Water Cycle Study (WCS) has been undertaken for Bromsgrove District Council (BDC) and Redditch Borough Council (RBC). Both of these Councils' areas of responsibility lie in northeast Worcestershire (Figure 1-1).

1.2 Study Aim and Objectives

1.2.1 The aim of this study is to assess the water cycle capacity constraints to planned growth and development (housing and employment land - see Chapter 3) and to identify infrastructure requirements and mitigation measures, where appropriate. The study has been conducted in accordance with Environment Agency Guidance,¹ and provides an important part of the evidence base for the Local Development Documents (LDD) of both Councils.

1.2.2 The study objectives, which have been agreed with the Councils and which align with the requirements for an Outline WCS as presented in the Environment Agency Guidance, are as follows:

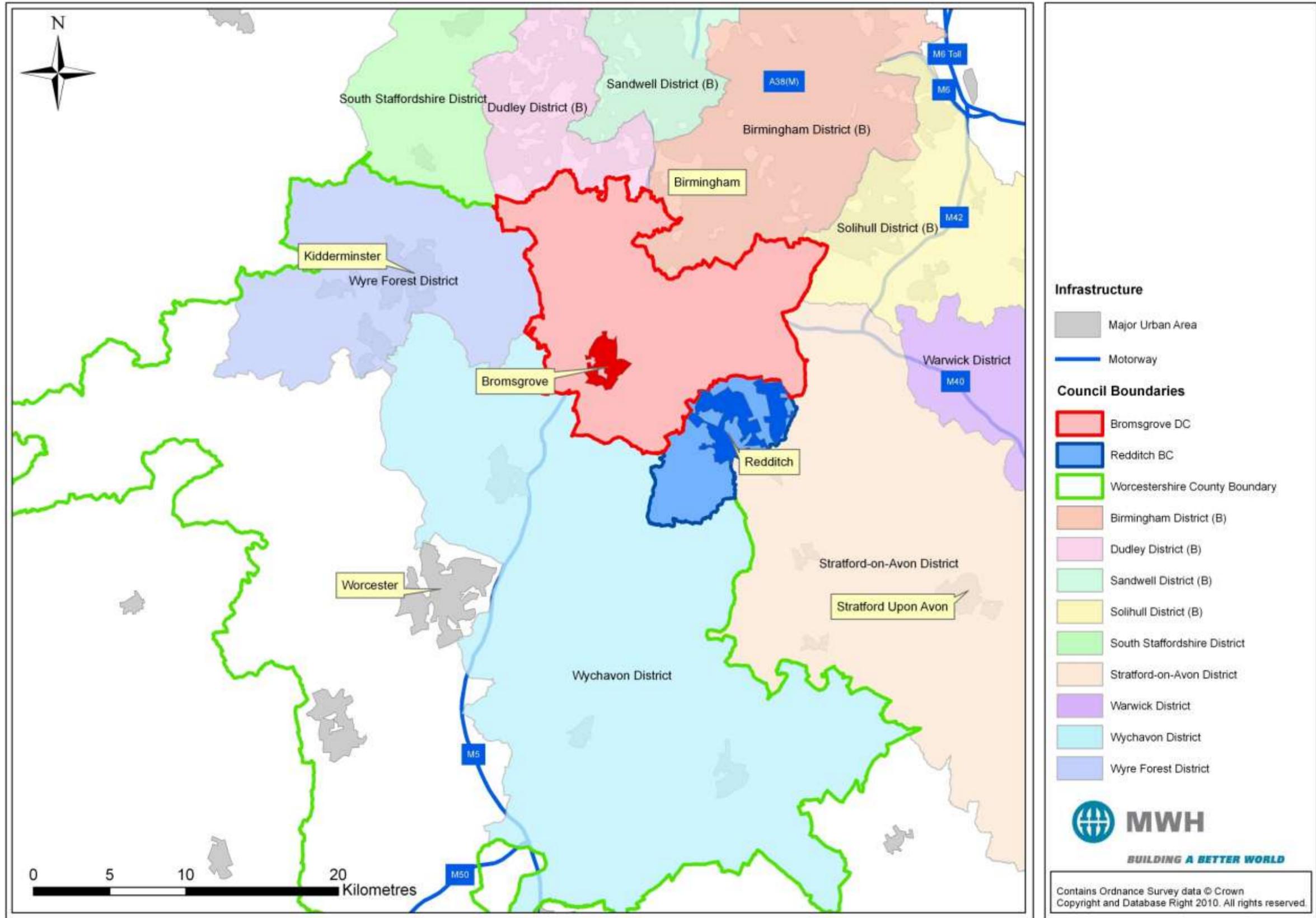
- To summarise the results and outcomes of the Level 2 Strategic Flood Risk Assessment (L2 SFRA)² – i.e. *can development be accommodated without increased flood risk?*
- To determine whether there is sufficient water supply and water infrastructure capacity to meet the proposed growth and development under average and peak demand conditions, and to propose demand management measures for the growth and development sites – i.e. *is there enough water?*
- To assess the wastewater collection and treatment capacity constraints to meet the proposed growth and development, to identify sustainable solutions, and to develop broad policy direction for the Core Strategy documents – i.e. *what constraints are there on increasing capacity?*
- To assess the capacity of the water environment to absorb additional effluent discharge, and the implications for wastewater treatment capacity and process upgrades to achieve water quality standards – i.e. *will there be a water quality impact?*
- To assess the impact of planned development on Sites of Special Scientific Interest (SSSI), Special Wildlife Sites (SWS) and Local Geological Sites (LGS) and to identify mitigation measures and policies to protect and enhance these sites - i.e. *are there other location specific environmental risks?*
- To summarise the study outcomes – i.e. what opportunities are there for changing the proposed development locations? / are there outstanding concerns about infrastructure provision that need to be addressed in a Detailed WCS?

¹ <http://www.environment-agency.gov.uk/research/planning/33368.aspx>

² Redditch Borough Council and Bromsgrove District Council (2011) *Level 2 Strategic Flood Risk Assessment – Draft Report*.

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Figure 1-1 Bromsgrove District and Redditch Borough



1.3 Scoping Level Water Cycle Study – January 2009

- 1.3.1 A Scoping Level WCS was completed for the Councils in January 2009.³ This study assessed the potential impacts of planned growth and development on the water cycle in Bromsgrove District and Redditch Borough. Although this Scoping Level WCS was carried out jointly between BDC and RBC, separate assessments were undertaken for the District and Borough.
- 1.3.2 The driver for the Scoping Level WCS was the growth and development targets presented in the Draft Phase Two Revision of the West Midlands Regional Spatial Strategy (WMRSS DP2) report.⁴ This required an assessment of the constraints and requirements that would arise from the proposed growth and development on the water cycle in the District and Borough. The WMRSS DP2 growth targets were as follows:
- an additional 2,100 new homes in Bromsgrove District, plus an additional 3,300 overflow from Redditch Borough, by 2026;
 - an additional 3,300 new homes in Redditch Borough, by 2026, with a further 3,300 in Bromsgrove District and / or Stratford-on-Avon District;
 - development of 21 ha of employment land in Bromsgrove District, plus an additional 24 ha 'overflow' from Redditch Borough, by 2026; and
 - development of 27 ha of employment land in Redditch Borough, by 2026, with a further 24 ha in Bromsgrove District and Stratford-on-Avon District.
- 1.3.3 Redditch town was cited as a 'Settlement of Significant Development' in the WMRSS DP2, and as such, was expected to accommodate a higher housing provision target than neighbouring areas in order to contribute to meeting the shortfall in land capacity of the Major Urban Areas (MUA). This would have a knock-on effect for Bromsgrove District which would need to accommodate additional 'overflow' growth as well as its own growth targets.
- 1.3.4 As the WMRSS DP2 had not been finalised prior to the completion of the Scoping Level WCS, two additional growth and development scenarios were assessed for the purposes of sensitivity testing. The first sensitivity test (Scenario 2) involved a 30% increase on the WMRSS DP2 Preferred Option growth and development figures, while the second sensitivity test (Scenario 3) represented an 'extreme assessment' (Table 1-1).

³<http://www.bromsgrove.gov.uk/cms/pdf/WCS%20-%20Final%20Report.pdf>

⁴http://www.wmra.gov.uk/Planning_and_Regional_Spatial_Strategy/RSS_Revision/RSS_Revision_Phase_2/RSS_Revision_Phase_2.a_spx

Table 1-1 Growth and Development Scenarios Assessed in the Scoping Level WCS

Planning Area (2006-2026)	Scenario 1 (Preferred Option)	Scenario 2 (Preferred Option +30%)	Scenario 3 (WMRSS DP2) Option 3
Bromsgrove			
Number of dwellings	2,100	2,730	7,200
Employment land (ha)	21	27	72
Redditch			
Number of dwellings	6,600	8,580	13,200
Employment land (ha)	51	68	99

1.3.5 The Scoping Level WCS concluded that the District's and Borough's:

- water resources were over-abstracted;
- demand exceeded supply;
- risk from flooding (mainly surface and sewer) was a significant concern;
- Sewage Treatment Works (STW) were generally at or approaching capacity; and
- sewer's lacked sufficient capacity.

1.3.6 The study concluded, however, that these issues were not 'show stoppers' provided sufficient water infrastructure investment was made. The study also concluded that resolving these issues would have an effect on the timing of growth and development, particularly with respect to flood risk mitigation measures.

1.3.7 The Scoping Level WCS recommended that further investigation was required to improve confidence in the study outcomes and recommendations.

1.4 West Midlands Regional Spatial Strategy Phase 2 Revision Panel Report for Examination in Public

1.4.1 Subsequent to the completion of the Scoping Level WCS, the WMRSS Phase 2 Revision Panel Report for Examination in Public (EiP)⁵ recommended a net increase of 1,900 houses in Bromsgrove District from that originally proposed in WMRSS DP2 and a net increase of 400 houses in Redditch Borough (Table 1-2). With respect to changes in employment land, the changes proposed by the Panel to '*Table 4 Employment Land Provision*' in the Phase 2 Revision Draft were to multiply the proposed rolling five-year figures by a factor of four rather than three. This increased the indicative long-term requirement for Bromsgrove District from 21 ha to 28 ha and for Redditch Borough from 51 ha to 68 ha. In addition, the Panel recommended for Redditch Borough, that 8 ha of the 17 ha rolling five-year reservoir should be provided within Stratford-on-Avon District. For the recommended indicative long-term requirement for Redditch Borough, the Panel recommended that at least 12 ha should be provided within Stratford-on-Avon District with 25 ha to be provided in Bromsgrove District, leaving a balance of 31 ha to be provided within Redditch Borough itself. However, the Panel

⁵http://www.wmra.gov.uk/Planning_and_Regional_Spatial_Strategy/RSS_Revision/RSS_Revision_Phase_2/RSS_Revision_Phase_2.a_spx

also noted that the location or locations for these allocations are to be agreed in the Core Strategies for Redditch Borough and Bromsgrove District.

Table 1-2 Housing Target Projections / Employment Land Required by the WMRSS Phase 2 Revision Panel Report for EiP Panel

Planning Area (2006-2026)	EiP Panel
Bromsgrove	
Housing (number of dwellings)	4,000
Employment (ha)	28
Redditch	
Housing (number of dwellings)	7,000 (3,000 overflow to Bromsgrove)
Employment (ha)	68
	31 within Redditch 25 overflow to Bromsgrove and 12 overflow to Stratford-on-Avon

1.5 Regional Spatial Strategies

- 1.5.1 The forthcoming Localism Bill will formally abolish Regional Spatial Strategies (RSS) once enacted, superseding CALA Homes' High Court victory in 2011⁶. Nevertheless, Local Planning Authorities (LPAs) are still under obligation to publish timetables and details of development schemes. Councils are also still required to publish five-year land supply and other targets at least annually.
- 1.5.2 The anticipated Localism Bill will still require LPAs to develop Core Strategies and other Development Plan Documents (DPD) which reflect local community aspirations and decisions on important issues such as housing and employment. However, LPAs are now mandated to establish the 'right level' of housing provision in their area, and to identify the long-term supply of housing land without regional housing targets. Accordingly, the Councils are currently considering the most appropriate level of housing for the District and Borough. However, the LPAs will still need to justify and defend their housing supply policies in line with Planning Policy Statement 3 (PPS 3): Housing⁷ during the Local Development Framework (LDF) examination process.

1.6 Planning Context

- 1.6.1 National planning documents which provide planning guidance to LPAs are referred to as Planning Policy Statements (PPSs). Local Planning Authorities must ensure that all planning documents consider these policies. These PPS consistently stress the importance of sustainability, resilience to climate change, water resource protection, biodiversity and geo-diversity conservation, flood risk mitigation and the use of Sustainable Drainage Systems (SuDS). This Outline WCS has been developed to align with the following PPSs:
- PPS 1: Delivering Sustainable Development⁸ (plus 2007 Supplement on Planning and Climate Change);⁹

⁶ <http://www.localism-agenda.com/the-bill/?gclid=COL6gOzjlawCFYEZ4Qodzksmg>

⁷ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement3.pdf>

⁸ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement1.pdf>

⁹ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppsclimatechange.pdf>

- PPS 3: Housing;¹⁰
- PPS 9: Biodiversity and Geological Conservation¹¹ and PPS 9 Practice Guide;¹²
- PPS 23: Planning and Pollution Control;¹³ and
- PPS 25: Development and Flood Risk¹⁴ and PPS 25 Practice Guide.¹⁵

1.6.2 In addition to the PPSs, the other national policies / regulations / guidance / recommendations that have informed this study are:

- The Code for Sustainable Homes (CSH)¹⁶ which requires different levels of performance (for social housing only) regarding water use, ranging from 120 litres per person per day (l/p/d) (Levels 1 / 2) to 80 l/p/d (Levels 5 / 6). Current best practice (without requiring water reuse of rainwater harvesting) is 105 l/p/d. The CSH requires all new social housing to be built to Level 3 from 2010.
- Changes to Part G of the Building Regulations¹⁷ issued in May 2009 by the Department of Community and Local Government (DCLG) now require water consumption in new dwellings not to exceed 125 l/h/d (regulation 17K). This also applies when a building is changed to residential use or where flats are added to new premises. Potential consumption must be calculated using the methodology described in 'The Water Efficiency Calculator for New Dwellings'. Further, Part H of the Building Regulations¹⁸ require surface water drainage solutions to consider connection to a soakaway or other 'adequate infiltration system' (SuDS), discharge to a river / water course or connection to a surface water sewer (or combined sewer if capacity exists) in that order of priority.
- The Building Research Establishment Environment Assessment Methodology (BREEAM)¹⁹ is a set of tools for measuring the sustainability of buildings (not residential housing), including water conservation measures.
- The Department for Food and Rural Affairs (Defra) Future Water²⁰ report sets out an aspirational water consumption target for all dwellings of 130 l/h/d by 2030.
- The Environment Agency's Water for People and the Environment²¹ sets out a water resources management strategy for England and Wales to 2050 and beyond. The strategy supports Defra's aspirational water consumption target of 130 l/h/d by 2030. To achieve this, new dwellings would need to meet the CSH Level 3 target and near universal meter penetration in all water stressed areas would be required by 2020. The strategy also recommends that planning applications for all significant new housing developments should be accompanied by a WCS.

¹⁰ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement3.pdf>

¹¹ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/147408.pdf>

¹² <http://www.communities.gov.uk/documents/planningandbuilding/pdf/143792.pdf>

¹³ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement23.pdf>

¹⁴ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/planningpolicystatement25.pdf>

¹⁵ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/324694.pdf>

¹⁶ http://www.planningportal.gov.uk/uploads/code_for_sust_homes.pdf

¹⁷ <http://www.stgbc.org.uk/Downloads/PartG2010.pdf>

¹⁸ http://www.planningportal.gov.uk/uploads/br/BR_PDF_ADH_2002.pdf

¹⁹ <http://www.breeam.org/>

²⁰ <http://www.defra.gov.uk/environment/quality/water/strategy/pdf/future-water.pdf>

²¹ <http://publications.environment-agency.gov.uk/pdf/GEHO0309BPKX-E-E.pdf>

- The Environment Agency's legislative and policy framework for managing and protecting groundwater, 'Groundwater Protection: Policy and Practice'²² (Part 4 is particularly relevant) outlines requirements for surface water drainage to mitigate any potential detrimental impact (including pollution) on aquifers.
- The Pitt Review²³ and subsequent Defra guidance²⁴ issued in response contain recommendations pertinent to LPA. Local Authorities will now need to co-ordinate and lead local flood management and are required to know the location of all local flood risk, the ownership and location of drainage assets and the needs and desires of the local community with respect to flood risk. Further, LPA will in future be responsible for adopting, maintaining and re-developing SuDS to increase their effectiveness and uptake.
- The Flood and Water Management Bill²⁵ published in 2009 encourages the uptake of SuDS through amending the automatic right to connect to sewers, and making provision for unitary and county councils to adopt SuDS for new developments and re-developments. Further, sewerage undertakers can be made statutory consultees to ensure development does not take place prior to proving sufficient infrastructure capacity.

1.6.3 At the LPA level, the findings of this Outline WCS will be used to ensure that best use is made of existing environmental and water infrastructure capacity. The findings will be used to inform local land use planning allocations, phasing of development and developer contributions in the emerging LDFs, as required by the Planning and Compulsory Purchase Act 2004. In particular, the Outline WCS will be used to inform the Councils LDDs. The impact of the proposed development on the water environment also forms a key part of the Strategic Environmental Assessment (SEA) and Sustainability Appraisal (SA), required under the Core Strategy process. Accordingly, each local planning authorities' Core Strategy must be:

- based on credible and robust evidence;
- be the most appropriate strategy and have considered all reasonable alternatives;
- be deliverable and flexible; and
- able to be monitored.

1.7 Structure of the Remainder of the Report

1.7.1 The remainder of the report is structured as follows:

- **Chapter 2** briefly describes the water environment and water cycle infrastructure in Bromsgrove District and Redditch Borough;
- **Chapter 3** presents the revised growth and development scenarios assessed as part of the Outline WCS;

²² <http://publications.environment-agency.gov.uk/pdf/GEHO1006BLMW-e-e.pdf>

²³ http://archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_full%20pdf.pdf

²⁴ <http://www.defra.gov.uk/environment/flooding/documents/risk/govtresptopitt.pdf>

²⁵ <http://services.parliament.uk/bills/2009-10/floodandwatermanagement.html>

- **Chapter 4** summarises the results and outcomes of the parallel report, the L2 SFRA. This presents answers to the question – *can development be accommodated without increased flood risk?*;
- **Chapter 5** presents the water supply and infrastructure assessment which answers the question – *is there enough water?* An approach to demand management is also proposed;
- **Chapter 6** presents the wastewater collection assessment which answers the question – *what constraints are there on increasing wastewater collection capacity?*;
- **Chapter 7** presents the wastewater treatment assessment which answers the question – *what constraints are there on increasing wastewater treatment capacity.* Chapter 7 also outlines the capacity of the water environment to absorb additional effluent discharge and the implications thereof for wastewater treatment capacity and process upgrades to achieve water quality standards. This answers the question – *will there be a water quality impact?*;
- **Chapter 8** outlines the potential impact on ecological and geological sites of importance and proposes mitigation measures thus answering the question – *are there other location specific environmental risks?*; and
- **Chapter 9** presents the overarching study outcomes, answering the questions – i) what opportunities are there for changing the proposed development locations?, and ii) are there outstanding concerns about water infrastructure provision that need to be addressed in a Detailed WCS?

2 Water Cycle Infrastructure and Water Environment

2.1 Bromsgrove District

- 2.1.1 The District of Bromsgrove is located within the County of Worcestershire and covers an area of 216.9 km². The District's population in 2001 (2001 census) was 87,837; 27,633 of whom were living in Bromsgrove town. The remainder of the District is rural with a number of larger villages including West Hagley, Romsley, Catshill, Marlbrook, Barnt Green, Alvechurch, Hollywood and Wythall.
- 2.1.2 Figure 2-1 shows the main towns, villages, roads, railways and STWs in Bromsgrove District.

2.2 Redditch Borough

- 2.2.1 Redditch Borough also lies within the County of Worcestershire. It covers an area of 54.3 km² and in 2001 (2001 census) had a population of 78,813; 93% of whom lived in Redditch town. The southern half of the Borough is predominantly rural, with a few smaller settlements (e.g. Astwood Bank and Feckenham). The northern half of the Borough contains the town of Redditch.
- 2.2.2 Figure 2-1 shows the main towns, villages, roads, railway and STWs in Redditch Borough.

2.3 Water Cycle Infrastructure – Water Supply

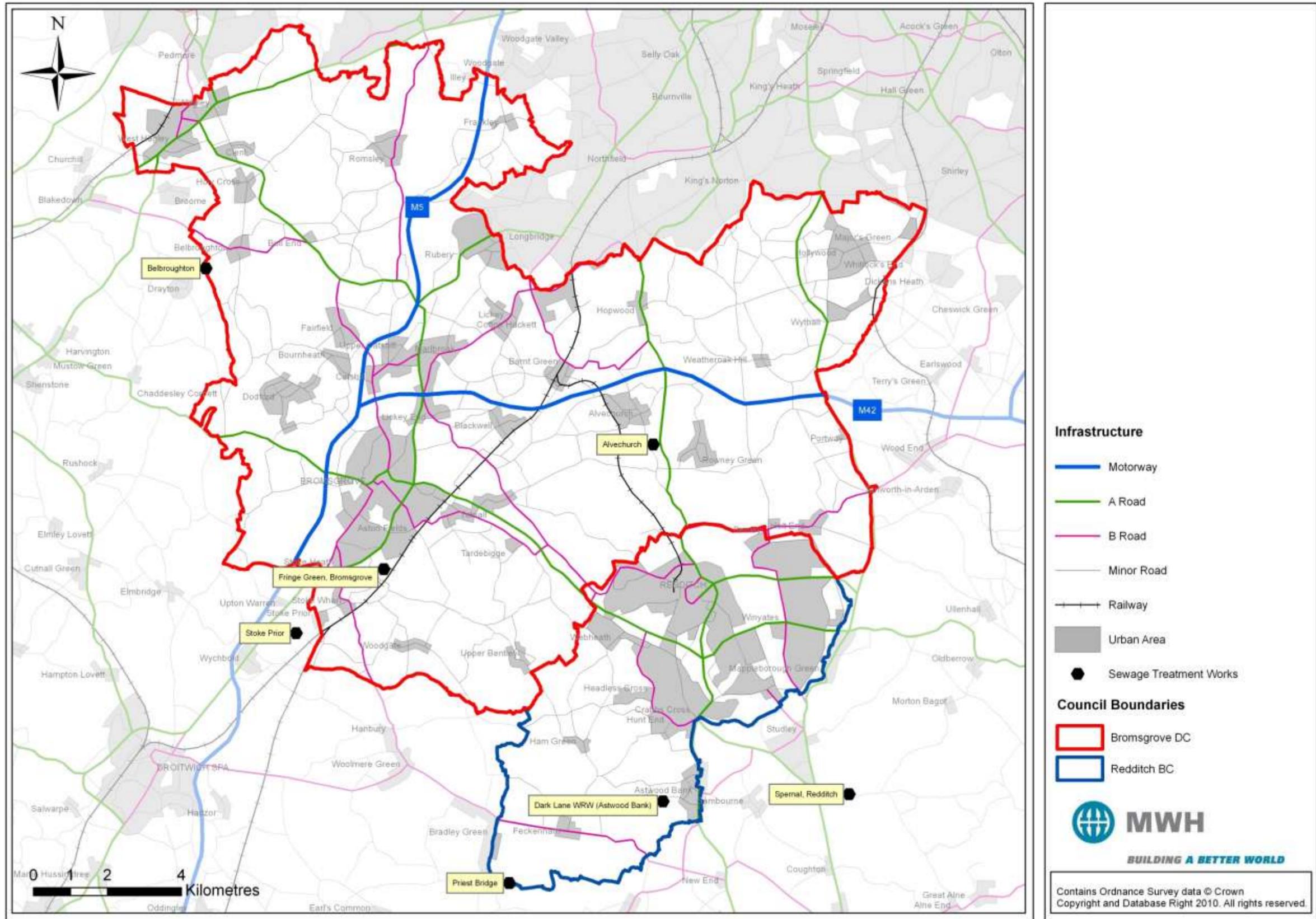
- 2.3.1 With the exception of a small area²⁶ to the north of Bromsgrove District, potable water is supplied to the District and Borough by Severn Trent Water Limited (STWL). Potable water is supplied through a network of water mains, as discussed in Chapter 5.
- 2.3.2 Water supply in the District and Borough is mainly from borehole sources. These wells abstract water from Triassic Sherwood Sandstones. These aquifers are generally robust to drought sequences because they have a high storage capacity and for the most part are not very sensitive to groundwater level variations. It is the longer term variations in rainfall and the complex interrelationship with water quality that drives the need for reduced or varied abstraction from these sources, rather than an occasional summer drought.
- 2.3.3 Supply is also sourced through STWL's strategic water grid which provides an increased level of security of water supply should there be issues of supply interruption from their main sources from the Triassic Sherwood Sandstones. This is discussed further in Chapter 5.

2.4 Water Cycle Infrastructure – Wastewater Collection

- 2.4.1 Publicly maintained wastewater collection within Bromsgrove District and Redditch Borough and is managed by STWL. There are, however, rural areas which are not connected to the public sewerage network.
- 2.4.2 Capacity exceedance (e.g. flooding, excessive operation of sewer overflows etc.) of piped sewerage systems has arisen due to the historical practice of discharging storm water to foul sewers. This problem has been exacerbated by the paving of front gardens and other permeable areas thereby increasing the volume and speed of surface water runoff to public sewers (both foul and surface water) which were not designed for this purpose. This is discussed further in Chapter 6.

²⁶ Includes the village of Romsley – South Staffordshire Water (SSW) supplies this area

Figure 2-1 Main Towns, Villages, Roads, Railways and STWs in Bromsgrove District and Redditch Borough



2.5 Water Cycle Infrastructure – Wastewater Treatment

- 2.5.1 All wastewater collected within the District and Borough is the responsibility of STWL. Wastewater from Bromsgrove District is treated within the District’s boundaries at Bromsgrove (Fringe Green) STW and Alvechurch STW and outside the District’s boundaries at Roundhill STW, Minworth STW, Stoke Prior STW and Belbroughton STW (Table 2-1). Wastewater treatment in the District is discussed further in Chapter 7. Figure 2-1 shows the location of the STWs that service the District.
- 2.5.2 Wastewater within Redditch Borough is treated within the Borough boundaries at Priest Bridge STW and at Astwood Bank (Dark Lane) STW. Wastewater is treated outside the Borough boundary at Sernal STW (Table 2-1). Wastewater treatment in the Borough is discussed further in Chapter 7. Figure 2-1 shows the location of these STWs.

Table 2-1 Sewage Treatment Works and Watercourses into which Effluent is Discharged for Bromsgrove District and Redditch Borough

Sewage Treatment Works	Watercourse
Treatment Within Bromsgrove District	
Bromsgrove, Fringe Green	Sugar Brook
Alvechurch	River Arrow
Treatment Outside Bromsgrove District	
Roundhill	River Stour
Minworth	River Tame
Stoke Prior	Hen Brook
Belbroughton	Hoo Brook
Treatment Within Redditch Borough	
Priest Bridge	Bow Brook
Astwood Bank (Dark Lane)	Doe Bank Brook
Treatment Outside Redditch Borough	
Sernal	River Arrow

2.6 Water Environment – Watercourses

- 2.6.1 The main water courses within the District and Borough that are potentially impacted by the proposed growth and development are presented in Figure 2-2.
- 2.6.2 There are three major watercourses that could be potentially impacted by the proposed development sites in Bromsgrove District. These are the River Salwarpe and its tributaries (Battlefield Brook, Spadesbourne Brook and Sugar Brook), Hoo Brook and Gallows Brook. The upper reaches of the rivers Arrow and Stour also have their source in Bromsgrove District. A number of smaller water courses are also potentially impacted by the proposed development, including tributaries of the River Cole, Blacksoils Brook and Hen Brook. The Worcester and Birmingham Canal also traverses the District and is potentially impacted by the proposed development.
- 2.6.3 There are two main watercourses that could be potentially impacted by the proposed development sites in Redditch Borough. These are the River Arrow and its tributaries (including Arrow Brook, Batchley Brook, Red Ditch, Blacksoils Brook, Ipsley Brook, Church

Hill Brook and Wharrington Brook) and Bow Brook and its tributaries / upstream sections (including Wixon Brook and The Wharrage).

- 2.6.4 Bob's Brook and the River Tame are potentially impacted outside the Borough and District boundaries.

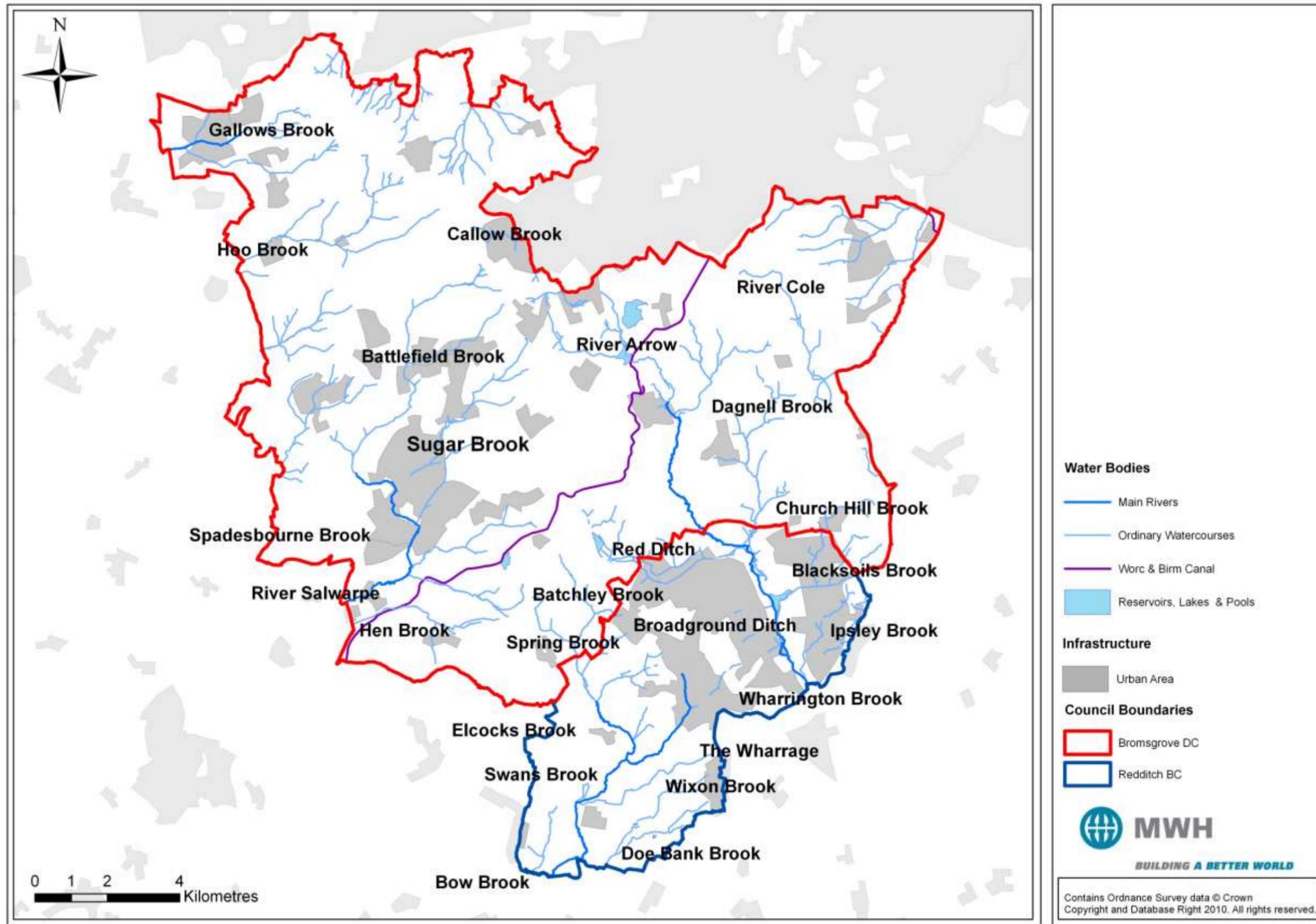
2.7 Water Environment – Water Supply Reservoirs

- 2.7.1 There are no water supply reservoirs within the District or Borough. There are, however, a number of balancing ponds, pools and storage areas. A very short section of the Stratford-on-Avon canal traverses the northeastern part of Bromsgrove District.

2.8 Water Environment – Ecological and Geological Sites of Importance

- 2.8.1 Redditch Borough contains no Ramsar Sites, Special Areas of Conservation (SAC), Special Protection Areas (SPA) or National Nature Reserves (NNR). There are 6 SSSI and 24 Special Wildlife Sites (SWS) within the Borough.
- 2.8.2 Bromsgrove District contains no Ramsar Sites, SAC, SPA or NNR. Two NNR are located immediately adjacent to the District boundary at Chaddesley Woods, to the west, and Fosters Green Meadows, to the south. Neither is within close proximity to proposed development sites. There are 14 (11 ecological and 3 geological) SSSI and 81 SWS (excluding the 2 newly proposed ones) within the District.

Figure 2-2 Main Watercourses in Bromsgrove District and Redditch Borough



3 Growth and Development

3.1 Introduction

3.1.1 To assess the capacity of water cycle infrastructure to meet proposed growth and development in Bromsgrove District and Redditch Borough, it is necessary to assume growth and development projections.²⁷ It is also necessary to assess whether there are sufficient development sites to accommodate the proposed growth and development.

3.1.2 The growth and development projections assessed in the Scoping Level WCS were presented in Chapter 1. However, as described earlier, the anticipated Localism Bill means that LPAs are now responsible for establishing the 'right level' of housing provision for their areas. They are also responsible for identifying the long-term supply of housing land in the absence of regional targets. Accordingly, the growth and development scenarios and projections assessed in this Outline WCS differ from those in the Scoping Level WCS. This chapter presents the growth and development scenarios and projections assessed in this Outline WCS.

3.2 Chapter Outline

3.2.1 The remainder of this chapter is structured as follows:

- Section 3.3 presents the growth and development scenarios considered in this study;
- Section 3.4 outlines the number of dwellings and area of employment land required to meet the growth and development scenarios outlined in Section 3.3 for the period to 2026 – i.e. the growth and development projections;
- Section 3.5 describes the existing development sites (as at April 2010) available to meet the requirements for employment and housing land to 2026 – i.e. sites available for development;
- Section 3.6 presents the area of housing land required to meet the number of projected dwellings to 2026 based on average housing densities – i.e. projected housing land required;
- Section 3.7 considers the housing and employment land shortfalls;
- Section 3.8 considers the additional development sites available to meet the housing and employment land shortfall; and
- Section 3.9 presents the chapter summary and conclusion.

3.3 Growth and Development Scenarios

3.3.1 The growth and development scenarios assessed in this study were agreed with the Project Steering Group (PSG) on 2 September 2010. For Bromsgrove District (Table 3-1) the following scenarios are considered:

²⁷ It should be noted, however, that the exact location of the final development sites will be dependent, in part, on the outcomes of numerous studies, including the Level 2 Strategic Flood Risk Assessment and this Outline Water Cycle Study

Scenario 1

- 4,000 dwellings to 2021, with a further 2,000 dwellings to 2026, a total of 6,000 dwellings to 2026; and
- 28 ha of employment land to 2026.

Scenario 2

- 4,000 dwellings to 2021, with a further 3,000 dwellings to 2026, a total of 7,000 dwellings to 2026; and
- 28 ha of employment land to 2026.

3.3.2 For Redditch Borough (Figure 3-1) the following scenarios are considered:

Scenario 1

- 3,000 dwellings to 2026; and
- 27 ha of employment land to 2026.

Scenario 2

- 7,000 dwellings to 2026; and
- 68 ha of employment land to 2026.

Table 3-1 Growth and Development Scenarios Assessed in this Outline WCS

Planning Area (2006-2026)	Scenario 1	Scenario 2
Bromsgrove		
Number of dwellings	6,000 (4,000 by 2021)	7,000 (4,000 by 2021)
Employment land (ha)	28	28
Redditch		
Number of dwellings	3,000	7,000
Employment land (ha)	27	68

3.3.3 The growth and development scenarios listed in Table 3-1 were utilised to compute annual housing requirements (number of dwellings) and annual land required for employment to 2021 and 2026 – the growth and development projections. These are described in Section 3.4 below.

3.4 Growth and Development Projections

3.4.1 The growth and development projections described below take into consideration the dwellings completed / committed for the period 2006 to 2010. For Bromsgrove District, 1,101 dwellings were completed / committed (Appendix 1). For Redditch Borough, 1,009 dwellings were completed / committed for the period 2006 to 2010 (Appendix 1).

3.4.2 The growth and development projections also take into consideration employment land completions and commitments. For Bromsgrove District, 27.36 ha of employment land has been completed / committed for the period 2006 to 2010 (Appendix 1); for Redditch Borough, for the same period, 12.56 ha of employment land has been completed / committed (Appendix 1).

- 3.4.3 The number of dwellings and employment land required to meet the growth and development scenarios listed in Table 3-1 for Bromsgrove District are presented in Figure 3-1 and Figure 3-2 respectively.
- 3.4.4 Similarly, the number of dwellings and employment land required for employment to 2026 for Redditch Borough are presented in Figure 3-3 and Figure 3-4 respectively.
- 3.4.5 The following annual requirements apply to Bromsgrove District:
- 263.5 new dwellings from 2010 to 2021; thereafter, 400 new dwellings every year between 2021 and 2026 – Scenario 1;
 - 0.06 ha of new employment land every year to 2026 – Scenario 1 and Scenario 2; and
 - 263.5 new dwellings every year from 2010 to 2021; thereafter, 600 new dwellings every year between 2021 and 2026 – Scenario 2.
- 3.4.6 The following annual requirements apply to Redditch Borough:
- 132.7 new dwellings every year to 2026 – Scenario 1;
 - 1.0 ha of new employment land every year to 2026 – Scenario 1;
 - 399.4 new dwellings every year to 2026 – Scenario 2; and
 - 3.7 ha of new employment land every year to 2026 – Scenario 2.

Figure 3-1 Required Number of Dwellings for Bromsgrove District to 2026

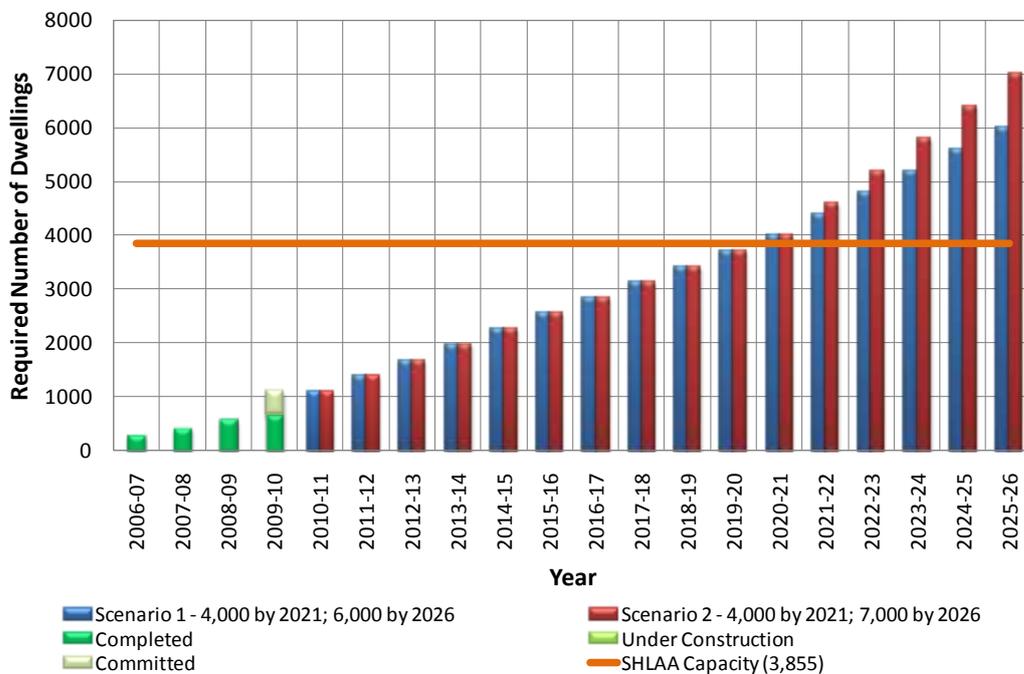


Figure 3-2 Projected Employment Land Required for Bromsgrove District to 2026

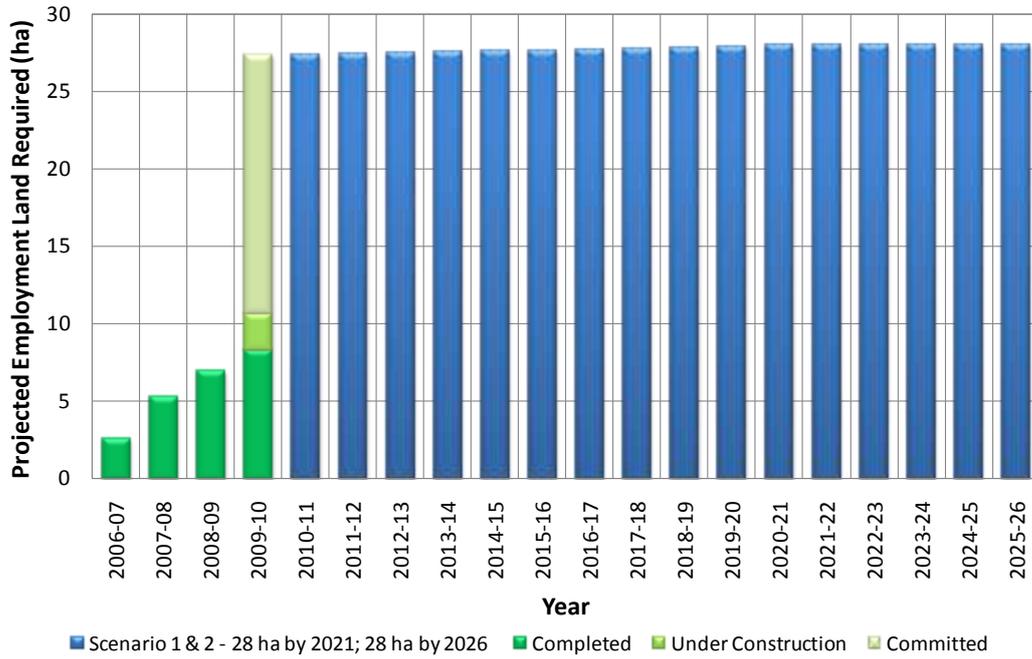


Figure 3-3 Required Number of Dwellings for Redditch Borough to 2026

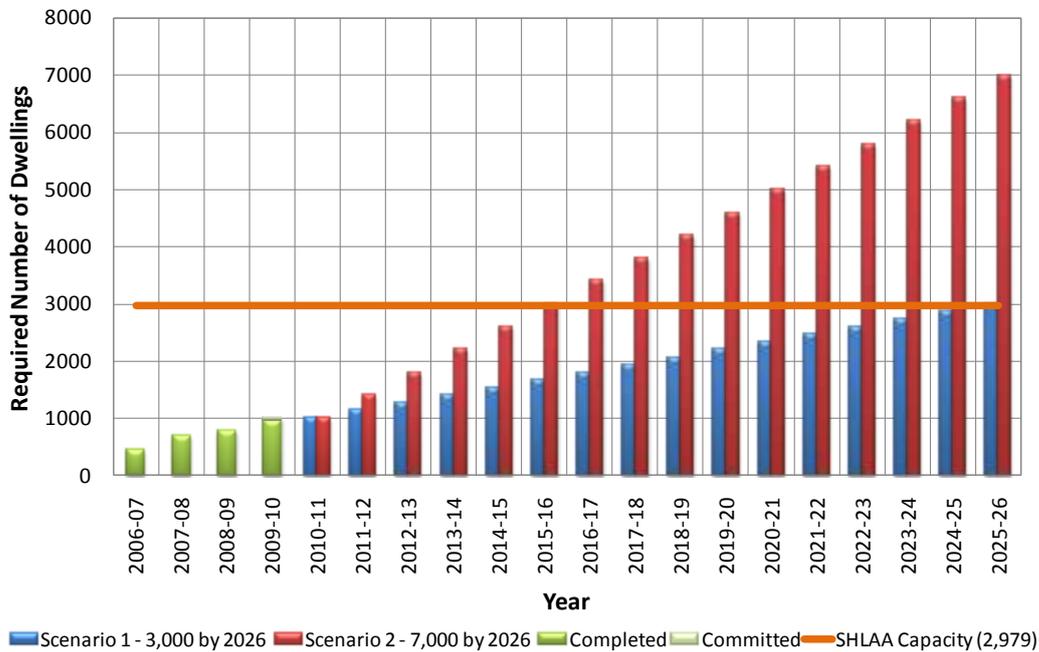
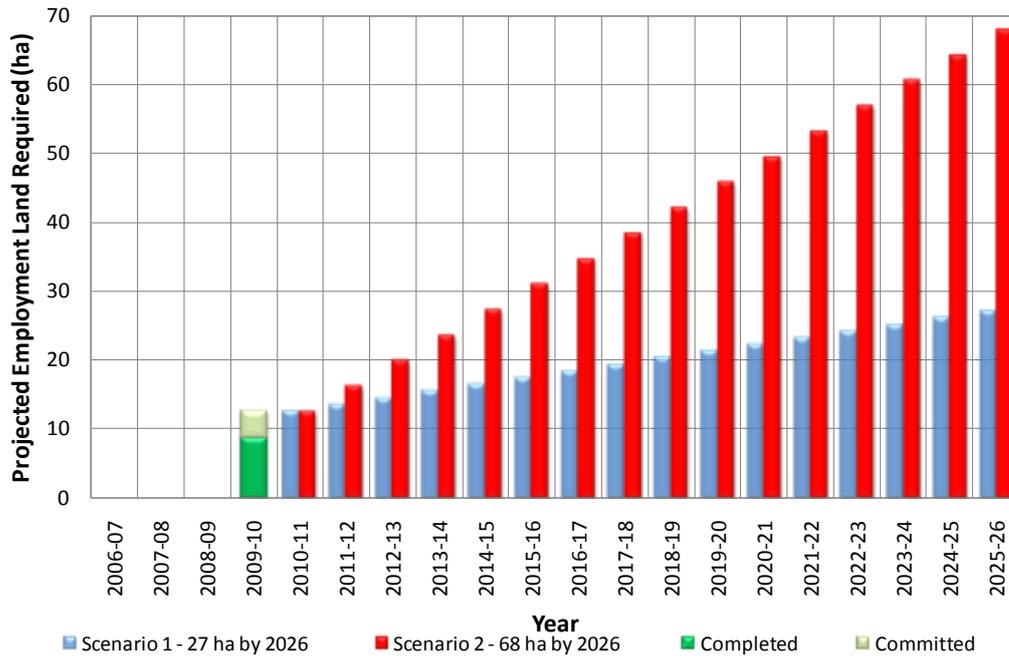


Figure 3-4 Projected Employment Land Required for Redditch Borough to 2026



3.5 Sites Available for Development

3.5.1 The Bromsgrove District Council Strategic Housing Land Availability Assessment (SHLAA)²⁸ identified potential housing development sites within the District. The annual Employment Land Availability Study shows the employment land supply status within the District. These development sites have been categorised, given a Unique Identification (ID) reference and mapped in a Geographic Information System (GIS). Table 3-2 summarizes this information.²⁹ A map of the potential residential development sites and sites allocated for employment as at April 2010 is presented in Figure 3-5.

3.5.2 Appendix 2 presents information on the individual potential development sites for Bromsgrove District.

Table 3-2 Potential Development Sites in Bromsgrove District

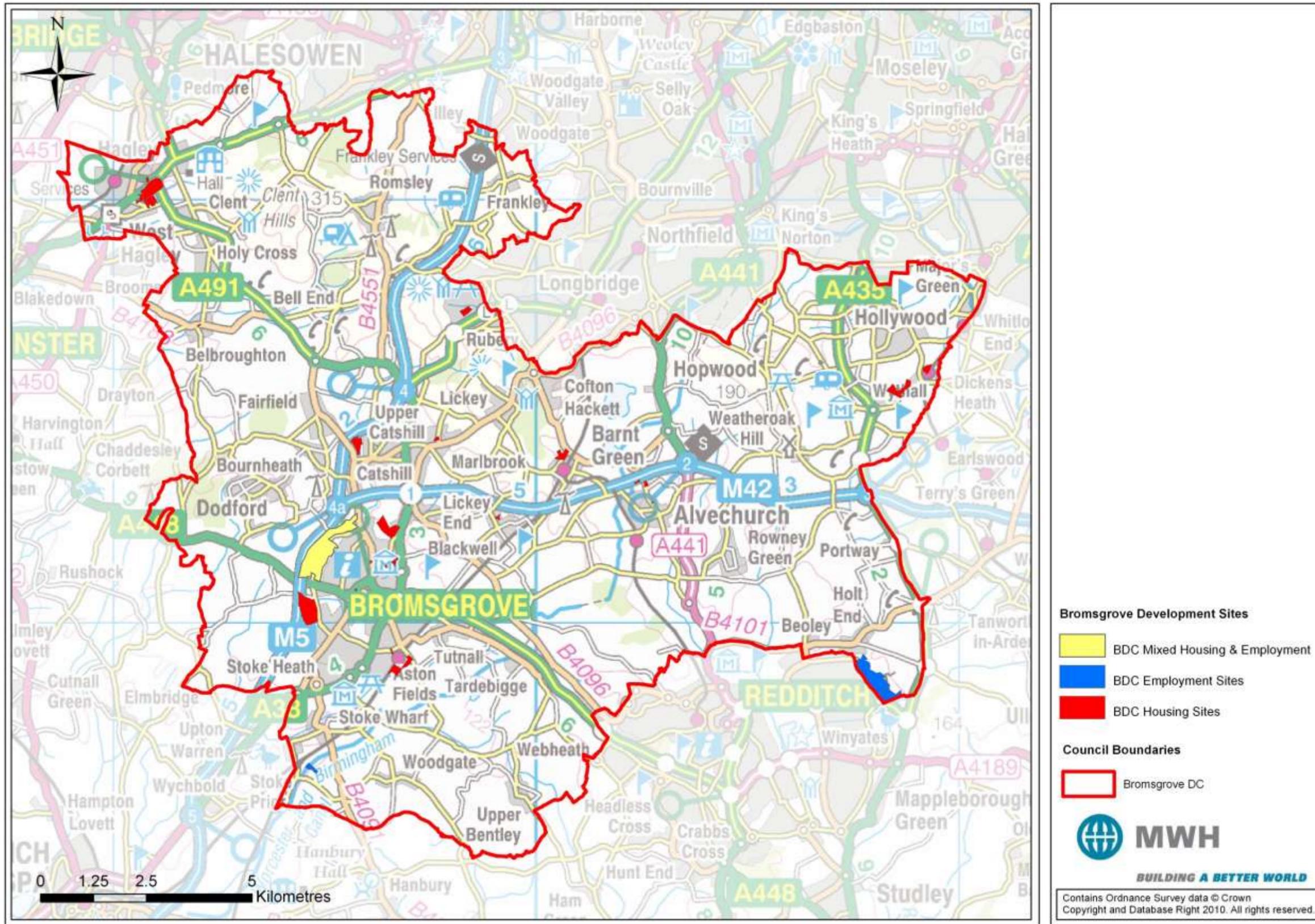
Description	Designated Use	Unique ID	Total Area (ha)
Employment Land	Employment Development ³⁰	Site 7 & part of BDC20	6.8
Residential Land	Residential Development	Unique BDC Reference Numbers	163.8

²⁸ <http://www.bromsgrove.gov.uk/cms/pdf/SHLAA.pdf>

²⁹ This includes housing completions, under construction and outstanding for Bromsgrove District. This information is presented in Appendix 1 for completeness

³⁰ Excludes sites identified at Ravensbank (Site 2 and Site 11) which are to be used to meet Redditch Borough’s employment land requirements

Figure 3-5 Potential Residential and Employment Development Sites as at April 2010 for Bromsgrove District



- 3.5.3 The Redditch Borough Council SHLAA³¹ and ‘Revised Development Strategy’³² reports outline potential development sites within the Borough as at April 2010. These are summarized in Table 3-3.³³ A map of the potential Residential and Employment development sites for Redditch Borough is presented in Figure 3-6.
- 3.5.4 Appendix 3 presents information on the individual potential development sites for Redditch Borough.

Table 3-3 Potential Development Sites in Redditch Borough

Description	Intended Use	Site Identification	Total Area (ha)
Employment Sites	Employment	EL	28.37
	Total Employment Area (ha)		28.37
Housing Sites (SHLAA)	Housing	Unique Reference Numbers	192.2
	Mixed Use (District Centre)	St2	2.5
		St4	1.7
	Employment	St8	0.5
Mixed Use	St10	4.6	

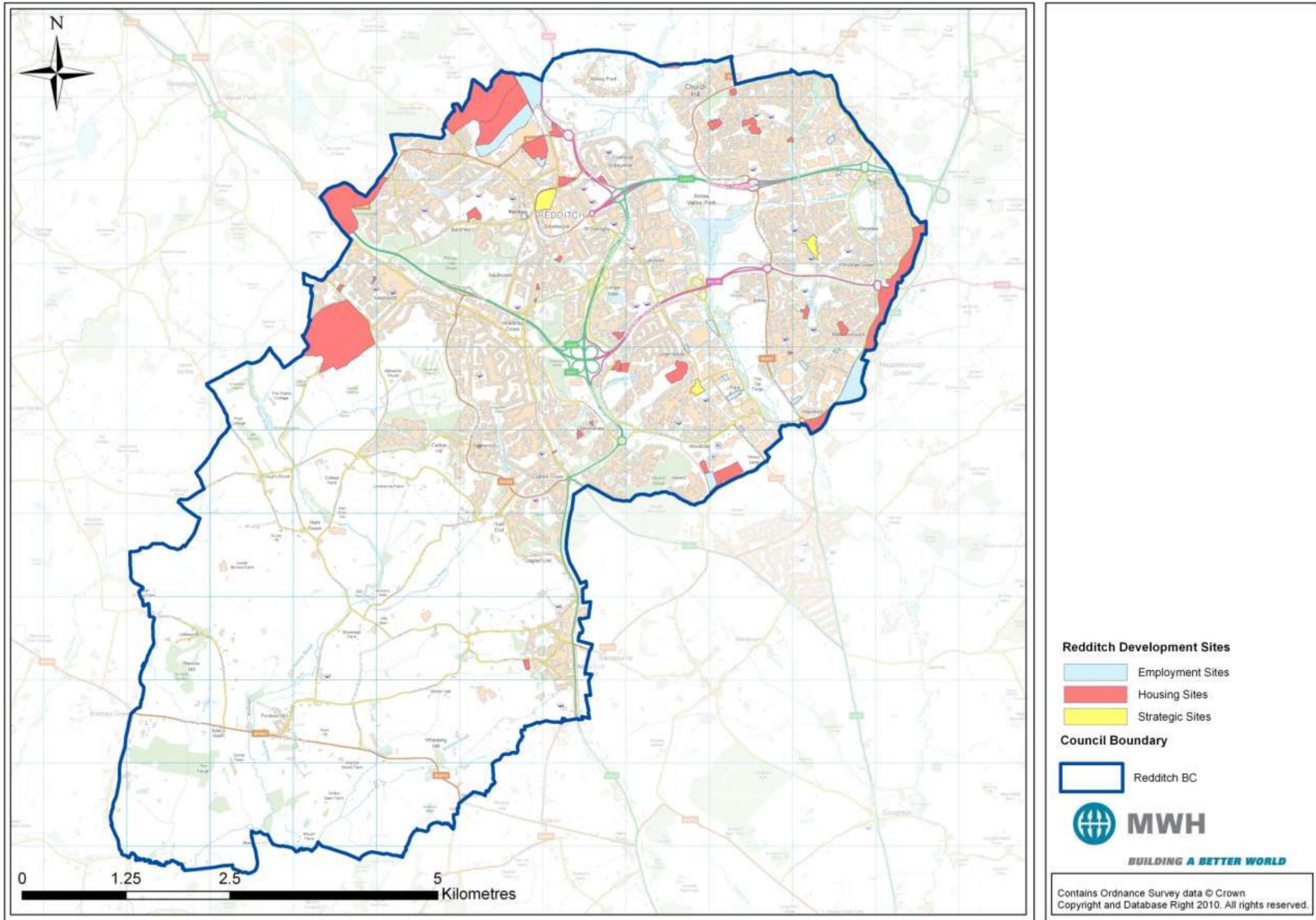
- 3.5.5 Bromsgrove District currently has 163.8 ha of residential land available for development (Table 3-2 and Appendix 1). Summation of the capacity values for residential land presented in the SHLAA report, which take into account site constraints, indicates there is capacity for 3,855 dwellings in Bromsgrove District (Appendix 1).
- 3.5.6 Redditch Borough currently has 192.2 hectares of residential land available for development (Table 3-2 and Appendix 1). Summation of the capacity values for residential land presented in the SHLAA report, which take into account site constraints, indicates there is capacity for 2,979 dwellings in Redditch Borough (Appendix 1). However, an additional 170 ‘Windfall Allowance’ dwellings are expected to arise from land unexpectedly becoming available, giving a total of 3,149 dwellings for Redditch Borough.
- 3.5.7 Bromsgrove District has 6.8 ha of land available for employment use (Table 3-2 and Appendix 1); Redditch Borough has 28.37 of land available for employment use (Table 3-3 and Appendix 1).

³¹ Strategic Housing Land Availability Assessment for Redditch Borough. Refreshed April 2010. (Unpublished)

³² <http://redditch.whub.org.uk/cms/pdf/PDCScore%20strat.pdf>

³³ This includes housing completions, under construction and outstanding for Redditch Borough. This information is presented in Appendix 1 for completeness

Figure 3-6 Potential Residential and Employment Development Sites as at April 2010 for Redditch Borough



3.6 Projected Housing Land Required

- 3.6.1 The Bromsgrove District SHLAA³⁴ assumes a development density of between 8.4 to 69.2 dwellings per hectare. However, as described in Section 3.5, the SHLAA has recommended that 3,855 dwellings be built on the 163.8 ha of available land; this gives an average density of 24 dwellings per hectare. Accordingly, this assessment has assumed a development density of 24³⁵ dwellings per hectare for the additional projected housing land required for Bromsgrove District.
- 3.6.2 The Redditch Borough SHLAA³⁶ requires residential development to be between 30 and 50 dwellings per hectare; within the town centre the requirement is 70 dwellings per hectare. Redditch Borough Council has used a conservative estimate of 30 dwellings per hectare in the SHLAA where there is not a specific site capacity associated with a scheme. However, as described earlier, the SHLAA has recommended that 2,979 dwellings be built on the 192.2 ha of available land; this gives an average net density of 16 dwellings per hectare. The 'Windfall Allowances' have not been included in this calculation because as stated in Paragraph 3.5.6, they will come from unexpected available land. Accordingly, this assessment has assumed a development density of 16³⁷ dwellings per hectare for the additional projected housing land required for Redditch Borough.
- 3.6.3 The application of a housing density of 24 dwellings per hectare results in the requirement for 123 ha³⁸ of residential land for Bromsgrove District by 2021 and 208 ha³⁹ and 251 ha⁴⁰ by 2026 for Scenario 1 and Scenario 2 respectively (Figure 3-7).

³⁴ <http://www.bromsgrove.gov.uk/cms/pdf/SHLAA.pdf>

³⁵ Actual average density is 23.53 dwellings per hectare which has been used for the derivation of areas but has been rounded up to 24 in the report

³⁶ Strategic Housing Land Availability Assessment for Redditch Borough. Refreshed April 2010 (Unpublished)

³⁷ Actual average density is 15.5 dwellings per hectare which has been used for the derivation of areas but has been rounded up to 16 in report

³⁸ 2,899 dwellings / 24 dwellings per hectare

³⁹ 4,899 dwellings / 24 dwellings per hectare

⁴⁰ 5,899 dwellings / 24 dwellings per hectare

Figure 3-7 Projected Land Required from 2011 for Housing for Bromsgrove District Based on a Housing Density of 24 Dwellings per Hectare

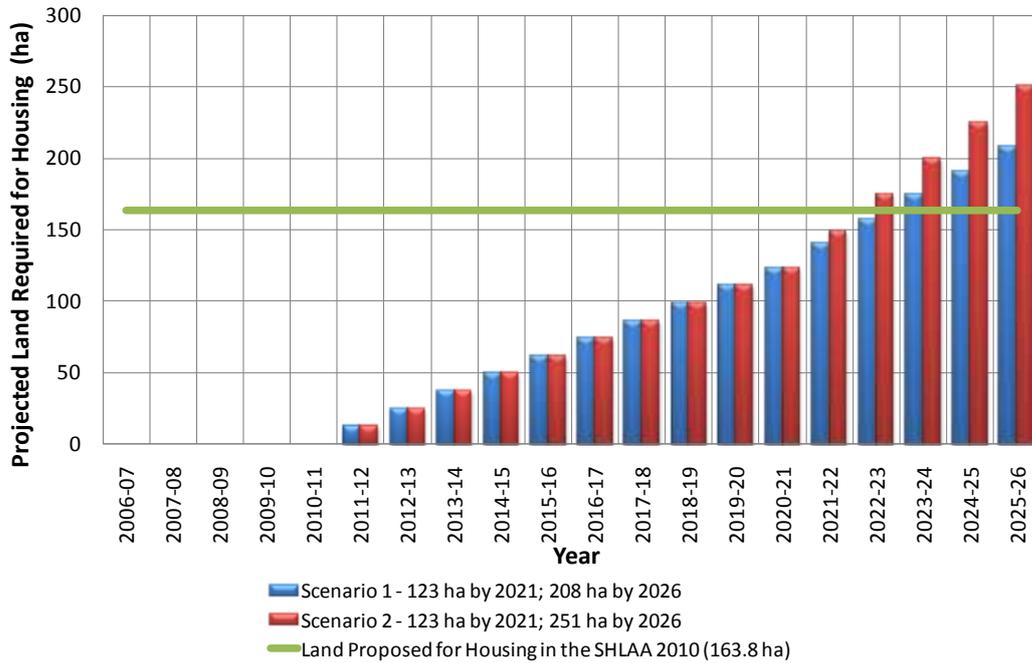
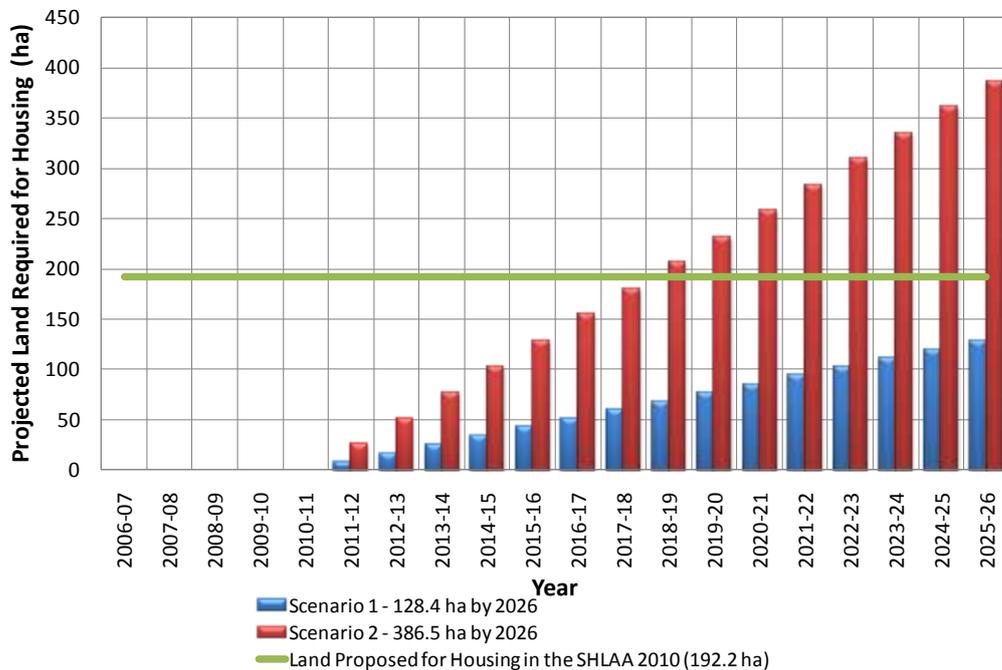


Figure 3-8 Projected Land Required for Housing from 2011 for Redditch Borough Based on a Housing Density of 16 Dwellings per Hectare



3.6.4 The application of a housing density of 16 dwellings per hectare for Redditch Borough results in the requirement for 128.4 ha⁴¹ and 386.5 ha⁴² of residential land by 2026 for Scenario 1 and Scenario 2 respectively (Figure 3-8).

⁴¹ 1,991 dwellings / 16 dwellings per hectare

⁴² 5,991 dwellings / 16 dwellings per hectare

3.6.5 The land available for housing and employment described in Section 3.5 and the average dwelling densities described above were used to estimate the housing and employment land shortfalls for Bromsgrove District and Redditch Borough. These are described below in Section 3.7.

3.7 Housing and Employment Land Shortfalls

3.7.1 There is no shortfall in residential land for Bromsgrove District under Scenario 1 and Scenario 2 at 2021 (Table 3-4). However, by 2026, a residential land shortfall of 44.4 ha and 86.9 ha under Scenario 1 and Scenario 2 is evident.

Table 3-4 Bromsgrove District Residential Land Shortfalls at 2021

Scenario	Dwellings Required by 2021	Dwellings Completed / Committed Between 2006 and 2010	Remaining Dwellings Required by 2021	Residential Land Required at 2021 (at 24 Dwellings / ha) ha	Land Available for Housing Development as at April 2010 (ha)	Shortfall (at 24 Dwellings / ha) at 2021 (ha)
1	4,000	1,101	2,899	123.2	163.8	0
2	4,000	1,101	2,899	123.2	163.8	0

Table 3-5 Bromsgrove District Residential Land Shortfalls at 2026

Scenario	Dwellings Required by 2026	Dwellings Completed / Committed between 2006 and 2010	Remaining Dwellings Required by 2026	Residential Land Required at 2026 (at 24 Dwellings / ha) ha	Land Available for Housing Development as at April 2010 (ha)	Shortfall (at 24 Dwellings / ha) at 2026 (ha)
1	6,000	1,101	4,899	208.2	163.8	44.4
2	7,000	1,101	5,899	250.7	163.8	86.9

3.7.2 There are no additional development sites in Bromsgrove District to meet the residential land shortfall identified in Table 3-5.

3.7.3 There is no employment land shortfall for either scenario for Bromsgrove District to the end of the planning period, 2026 (Table 3-6).

Table 3-6 Bromsgrove District Employment Land Shortfalls at 2021 and 2026

Scenario	Employment Land Required at 2026 (ha)	Employment Land Completed / Committed to 2010 (ha)	Remaining Employment Land Required at 2026 (ha)	Employment Land Available as at April 2010 (ha)	Shortfall at 2021 and 2026 (ha)
1	28	27.4	0.6	6.8	0
2	28	27.4	0.6	6.8	0

3.7.4 Redditch Borough has sufficient residential land under Scenario 1 at 2026 (Table 3-7). However, under Scenario 2, a shortfall of 194.3 ha is evident (Table 3-7).

3.7.5 There is no employment land shortfall in Redditch Borough at 2026 under Scenario 1. However, there is a 27.7 ha shortfall under Scenario 2 (Table 3-8).

Table 3-7 Redditch Borough Residential Land Shortfalls at 2026

Scenario	Dwellings Required by 2026	Dwellings Completed / Committed Between 2006 and 2010	Remaining Dwellings Required by 2026	Residential Land Required at 2026 (at 16 Dwellings / ha) ha	Land Available for Housing Development as at April 2010 (ha)	Shortfall (at 16 Dwellings / ha) at 2026 (ha)
1	3,000	1,009	1,991	128.4	192.2	0
2	7,000	1,009	5,991	386.5	192.2	194.3

Table 3-8 Redditch Borough Employment Land Shortfalls at 2026

Scenario	Employment Land Required at 2026 (ha)	Employment Land Completed / Committed at 2010 (ha)	Remaining Employment Land Required by 2026 (ha)	Employment Land Available as at April 2010 (ha)	Shortfall at 2026 (ha)
1	27	12.56	14.44	28.37	0
2	68	12.56	55.44	28.37	27.07

3.7.6 Section 3.8 below considers whether utilization of the Mixed Use Strategic Sites in Redditch Borough (Table 3-3) meets the shortfall in residential and employment land at 2026.

3.8 Selection of Additional Development Sites to Meet Shortfall

3.8.1 There is an additional 8.8 ha of Strategic Sites classified as Mixed Use⁴³ (Table 3-3) in Redditch Borough to meet the residential and employment land shortfall. However, these sites cannot be used to solely meet one type of development and would therefore be insufficient to meet the residential land shortfall of 194.3 ha (Table 3-7) or employment land shortfall of 27.07 ha (Figure 3-8), both under Scenario 2.

3.9 Summary and Conclusions

3.9.1 Assuming a density of 24 dwellings per hectare, Bromsgrove District has a 44.4 ha and 86.9 ha shortfall in land available for residential development for Scenario 1 and Scenario 2 respectively at 2026.

3.9.2 There is no employment land shortfall in Bromsgrove District at 2026.

3.9.3 Assuming a density of 16 dwellings per hectare, there are insufficient residential and strategic sites in Redditch Borough to meet the required target of 7,000 dwellings by 2026. A shortfall of 194.3 ha is evident for Scenario 2. Consideration may need to be given for cross boundary development if Scenario 2 is to be met.

3.9.4 There is no employment land shortfall in Redditch Borough at 2026 under Scenario 1. However, there is a 27.7 ha shortfall under Scenario 2.

3.9.5 The consequence of this is that the wastewater collection and treatment assessment component of this Outline WCS has only considered the proposed development of 3,855 dwellings and 6.8 ha of employment land in Bromsgrove District and 2,979 dwellings and 28.37 ha of employment land in Redditch Borough.

⁴³ St2 – 2.5 ha, St4 – 1.7 ha and St10 – 4.6 ha

4 Flood Risk Management

4.1 Introduction

4.1.1 The purpose of this chapter is to answer the following four questions:

- i. Can development be accommodated without increasing flood risk?
- ii. Is there sufficient land at low risk of flooding for the selected proposed development sites?
- iii. Will rainwater be adequately managed to prevent surface water flooding in the selected proposed development sites or elsewhere?
- iv. Will increased discharge from Waste Water Treatment Works increase flood risk?

4.1.2 The Environment Agency's WCS Guidance document⁴⁴ fleshes out these requirements further by stating that the Outline WCS will need to demonstrate that, in principle, the proposed development will not increase flood risk within the development or elsewhere. Accordingly, the Outline WCS will need to:

1. Direct development away from areas of high flood or coastal erosion risk.
2. Help determine whether a Surface Water Management Plan (SWMP) is required to provide a strategic approach to surface water drainage, groundwater flooding, and flood risk management.
3. Allow the Environment Agency to agree 'in principle' that the Local Development Framework Core Strategy policies are compliant with PPS25.
4. Identify the need and opportunities for options that produce multiple benefits.
5. Ensure that climate change impacts on flood risk and sea level rise are taken into account in spatial planning.
6. Provide high level policies and advice for developers where necessary.

4.1.3 This chapter presents the main conclusions, recommendations and policy guidance from a parallel report for BDC and RBC, the L2 SFRA⁴⁵. In so doing, this chapter seeks to answer the questions set out in Paragraph 4.1.1 and to meet the information requirements presented in Paragraph 4.1.2.

4.1.4 The L2 SFRA was carried out in accordance with the requirements of PPS25, the aim of which is to direct development away from areas at highest risk of flooding. Where this is not possible, policies and guidance have been recommended to allow development in these areas when it has been proven that they will be safe for the lifetime of the development and they will not increase flood risk elsewhere.

4.1.5 It should be noted, however, that in agreement with BDC and RBC, only 18 key proposed development sites were assessed as part of the L2 SFRA. These agreed assessment sites are presented in Table 4-1. The conclusions, recommendations and policy guidance presented in this chapter apply only to these 18 strategic sites, as described below.

⁴⁴ <http://www.environment-agency.gov.uk/research/planning/33368.aspx>

⁴⁵ Redditch Borough Council and Bromsgrove District Council 2011: *Level 2 Strategic Flood Risk Assessment Draft Report*. Contract Ref: DP/SFRA/10, 52pp + Appendices

Table 4-1 Selected Proposed Development Sites Assessed in the L2 SFRA

Bromsgrove District		Redditch Borough	
BDC20	BDC81	2010/09	2010/14
BDC35B	BDC188	2010/10	EL63 (IN67)
BDC49	BDC189	2010/11	St 8
BDC51	Site 2	2010/12	St10
BDC80		2010/13	

4.2 Chapter Outline

4.2.1 The remainder of this chapter is structured to answer the questions set out in Paragraph 4.1.1 and the information requirements presented in Paragraph 4.1.2, as listed below:

- Section 4.3 presents a summary of fluvial flood risk at the 18 proposed development sites;
- Section 4.4 highlights the risk from surface water flooding at the proposed development sites together with advice on what should be incorporated into planning policy to deal with this risk. Further guidance is provided on mitigation measures which should be included at all proposed development sites together with guidance on site specific Flood Risk Assessments (FRA) that will need to be carried out prior to development taking place;
- Section 4.5 discusses those sites prone to sewer flooding which must be considered when carrying out a site specific FRA;
- Section 4.6 recommends where groundwater flooding should be considered as part of the site specific FRA;
- Section 4.7 outlines the need and opportunities for multiple benefits that will help improve the ecological quality of the receiving water, provide amenities and open space as well as reduce flood risk; and
- Section 4.8 presents the conclusions and recommendations

4.3 Fluvial Flood Risk

4.3.1 Hydraulic modelling was carried out in the L2 SFRA study to determine the fluvial flood risk at the 18 proposed development sites (Table 4-1). The hydraulic modelling included assessment of the impacts of climate change.

4.3.2 This modelling was used to determine whether the proposed development sites were located in Flood Zone 1, 2, 3a or 3b to allow the sites to be sequentially tested and to generate an understanding of the extent of the flooding and the associated hazards.

4.3.3 A Sequential Test was carried out, based upon the guidance contained in Tables D.1, D.2 and D.3 of PPS25. Table 4-2 summarises the flood risk at each site and whether the proposed use was considered to be suitable for development.

4.3.4 It should be noted that it was agreed with the Environment Agency that if flooding occurs in less than 5% of the proposed development site, this is considered minor for the purposes of the Sequential Test.

Table 4-2 Flood Risk at the 18 Selected Proposed Development Sites in RBC and BDC. Sites Where Flooding is a Minor Issue are Presented in Green. Sites Where Flooding is a More Significant Issue are Presented in Red

	Site Ref	Category of Proposed Development	Highest Risk Flood Zone Within the Site	Suitability of Proposed Development in Relation to Flood Risk
BDC	BDC 20	More vulnerable	3b	Very small section within a high risk flood zone, built development in this area should be avoided. Development should be directed to areas at lower risk within the site.
	BDC35B	Less / more vulnerable	3b	Approximately 2.6% lies in Flood Zone 3a and 1.8% in Flood Zone 3b, built development in these areas should be avoided. Development should be directed to areas at lower risk of flooding within the site.
	BDC 49	Less / more vulnerable	3b	Very small section in a high risk flood zone and built development in this area should be avoided. Development should be directed to areas at lower risk of flooding within the site.
	BDC51	Less / more vulnerable	3b	Approximately 3.3% lies in Flood Zone 3a and 1.1% in Flood Zone 3b so built development in these areas should be avoided. Development should be directed to areas at lower risk of flooding within the site.
	BDC80	More vulnerable	3b	Less than 0.1% of the site lies in Flood Zone 3a and less than 0.1% in Flood Zone 3b, built development in these areas should be avoided. Development should be directed to areas at lower risk of flooding within the site.
	BDC81	More vulnerable	1	No issue with fluvial flooding.
	BDC188	Less / more vulnerable	3b	Less than 0.1% lies in Flood Zone and less than 0.1% in Flood Zone 3b. Built development in these areas should be avoided. Development should be directed to areas at lower risk of flooding within the site.
	BDC 189	Less / more vulnerable	3b	6.8% of the site lies in Flood Zone 3a and 5.3% in Flood Zone 3b, built development in these areas should be avoided. Development must be directed to areas at lower risk of flooding within the site.
	Site 2	Less vulnerable	3b	A small section (3%) lies in Flood Zone 3a, while 2% lies in Flood Zone 3b. Built development in these areas should be avoided and directed to areas at lower risk of flooding within the site.
RBC	EL63 (IN67)⁴⁶	More vulnerable	3b	5.3% of the site is located in a high risk flood zone; built development in these areas should be avoided. Development must be directed to areas at lower risk of flooding within the site.

⁴⁶ It should be noted that modelling EL63 (IN67) North of Red Ditch, has identified that approximately 5.3% lies in a high flood risk zone. However due to the nature of this assessment and the predicted figure being only marginally above the Environment Agency's cut off point of 5% (which it considers as minor flooding), it was not considered appropriate to carry forward this site for Exception Testing

Site Ref	Category of Proposed Development	Highest Risk Flood Zone Within the Site	Suitability of Proposed Development in Relation to Flood Risk
2010/09	More vulnerable	1	No fluvial flooding issues.
2010/10	Less/more vulnerable	2	4.8% of the site lies within Flood Zone 3a. Built development should be avoided in this area and directed to areas at lower risk of flooding where possible, but the proposed uses are suitable for this category of flood zone.
2010/11	More vulnerable	1	No fluvial flooding issues.
2010/12	More vulnerable	3b	A small section (2.1) lies in Flood Zone 3a and 1.6% in Flood Zone 3b, development in these areas should be avoided. Built development should be directed to areas at lower risk of flooding within the site.
2010/13	More vulnerable	3b	1.1% of the site lies Flood Zone 3a and 0.01% in Flood Zone 3b, built development in these areas should be avoided. Development should be directed to areas at lower risk of flooding within the site.
2010/14	More vulnerable	1	No fluvial flooding issues.
St 8	Less vulnerable	1	No fluvial flooding issues.
Minor flooding issue = green More significant flooding issue = red			

4.3.5 Each of the sites listed in Table 4-2 were assessed to determine whether there were alternative sites available to accommodate these developments, which are at lower risk of flooding. One site was identified as having no suitable alternatives and therefore in accordance with Figure 4.2 of PPS25, an Exception Tests was required at the following proposed development site:

- BDC189 Strathearn, Western Road Hagley.

4.3.6 The L2 SFRA assessed whether of the aforementioned site had wider suitability benefits which outweigh flood risk at the site and whether it could be designed to be safe for the lifetime of the development.

4.3.7 Approximately 6.8% (by area) of the site at Strathearn, Western Way, Hagley BDC189 site lies in Flood Zone 3a and 5.3% in Flood Zone 3b. Development must be directed to areas at lower risk from flooding. It is essential that no built development takes place in the area identified as being within the predicted 1% plus climate change flood extent. However, the majority of the area is located in Flood Zone 1, which is considered suitable for all types of development. To ensure safety for the lifetime of the development, floor levels should be at least 600 mm above the predicted 1% plus climate change flood level and all residents must be informed of safe access / egress routes. Numerous sustainability benefits have been identified by locating this site in the proposed area.

4.3.8 It should be noted that other sites were identified as being 'red' and having 'significant issues' in Table 4-2. However, following discussion with the Environment Agency, it was agreed that if flooding occurred in less than 5% of the site, this was considered to be minor for the purposes of the Sequential Test; this removed the need for Exception Testing. This approach allowed the Sequential Test to be applied within each of the proposed sites themselves rather than being applied on a catchment scale, with built development being directed to lower risk areas within each of the proposed sites. No built development will be permitted in these proposed sites within the predicted 1% plus climate change flood extent.

4.3.9 Chapter 8 of the L2 SFRA provided recommendations for site specific FRA and guidance on what should be considered when preparing these documents. In summary, the recommendations for site specific FRAs are:

- to prepare a FRA which demonstrates that the proposed land use is acceptable in terms of flood risk;
- to ensure the site is safe for the lifetime of the development, including allowance for climate change;
- to ensure the proposals do not increase flood risk within the site itself or elsewhere;
- to ensure that the site does not impede flood flows or result in a loss of floodplain storage;
- to ensure that surface water is appropriately controlled;
- to determine the suitability of any mitigation measures; and
- to consult with LPAs and the Environment Agency at the earliest opportunity.

4.3.10 In summary, the guidance for site specific FRA is:

- in accordance with PPS25, a FRA must be prepared to support a planning application if a development is thought to be at risk of flooding, has suffered from historic flooding or is likely to increase flood risk elsewhere.

4.4 Surface Water Flooding

4.4.1 Surface water flooding is a risk at all proposed development sites due to the nature of the catchments and the uncertainties associated with climate change. The SFRA has provided advice on what should be incorporated into planning policy to minimise this risk, provided guidance on mitigation measures which need to be included at all of the development sites which were considered, and provided guidance on what mitigation measures should be considered during the preparation of site specific FRAs.

4.4.2 It is recommended that Sustainable Drainage (SuDS) techniques are used wherever possible, not only to provide attenuation, but to provide water quality improvements and increased amenity value / habitat creation.

4.4.3 In summary, the following should be included into planning policy to minimize surface water flooding:

- surface water must be appropriately controlled on-site to ensure development does not increase flood risk elsewhere;

- surface water discharge rates should be no greater, and ideally reduced, post development;
- Sustainable Drainage devices (SUDs) should be used, where possible, to control surface water runoff; and
- opportunities should be sought to provide measures which can help deliver multiple benefits such as the creation of an amenity, water quality improvements and habitat creation.

4.4.4 In summary, the guidance for controlling surface water is as follows:

- in accordance with PPS25 (and the principles of the National Planning Policy Framework (NPPF)), surface water should be controlled, as appropriate;
- preference should be given to the use of SUDs which can deliver multiple benefits;
- a management train approach should be adopted when selecting surface water management measures; and
- opportunities should be sought to provide measures which can help deliver multiple benefits such as the creation of an amenity, water quality improvements and habitat creation.

4.4.5 A key recommendation of the L2 SFRA is that a SWMP is prepared as a matter of urgency.

4.4.6 It is recommended that SuDS are used wherever possible, not only to provide attenuation, but to provide water quality improvements and increased amenity value / habitat creation.

4.5 Sewer Flooding

4.5.1 Chapter 6 has identified proposed development sites where there are known sewer flooding issues (see Table 6-2). Site specific FRAs at these proposed development sites must take account of sewer flooding.

4.6 Groundwater Flooding

4.6.1 Groundwater flooding can often occur as a result of prolonged heavy rain. It is recommended that this should be considered when preparing site specific FRAs as required.

4.7 Opportunities for Multiple Benefits

4.7.1 Opportunities should be sought, wherever possible, to provide multiple benefits when managing flood risk. For example, restoring a floodplain to improve ecological quality, deculverting watercourses not only as a flood risk measure but to provide amenity benefit and ensuring an appropriate distance is left undeveloped along the length of a watercourse to allow migration of the stream / river and to provide green corridors. This would be subject to local byelaws and the functional floodplain extents. However, the Environment Agency usually requires a minimum of 5 m from the top of bank for maintenance of defences.

4.8 Conclusions and Recommendations

4.8.1 As described above, assessments were carried out on a total of 18 proposed development sites for the purposes of the L2 SFRA. This involved generating a detailed understanding of the flood risk at each of these locations. However, it should be noted that less detailed

assessments were carried out previously on a large number of other potential development sites which are described in Tables 7, 8 and 9 of the L1 SFRA.

- 4.8.2 The findings of the flood risk management assessment are summarized in Table 4-3 and Table 4-4 against the guidance requirements. Conclusions and recommendations are also presented in these tables.

Table 4-3 Response to Questions Presented in Paragraph 4.1.1

Requirement Description	Summary of Assessment	Conclusion / Recommendation
Can development be accommodated without increased flood risk?	<ul style="list-style-type: none"> • Provided the proposed development type is suitable for a flood zone, development can be accommodated without increased flood risk. 	<ul style="list-style-type: none"> • No inappropriate development should take place in high risk flood zones. • Surface water should be appropriately controlled. • Development should be directed towards areas of lowest flood risk within each site.
Is there sufficient land at low risk of flooding for the selected proposed development sites?	<ul style="list-style-type: none"> • There is sufficient land available to accommodate the assessed proposed development sites. 	<ul style="list-style-type: none"> • Avoid inappropriate development in higher risk flood zones. • Development should be directed towards areas within the site which are at lower risk.
Will rainwater be adequately managed to prevent surface water flooding in the selected proposed development sites and elsewhere?	<ul style="list-style-type: none"> • Runoff should be managed through the use of SUDs. 	<ul style="list-style-type: none"> • Post construction discharge rates should be no greater, and ideally should be lower than existing discharge rates. • SUDS should be used, where appropriate, to control surface water and provide multiple benefits. • A management train approach should be adopted.
Will increased discharge from Waste Water Treatment Works increase flood risk?	<ul style="list-style-type: none"> • Provided appropriate measures are put in place to control surface water runoff from each of the assessed proposed development sites, there should be no increase in flood risk at the STWs. 	<ul style="list-style-type: none"> • Implement SUDS, where appropriate. • Adopt a management train approach to dealing with surface water.

Table 4-4 Response to Requirements 1 to 6 in Paragraph 4.1.2

Requirement Description	Summary of Assessment	Conclusion / Recommendation
Does the Outline WCS direct development away from areas of high flood or coastal risk?	<ul style="list-style-type: none"> Where appropriate, development has been directed away from areas of high flood risk. 	<ul style="list-style-type: none"> Direct development away from areas of high flood risk.
Is a SWMP required to provide a strategic approach to surface water drainage, groundwater flooding, and flood risk management?	<ul style="list-style-type: none"> A SWMP is required. 	<ul style="list-style-type: none"> Undertake a SWMP.
Are the selected proposed development sites compliant with PPS25?	<ul style="list-style-type: none"> The assessed development sites are compliant with PPS25 as long as development in high risk flood zones is avoided. 	<ul style="list-style-type: none"> Undertake site specific FRA as required.
Is there are need and are there opportunities for options that produce multiple benefits?	<ul style="list-style-type: none"> Opportunities should be sought wherever possible to provide multiple benefits when managing flood risk. For example restoring a floodplain to improve ecological quality, deculverting watercourses not only as a flood risk measure but also to provide amenity benefit and ensuring an appropriate distance is left undeveloped along the length of a watercourse to allow migration of the stream / river and to provide blue / green corridors. 	<ul style="list-style-type: none"> Seek opportunities during a site specific FRA. Incorporate appropriate flood risk management measures into the design and layout of the proposed development. Appropriate buffer zones should be provided between the developments and watercourses. Opportunities for deculverting and watercourse enhancements should be explored.
Have climate change impacts on flood risk and sea level rise been taken into account to inform spatial planning?	<ul style="list-style-type: none"> The potential impacts of climate change have been considered throughout the L2 SFRA and guidance has been provided on how to take account of this during site design. 	<ul style="list-style-type: none"> Site specific FRAs should consider the potential impacts of climate change.

Requirement Description	Summary of Assessment	Conclusion / Recommendation
<p>Has high level policy and advice been provided for developers where necessary?</p>	<ul style="list-style-type: none"> • High level policy guidance has been provided with respect to: <ul style="list-style-type: none"> • the risk from surface water flooding • advice on what should be incorporated into planning policy to deal with the risk from surface water flooding • mitigation measures which should be included at all proposed development sites together with guidance on site specific FRAs that will need to be carried out prior to development taking place • consideration of sewer flooding • consideration of groundwater flooding • opportunities for multiple benefits. 	<ul style="list-style-type: none"> • Developers to implement high level policy advice.

5 Water Resources and Water Supply

5.1 Introduction

5.1.1 The purpose of this chapter is to answer to two broad questions:

- i. Is there enough water under average and peak demand conditions to meet the growth and development scenarios presented in Chapter 3?
- ii. Will STWL's twin track approach ensure that there is enough water available to meet the growth and development scenarios presented in Chapter 3?

5.1.2 The Environment Agency's WCS Guidance document⁴⁷ fleshes out these requirements further; these are summarized below:

1. Confirm demand management, leakage reduction measures, and new resource schemes identified in the Water Resource Management Plan (WRMP) are adequate for the projected development and population increase.
2. Assess the risk of sustainability reductions or River Basin Management Plan (RBMP) reducing abstraction licenses.
3. Compare and confirm the STWL population estimates and projections in the WRMP against the latest forecast population projection.
4. Assess the balance of demand management and leakage reduction schemes against new resource schemes, and identify opportunities for further demand management schemes in new and existing developments.
5. Confirm that the forecast population growth can be accommodated with the water resource and supply schemes proposed in the WRMP.
6. Identify if there are opportunities to save money or improve sustainability through an integrated approach with other elements of the water cycle study. Where this is the case, the outline study will need to identify what further work is required in the detailed study to achieve the benefits. An example of this would be rainwater harvesting or grey-water recycling.
7. Identify high level policy advice on water efficiency measures for developers.
8. Identify any information, data, funding or policy gaps that need further investigation.

5.1.3 The assessment of water resources and water supply included in this Outline WCS has been primarily based on data and information provided by STWL, the Environment Agency and Ofwat. It was agreed with SSW that no further consultation with them was necessary as no development sites are located in their area of supply.⁴⁸

5.2 Chapter Outline

5.2.1 The remainder of this chapter is structured to answer the questions set out in Paragraphs 5.1.1 and 5.1.2. First, the evidence base for the assessment is outlined in Sections 5.3 to 5.11. Second, a summary table is presented in Section 5.13 which directly meets requirements 1 to 5 (posed in Paragraph 5.1.2). A summary table is also presented in

⁴⁷ <http://www.environment-agency.gov.uk/research/planning/33368.aspx>

⁴⁸ Email correspondence between Bromsgrove Council and SSW on 10 May 2010

Section 5.13 in response to requirements 6 to 8 (posed in Paragraph 5.1.2). The remainder of the chapter is structured as follows:

- Section 5.3 provides a brief overview of STWL's water supply to Bromsgrove District and Redditch Borough in the context of its water resources strategy and planning obligations;
- Section 5.4 outlines the key national, regional and local water resource strategies and plans that will influence water resources and supply at the proposed development sites;
- Section 5.5 describes the STWL Water Resource Zones (WRZ) relevant to Bromsgrove District and Redditch Borough;
- Section 5.6 describes STWL's Strategic Treated Grid which allows STWL to support any local demand from almost any Water Treatment Works (WTW) within the grid, including Bromsgrove District and Redditch Borough;
- Section 5.6 presents the baseline water supply demand balance for the Severn WRZ for the period 2010 to 2035;
- Section 5.8 presents the supply side measures planned by STWL to help meet the baseline supply deficit;
- Section 5.9 presents the demand side measures planned by STWL to help meet the baseline supply deficit;
- Section 5.10 summarises the outcomes from implementation of these two sets of measures for the water supply demand balance;
- Section 5.11 describes the potential impact of environmental constraints on future water resources availability within Bromsgrove District and Redditch Borough;
- Section 5.12 presents any water supply infrastructure constraints to the potential development sites presented in Chapter 3;
- Section 5.13 summarises the information salient to meeting requirements 1 to 5 outlined in Paragraph 5.1.2 in a tabular format;
- Section 5.14 summarises the information salient to meeting requirements 6 to 8 outlined in Paragraph 5.1.2 in a tabular format; and
- Section 5.15 presents the chapter summary and conclusion.

5.3 Water Supply to Bromsgrove District and Redditch Borough

- 5.3.1 Potable water supply to most of Bromsgrove District and all of Redditch Borough is provided by STWL. SSW is responsible for providing potable water to a small area in the north of Bromsgrove District, which includes the village of Romsley.
- 5.3.2 STWL supplies a population of 7.4 million people with approximately 1,850 million l/d potable water over an area of 21,000 km². Across the STWL supply area, 40% of the water supply is from river abstractions, 30% from groundwater and 30% from reservoirs.

5.3.3 The planning and provision of water supply by STWL to its customers is framed within the company's Strategic Direction Statement.⁴⁹ This defines the priorities for STWL for the next 25 years over the period 2010 to 2035. STWL's WRMP⁵⁰ presents the company's proposals to meet the principles, policies and targets for water supply set out on the Strategic Direction Statement. The WRMP is prepared in compliance with the Environment Agency's Water Resources Planning Guidelines,⁵¹ and in parallel with the STWL 2009 Business Plan,⁵² which was submitted to Ofwat for review and determination of prices for the five year period 2010 to 2015.

5.4 Water Resources Strategies and Plans

5.4.1 The Environment Agency plays a key role in the planning of water resources and water supply. The Agency is responsible for preparing the Water Resources Planning Guidelines, which all water companies in England and Wales must comply with. The Agency is also the Competent Authority responsible for the preparation of RBMPs and for facilitating the delivery of the targets under the EU Water Framework Directive (WFD).⁵³

5.4.2 The Agency published the '*Water Resources Strategy Regional Action Plan for Midlands Region*' in December 2009.⁵⁴ This presents how the Agency plans to implement the national water resources strategy for England and Wales in the Midlands Region. It takes account of, amongst other things, the:

- Restoring Sustainable Abstraction (RSA) Programme and National Environment Programme (NEP): the RSA programme reviews the environmental impact of existing licensed abstractions and recommends changes where the impact is found to be unacceptable. This programme is driven by an overall need to ensure long-term sustainability and, more immediately, to meet the requirements of European Directives, UK law and other environmental and local concerns. Where an investigation identifies that a site is being damaged by abstraction, and the abstractor is a water company, the issue may be included in the NEP for investigation, options appraisal or implementation, and funded through the water company;
- Catchment Abstraction Management Strategies (CAMS): CAMS provide an assessment of the water resources available in local catchments and set out local water abstraction licensing practice to help balance the needs of water-users and the environment on a local scale;
- LDF: the Agency recognises the need to maintain and strengthen links with LDFs within the Midlands, especially in areas already under water stress, as an important mechanism in the delivery of the aims of the Midlands Action Plan; and
- Figure 5-1 shows how these policies, plans and strategies interact with the aim of providing sustainable water resources management in the Midlands.

⁴⁹ <http://www.stwater.co.uk/server.php?show=nav.6367>

⁵⁰ <http://www.stwater.co.uk/server.php?show=nav.6186>

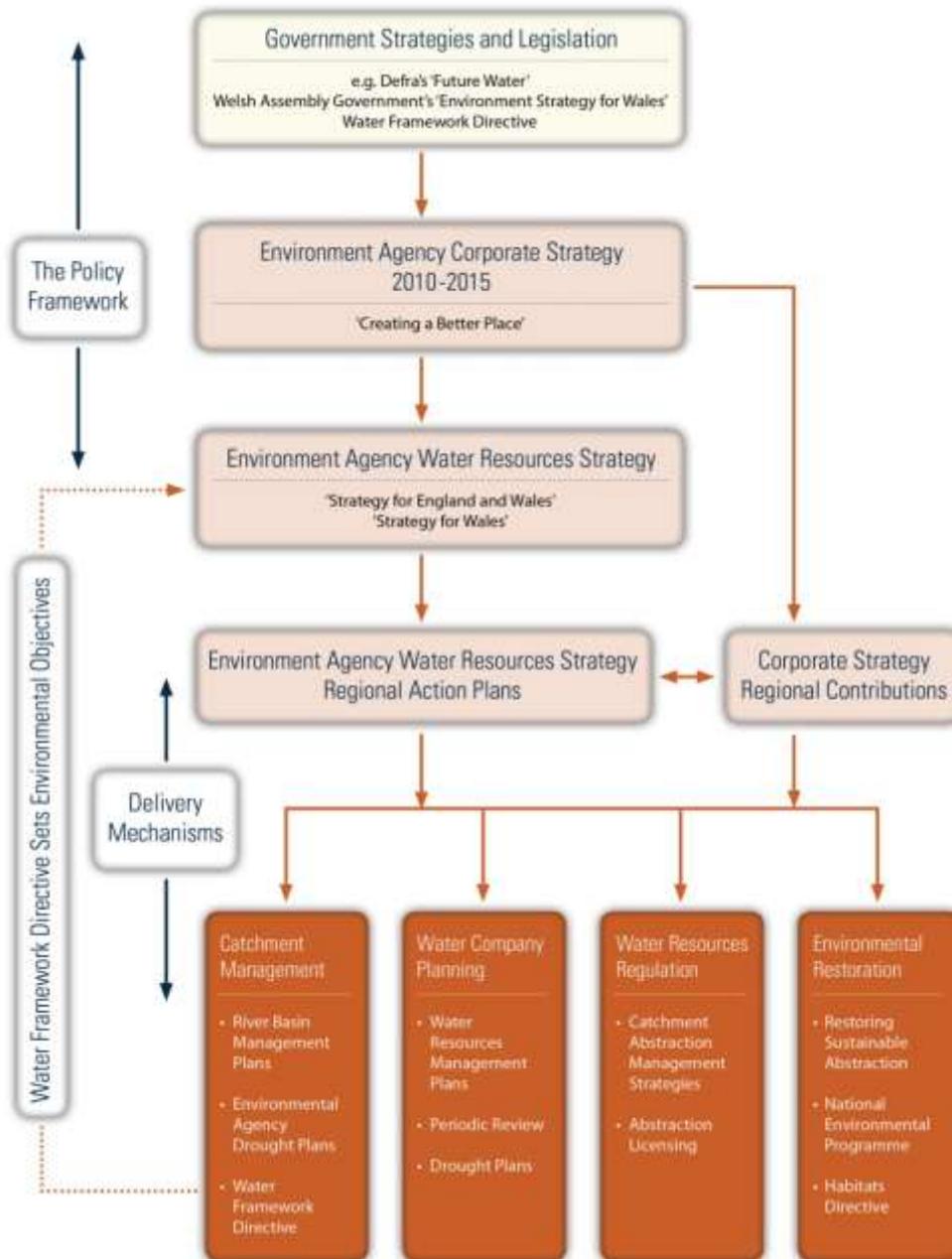
⁵¹ <http://www.environment-agency.gov.uk/business/sectors/39687.aspx>

⁵² <http://www.stwater.co.uk/server.php?show=nav.6279>

⁵³ <http://www.environment-agency.gov.uk/research/planning/33362.aspx>

⁵⁴ <http://publications.environment-agency.gov.uk/pdf/GEHO1209BRKX-e-e.pdf>

Figure 5-1 Water Resources Management: Linkages Between Strategies and Plans



5.5 Water Resource Zones

- 5.5.1 The STWL water supply area is currently divided into six WRZs. A WRZ is defined⁵¹ as 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 shortfall.
- 5.5.2 Figure 5-2 shows the location of Bromsgrove District and Redditch Borough in relation to the STWL and SSW WRZs. This indicates that only a small part of Bromsgrove District falls within the SSW supply area, that most of the remainder of Bromsgrove District and all of Redditch Borough is located within the Severn WRZ, and that only a small portion of Bromsgrove District falls within the Elan (or Birmingham) WRZ.

5.5.3 The definition of a WRZ means that any new development within a zone will need to be subject to the same level of service and risk of supply failure as existing customers. If, however, there are water supply network operational issues at the sub-WRZ level which could exacerbate existing problems, or if the new development were to create new water supply network operational issues, STWL would need to consider a response. These issues are explored in more detail in Section 5.11 with respect to population and housing projections within the WRMP and how they compare with the growth and development scenarios presented in Chapter 3. In Section 5.12 specific water supply network constraints related to the potential parcels of land allocated to receive housing and employment land under these same scenarios are identified as a potential constraint to development.

5.6 Water Supply Sources

5.6.1 STWL operates 17 major surface water abstraction and raw water treatment works and over 180 groundwater abstraction sources across their operational area. The major treatment works are supplied by a mix of run-of-river abstractions and impounding reservoirs. Four impounding reservoirs are pump-filled. The remainder (11) are naturally filling gravity-fed reservoirs. The groundwater sources draw mainly from the Triassic Sandstone Aquifers in the Midlands, but groundwater is also taken from smaller aquifers such as the Magnesium Limestone of Nottinghamshire and the Oolitic Limestone of the Cotswolds. In supply terms, during the recent normal demand year of 2006-7, the total water provided into supply reached 1,990 MI/d. This includes all imports and exports. However, during 2003-4, the most recent dry year, this rose to 2,008 MI/d.

5.6.2 To supplement STWL's own supplies, a small quantity i.e. around 40 MI/d, is obtained through bulk imports from neighbouring water undertakers, principally SSW and Anglian Water. A major raw water import is also taken from the Elan Valley Reservoirs system which is owned by Dwr Cymru Welsh Water. This water is transferred under gravity via the Elan Aqueduct from Rhayader in Powys to Frankley WTW in Birmingham. The aqueduct has a current capacity of 345 MI/d, and all of this water is treated at Frankley WTW in Birmingham, which is the sole supply to the city (and a small portion of Bromsgrove District). In a normal demand year the typical volume transferred to Birmingham is around 320 MI/d, but in a drier summer, this quantity can increase to an average of 340 MI/d (up to 345 MI/d) due to local demand increases as well as higher exports from Birmingham into the Severn WRZ.

5.6.3 The key characteristic, however, of the STWL supply to Redditch Borough and the remainder of Bromsgrove District is the Strategic Treated Water Grid. A schematic of this system is presented in Figure 5-3.

5.6.4 The Grid runs between the Derwent Valley system in North Derbyshire and the Mythe WTW near Tewkesbury in Gloucestershire. The lateral extensions of the grid extend into all counties that the grid crosses, and links to 13 of STWL's 17 major WTW are made. The Grid is therefore able to contribute to the supply of water to around 75% of STWL's customers, including those in Bromsgrove District and Redditch Borough.

Figure 5-2 STWL and SSW Water Resources Zones

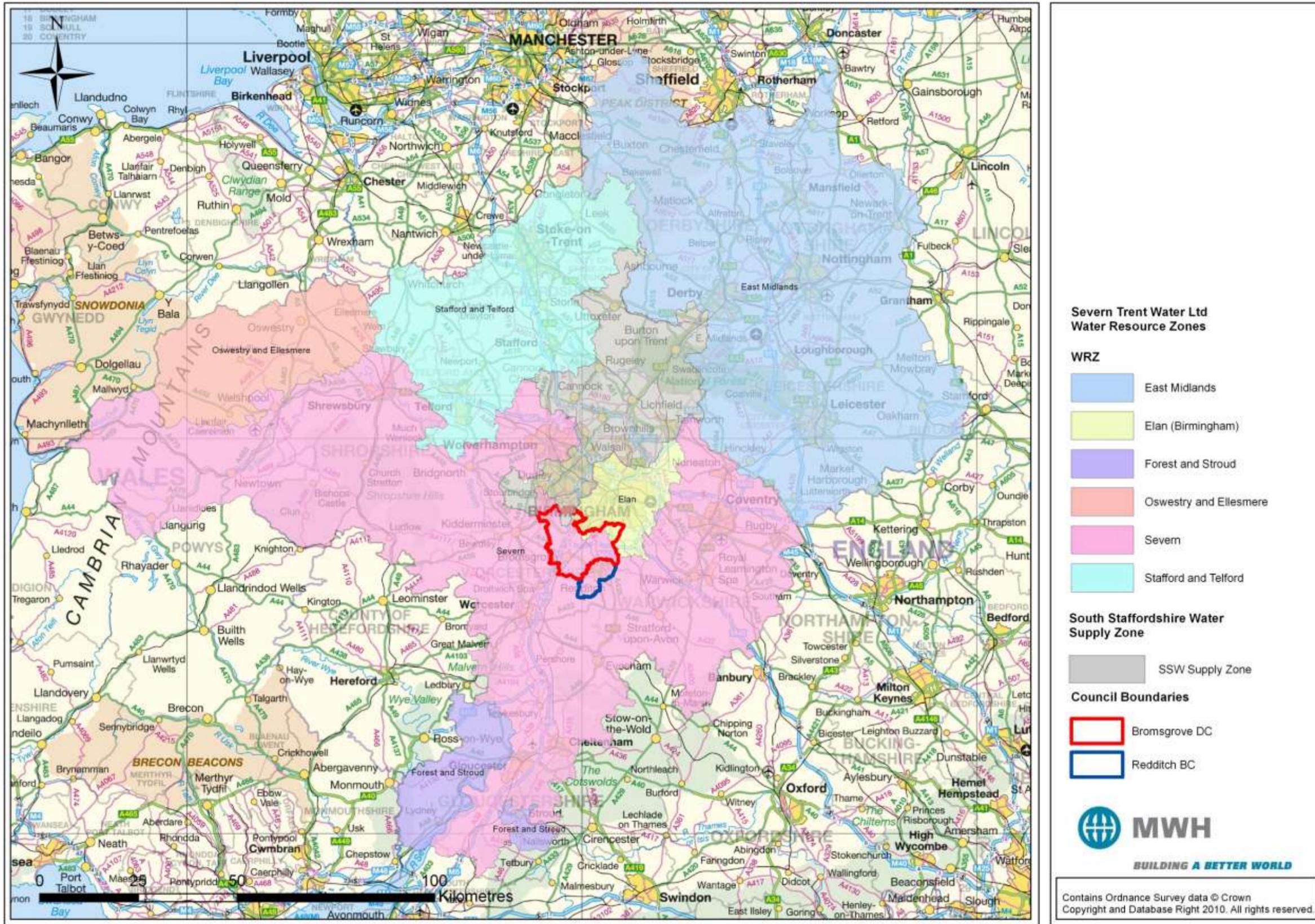
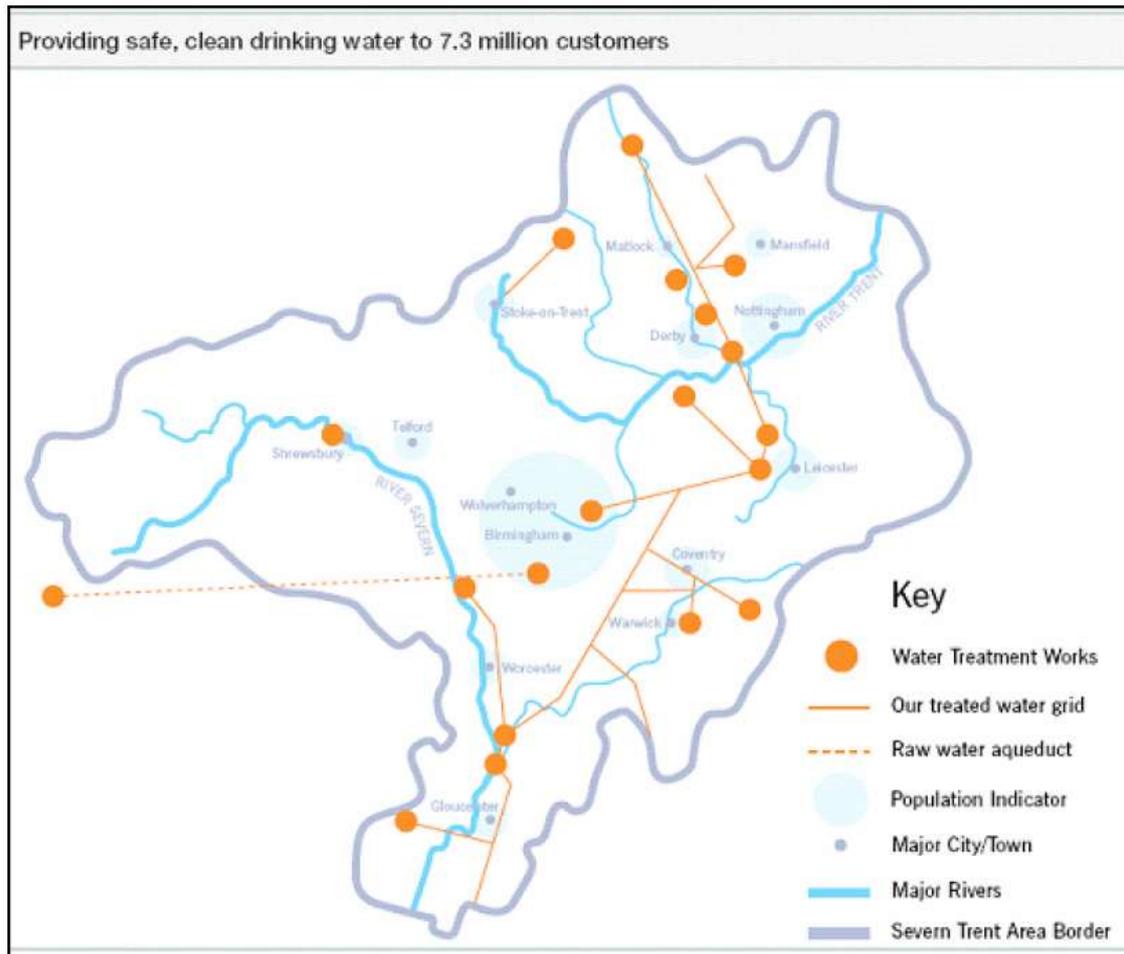
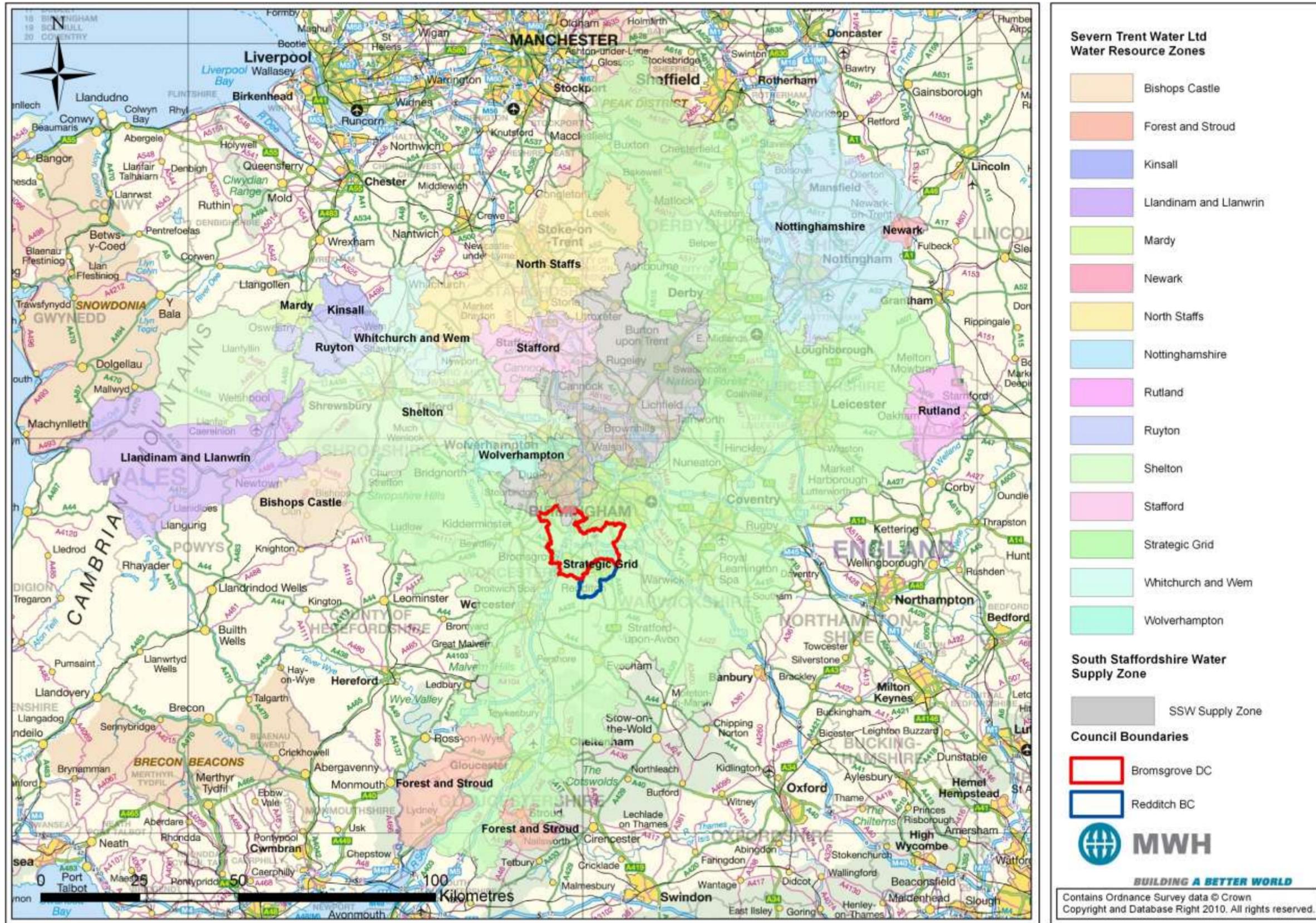


Figure 5-3 The STWL Strategic Treated Water Grid



- 5.6.5 Supplies to the East Worcestershire demand centre, which includes Bromsgrove District and Redditch Borough, are predominantly based on borehole sources. Supply from the Elan Aqueduct can also be used to meet demand within this area, via both the Trimpley and Frankly WTWs.
- 5.6.6 The development of the strategic water grid provides an increased level of security of water supply for Bromsgrove District and Redditch Borough should there be issues of supply interruption from their main sources from the Triassic Sherwood Sandstones. For example, if an unplanned outage event was to occur at one or more of the sources that supply Bromsgrove District and Redditch Borough, the strategic water grid would be available to maintain supplies to STWL customers until the outage event was resolved and these local sources are brought back into service.
- 5.6.7 The significance of the Strategic Grid to STWL water supply is illustrated in Figure 5-4. This presents the outcome from the 2010 review of WRZs and resulted in 15 potential zones. The largest WRZ is the Strategic Grid, which is based in the strategic treated water grid presented in Figure 5-3. STWL are planning to assess the feasibility of improving links between these zones, and it is therefore possible that their number could reduce. Nevertheless, Bromsgrove District and Redditch Borough will remain within the Strategic Grid WRZ.

Figure 5-4 STWL Potential Revised Water Resources Zones



5.7 Current and Planned Water Resources – Supply Demand Balance

5.7.1 STWL aims to achieve and maintain the balance of supply necessary to deliver their target levels of service⁵⁵ at least cost to their customers while minimizing impact on the environment. Their WRMP presents results for each of their WRZs for the Baseline (existing situation forecasts) case for the planning period 2010 to 2035. Where a supply demand balance deficit is predicted, a programme of measures has been identified to address any shortfall. Measures that require funding have been incorporated into the Business Plan and contribute to their submission to Ofwat for the setting of tariffs for each Asset Management Plan (AMP) cycle.

5.7.2 The main equation used in the assessment of the supply demand balance within each WRZ is:

$$\text{Balance of Supply} = \text{Deployable Output} - \text{Outage} - \text{Headroom} - \text{Demand}$$

Where:

Deployable Output = the output of a commissioned source or group of sources or of bulk supply, constrained by, for example, environmental needs, licence, pumping plant and / or well / aquifer properties, raw water mains, treatment capacity or water quality.

Outage = a temporary loss of deployable output.

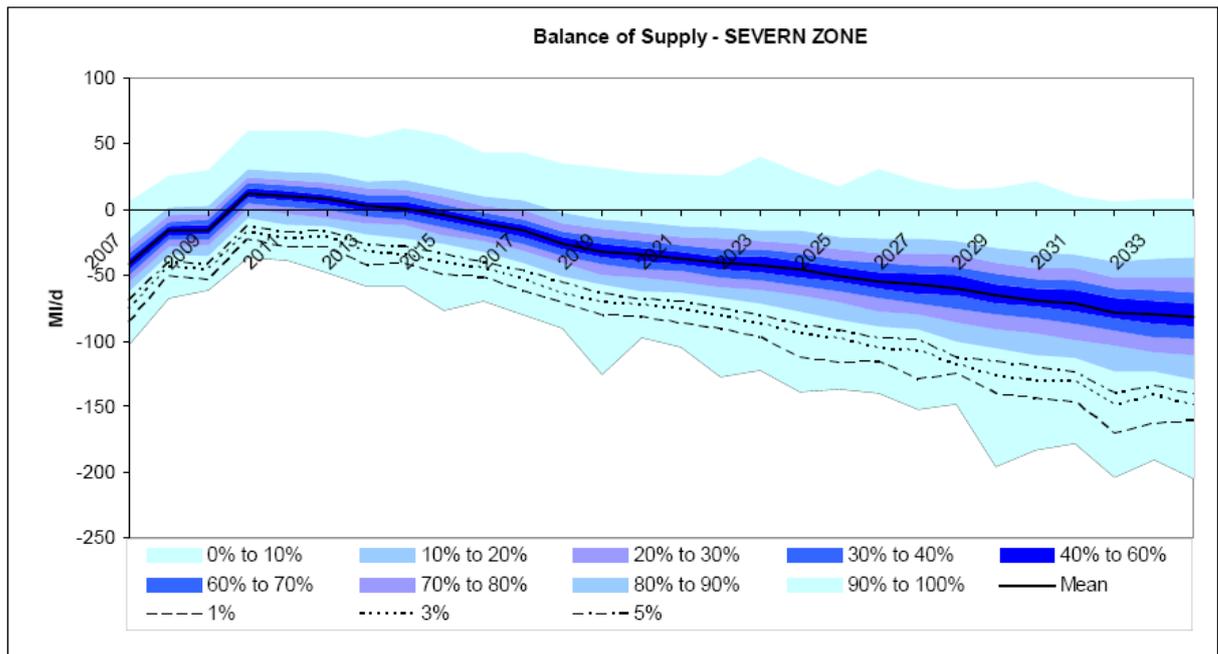
Headroom = the minimum buffer to maintain between supply and demand for water to cater for current and future uncertainties.

Demand = total demand for water under dry year conditions for each year of the forecast period.

5.7.3 The assessments of headroom and outage are calculated in a probabilistic manner, resulting in calculations of the mean value of the balance of supply in each year within the planning period, along with bands of uncertainty around the mean. The baseline results for the Severn WRZ are presented in Figure 5-5. The results presented here demonstrate a potentially long-term and increasing level of risk of not being able to provide a positive supply demand balance. STWL identified the main drivers for this trend as being uncertainty due to climate change and long-term trends in water quality, as well as projected growth in demand through the planning period within this WRZ.

⁵⁵ STWL target level of service for water supply is that there should not be hosepipe bans and Drought Permits more than three times in 100 years

Figure 5-5 The Severn WRZ Baseline Supply Demand Projection



- 5.7.4 The importance of uncertainties due to climate change and long-term trends in water quality were common contributors to STWL’s headroom assessment. Given the importance of these drivers to the planning and investment decision process, and their high relative uncertainties, STWL adopted as their target headroom risk profile values of 80% for the period 2010 to 2020, declining to 70% for 2020 to 2025, 60% for 2025 to 2030 and 50% for 2030 to 2035. This means that the WRMP for AMP5 and AMP6 (2010 to 2020) is based on an 80% level of confidence that the target levels of service will be met. This level of confidence declines to 50% for the period 2030 to 2035. However, as uncertainties associated with climate change and water quality trends are addressed, and adaptation measures developed, STWL view this profile as a prudent approach, with longer term investment decisions refined and reviewed as uncertainties are reduced, and the risk profile modified to reflect this.
- 5.7.5 Included within STWL’s supply demand balance calculations are the housing growth projections presented in the WMRSS. It should be noted, however, that STWL considered that the rates of housing growth proposed in the WMRSS represented a significant increase over the historic rates of new connections to their system. STWL therefore took the view that the WMRSS housing growth projections were inappropriate for use in their demand projections for AMP5. The average number of new connections reported in their Annual June Returns for Ofwat between 1997 / 98 and 2006 / 07 was around 23,000 across their supply area. The average rate of new housing provision set out in the RSSs between 2007 and 2035, is around 30,000 per annum. Therefore, for the planning period up to 2014 / 15 STWL have projected build rates of 23,000 per annum. For the planning period post-2015, their projections reverted to the WMRSS targets (preferred option with 115 per annum for Bromsgrove District and 332 per annum for Redditch Borough). This assumption was made following feedback and discussions with stakeholders regarding the level of housing growth proposed in the WMRSS and observed historic rates of growth in the STWL region.
- 5.7.6 It should also be noted that STWL revised downwards their estimates for non-domestic demand between the publication of their draft and final WRMP. This was based on the recent economic downturn and a more detailed analysis of demand from their non-household customers. For example, between the draft and final WRMP, STWL reduced the estimate of non-household water delivered for 2009 to 2010 from 400 MI/d to 350 MI/d for the whole of their area. For their baseline planning horizon, at 2034 to 2035, the equivalent estimates had reduced from 360 MI/d to near 250 MI/d.

- 5.7.7 Population increases associated with the growth and development scenarios in Chapter 3 are presented in Figure 5-6 and Figure 5-7 for Scenario 1 and Scenario 2 respectively from 2001 to 2026, with STWL's own population estimates from 2007 to 2026 as used within their final WRMP. Details regarding assumed occupancy rates associated with each scenario are presented in Appendix 4, with tabulated annual population estimates from 2001 to 2026.
- 5.7.8 As can be seen in Figure 5-6, the implied population estimates associated with Scenario 1 adopted here are marginally lower than those used by STWL for their final WRMP. Under Scenario 2, for Bromsgrove District the projections remain lower than the STWL estimates, but less so post-2021. For Redditch Borough, given the greater rate of housing growth, the population estimates are larger than those adopted by STWL.
- 5.7.9 With respect to the employment land sites included within the growth and development scenarios, no assumptions have been made regarding the type of employment activities that will be associated with these sites. For their AMP5 planning, STWL generated estimates of water demand for 17 sectors across 4 different tariff bands. Water demands are very sector and tariff band specific, which means that until there is some certainty on the industries occupying employment land it was not considered appropriate to estimate water demands at this time. Therefore, no information is presented here regarding likely water demands associated with economic activities on each of these sites given this uncertainty.
- 5.7.10 As demonstrated in Figure 5-6 and Figure 5-7 the growth and development scenarios that form the basis of this Outline WCS are not aligned with STWL's own projections as used within their water resources planning process. STWL has taken a less conservative approach with respect to housing projections and non-domestic water demands than the earlier WMRSS and for the Scenario 1 and Scenario 2 projections prepared for this Outline WCS. This means that estimates of the demand for water based on Scenario 1 are likely to be lower for both Redditch Borough and Bromsgrove District than those included within the STWL WRMP. For Scenario 2, the estimates are again likely to be lower for Bromsgrove District, but tending to be higher for Redditch Borough from 2013 onwards.
- 5.7.11 This means that the projected STWL baseline balance of supply is likely to be marginally over-predicting the level of risk of not being able to provide a positive supply demand balance for the Severn WRZ as a whole. However, it should be noted that uncertainty is explicitly included within the supply demand balance projections, and that STWL has already identified uncertainty in demand projections as a key component of the overall risk of not being able to maintain a positive supply demand balance.
- 5.7.12 Within the WRMP, STWL proposed a number supply and demand side measures to address this risk within the Severn WRZ, which includes Redditch Borough and Bromsgrove District. These measures are summarised in Sections 5.8 and 5.9 respectively, with their projected outcomes on the balance of supply and demand presented in Section 5.10.

Figure 5-6 Population Projections for Scenario 1 Compared with STWL WRMP Projections

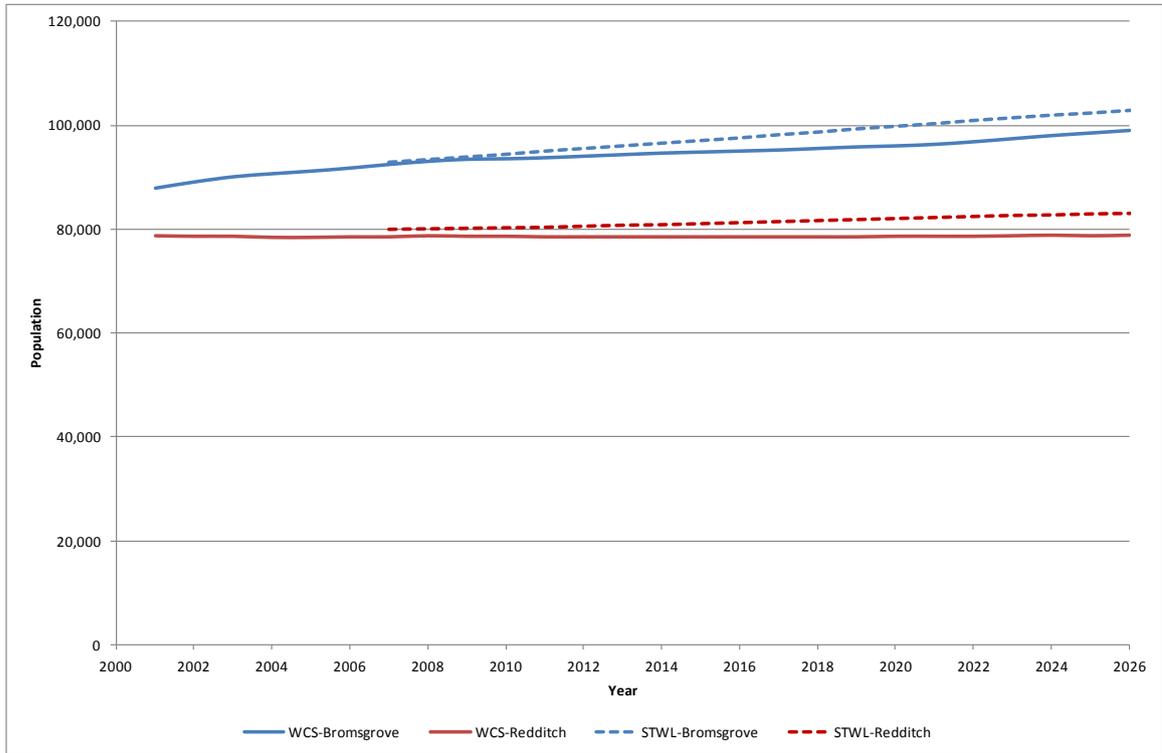
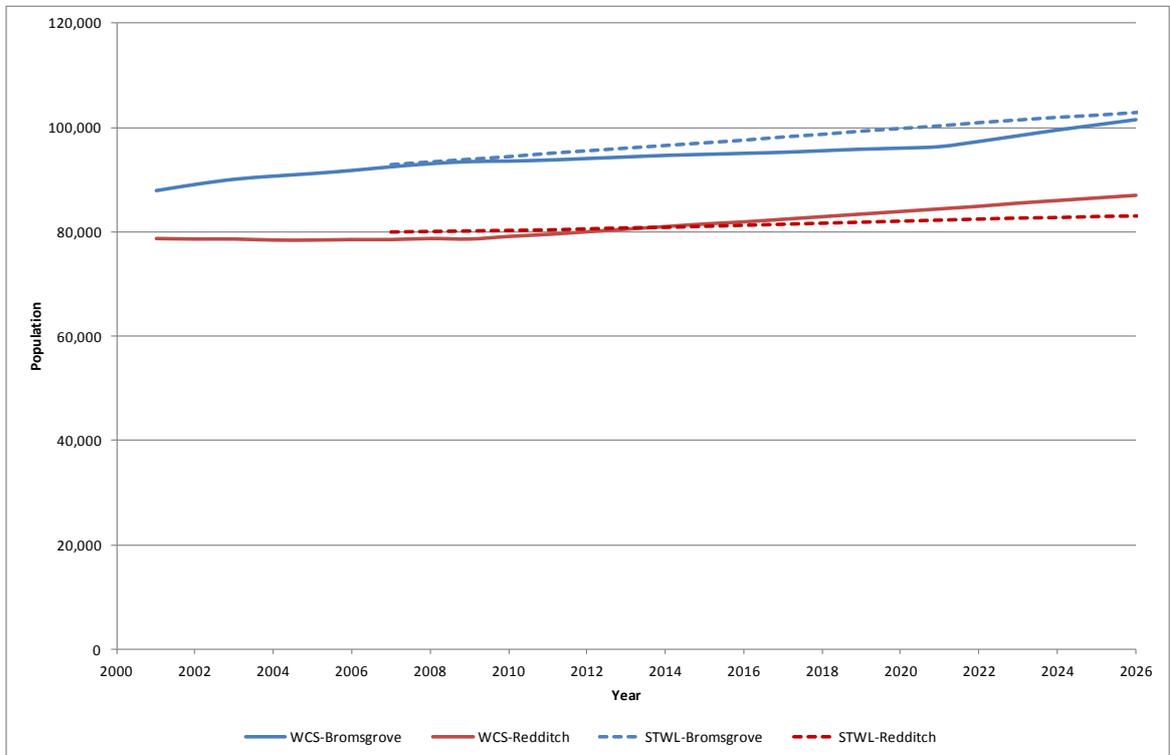


Figure 5-7 Population Projections for Scenario 2 Compared with STWL WRMP Projections



5.8 Current and Planned Water Resources – Supply Side Measures

- 5.8.1 STWL note in their WRMP that during AMP4 from 2005 to 2010, significant improvements were made to the balance of supply in the Severn and neighbouring Birmingham (Elan) WRZs. This has included new granular activated carbon treatment capability at Frankley WTW, allowing increased conjunctive use of the Elan Valley / River Severn water resources by making greater use of the River Severn and delaying the on-set of transfers from the Elan Valley reservoirs. Total leakage has also been reduced by 10 MI/d in AMP4 in these WRZs. The strategy for AMP5 and beyond is based on a proposed programme of measures that includes a re-zoning exercise that will combine the Birmingham (Elan) and Severn WRZs as part of the redefining of the Strategic Grid WRZ.
- 5.8.2 Other measures included with this strategy for the existing Severn and Birmingham (Elan) WRZs include:
- improving supply across the strategic distribution links;
 - use of managed aquifer recharge to utilise spare resource and treatment capacity in winter months, for later use during periods of higher demand;
 - provide new groundwater resources development;
 - continue to reduce leakage over the planning period; and
 - adopt and deliver measures to help their customers improve their use of water and thereby reduce demand for water.
- 5.8.3 The programme of distribution and supply side measures included within STWL's programme to restore a positive supply demand balance are summarised below. The first four projects are planned for the period 2010 to 2020, while the final three are more longer term from 2020 to 2035.
- Duplication of the Derwent Valley Aqueduct (DVA): the current capacity of the DVA acts as a bottleneck against production capacity at a number of WTW north of the River Trent in the East Midlands WRZ. Duplication of the DVA will release this production and increase the capacity of the DVA by 60 MI/d and the deployable output from the East Midland WRZ by the same amount. 20 MI/d of this capacity will be available to the Severn WRZ via increased use of the strategic link between these two WRZs.
 - Highters Heath Aquifer Storage and Recovery: this scheme is planned to recharge treated water, when capacity is available, most likely from Frankley WTW into the Sherwood Sandstone. The deployable output benefit is based on an injection at a rate of 15 MI/d over an average of 4 months per year, with re-abstraction at the same rate for a total of 16 months per year every 5 years. This will be available to either of the Severn or Birmingham WRZs.
 - Minworth Aquifer Storage and Recovery: this scheme is planned to recharge treated water, when capacity is available, most likely from Frankley WTW into the Sherwood Sandstone. The deployable output benefit is based on an injection at a rate of 15 MI/d over an average of 4 months per year, with re-abstraction at the same rate for a total of 16 months per year every 5 years. This will be available to either of the Severn or Birmingham WRZs.
 - New Edgbaston Groundwater Source: this scheme is to develop a new groundwater source in Birmingham to deliver a dry period deployable output of 10 MI/d. The output

from this scheme would help to offset demands placed on Frankley WTW, resulting in more water being available for the Birmingham and Severn WRZ. It is recognised by STWL that this increase in abstraction from the groundwater management unit of interest is slightly higher than the CAMS annual licensable resource, but that groundwater modelling will be undertaken to assist in defining how the licence should be operated to maintain CAMS compliance and deliver the deployable output benefit.

- **Norton Aquifer Storage and Recovery:** this scheme is planned to recharge treated water, when capacity is available into the Sherwood Sandstone. It will make use of assets in place from an earlier Aquifer Storage and Recovery (ASR) project that was not implemented. The deployable output benefit is based on an injection at a rate of 10 MI/d, using capacity available at Frankley WTW, for which the site still holds a licence, with re-abstraction delivering a deployable output benefit of 6 MI/d. This water will be available for entry into the Elan Valley Aqueduct or the Norton Distribution Storage Reservoir (DSR), with potential benefits for the Severn or Birmingham WRZs by reducing demands on the Elan Reservoirs or Frankley WTW respectively.
- **Whitacre Aquifer Storage and Recovery:** this scheme is planned to recharge treated water, when capacity is available, most likely from the Whitacre WTW but possibly from Frankley WTW into the Sherwood Sandstone. The deployable output benefit is based on an injection at a rate of 10 MI/d over an average of 4 months per year, with re-abstraction at the same rate for a total of 10 months per year every 5 years. This will be available to the Severn WRZ.
- **Change in Flow Compensation Conditions on the River Leam:** the Environment Agency previously identified that additional resources may be available from the River Leam above Leamington, subject to a review of the prescribed flow conditions. This STWL scheme proposes a permanent reduction in the prescribed flow from 18.2 MI/d to 12.2 MI/d, which could result in a potential source yield deployable output gain of 6 MI/d. This increase in deployable output would be available to either of the Severn or Birmingham WRZs.

5.9 Current and Planned Water Resources – Demand Side Measures

5.9.1 The proposed demand management measures which aim to deliver the Ofwat stipulated minimum water savings of 1 l/property/day and 3.27 MI/d annually for AMP5 (2010 to 2015) in the STWL region are summarised below.⁵⁶

- **Metering:** water companies and Government have regarded metering as an important demand management measure. Since AMP4 (2005 to 2010) STWL's policy has included compulsory meter installation in all new households and a targeted promotion of installing free meters at existing homes. Within their WRMP, STWL assumed (for the benefits of optional and selective metering) water savings of 10% derived from a UKWIR study.⁵⁷ Further the company assumed a supply side leakage reduction of 10 l/property/day if a meter is installed externally to dwellings.
- For AMP5, STWL considered additional compulsory meter installation at occupier change. However, STWL could not introduce this measure due to insufficient cost benefit evidence. Therefore, STWL will be carrying out pilot studies in AMP5 to reduce the uncertainty associated with these estimates. If it proves cost effective, STWL will roll out its new strategy during AMP6.

⁵⁶ In Chapter 1, some of the legislation, regulation and policy with respect to demand management in the UK was summarised. Appendix 5 expands upon this, as well as presenting a brief overview of current demand management activities in the UK

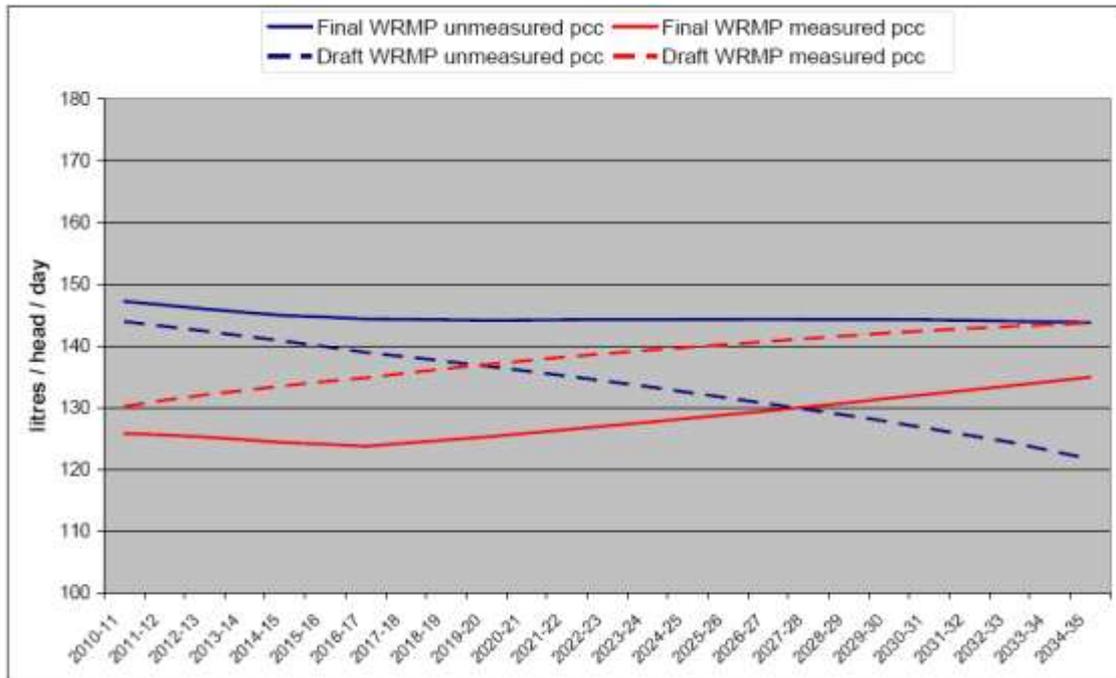
⁵⁷ 'A Framework Methodology for Estimating the Impact of Household Metering on Consumption', Ref.: 03/WR/01/4, UKWIR

- Leakage: in their WRMP, STWL present how they will achieve their sustainable leakage target of 453 Ml/d for their whole supply area by 2015. The company presents a range of options to reduce its levels of leakage, including active leakage control, mains renewal, pressure management and metering.
- Promotion of Water Efficiency Products: in recent years STWL has worked together with a range of product manufacturers and suppliers to promote water-efficient showerheads, shower timers, water butts and internal leak alarms. Since 2005 the company has distributed cistern displacement devices under the banner of 'Save-a-Flush'. STWL will continue to promote this device as it is claimed to be able to achieve annual savings of up to 1 Ml/d per year through AMP5 across the STWL supply area. In addition STWL has made provision to allow for product subsidies to provide access to water efficient products to all customers and to raise uptake rates.
- Education: customer education has been identified as an important measure, and facilitated by company visits and face to face contacts to not only promote water efficiency practices and products but also to change customer behaviour. Auditing programmes have been an important part of customer education to raise customers' awareness about water use. As part of their AMP5 (2010 to 2015) action plan, STWL aim to encourage customers to undertake self-audits and will provide information and materials on how household inefficient usage and waste can be reduced.
- Retrofit Programme: in AMP4 (2005 to 2010) STWL undertook a successful pilot retrofit programme involving 50 schools.⁵⁸ The programme has now been extended to a 600 school-site retrofit audit programme by the end of 2010. For AMP5 (2010 to 2015) the company will roll out further programmes into the wider public, social housing and commercial sectors by means of advice, audits and installation of water efficient devices.

5.9.2 With adoption of these programmes and measures, STWL are projecting an overall per capita consumption reduction of 3.6 l/person/day by 2035. STWL's projections were amended in the period following the publication of their draft WRMP and their final WRMP in June 2010. This was on the basis of comments received from Ofwat and the Environment Agency, as well as the latest views of Government on the future product standards for water use and efficiency. STWL's models of water usage in metered versus unmetered / unmeasured properties were also reviewed and updated, while the impacts of Ofwat's water efficiency targets were also factored into the revised forecasts. The draft WRMP and final WRMP projections are presented in Figure 5-8.

⁵⁸ www.waterwise.org.uk/images/site/Research/water_efficiency_review%20website%20version.pdf

Figure 5-8 STWL Dry Year Per Capita Consumption Projections



5.9.3 STWL’s long-term projection is that overall normal year per capita consumption will reach around 132 ℓ/person/day by 2030, which compares favourably with the Government’s target of 130 ℓ/person/day set out in Future Water.⁵⁹

5.9.4 For non-household water demand, STWL are projecting a decline in demand of 95 Ml/d across their supply area by 2035. As with domestic demands, between publication of the draft WRMP and the final WRMP in June 2010, STWL revisited their projections for this sector improving their base datasets and modelling. In addition to this, the recent economic downturn impacted the quantities of water required by their commercial customers. Therefore, the demand projections were also adjusted to reflect this change in water needs. The outcomes from these revisions are presented in Figure 5-9. These show the sharp decline in commercial demand recorded in 2008 and 2009, which is projected to continue through 2010, with a steeper decline in commercial use in the final WRMP than was the case in the draft WRMP.

⁵⁹ <http://www.defra.gov.uk/environment/quality/water/strategy/pdf/future-water.pdf>

Figure 5-9 STWL Projections of Total Non-Household Water Delivered



5.9.5 Further information and details on STWL approaches to demand management are provided in Appendix 5.⁶⁰

5.10 Outcome of Planned Measures

5.10.1 The outcomes for the balance of supply within the Severn and Birmingham WRZs are presented in Figure 5-10 and Figure 5-11 respectively. As can be seen, with adoption of the planned programme of measures described above, both the Severn and Birmingham WRZs' balance of supply remains positive through the planning period within the risk profile as described earlier in Paragraph 5.7.4.

5.10.2 As Redditch Borough and Bromsgrove District are located within the Severn Zone, it is very likely the proposed development sites can be supplied within STWL's Level of Service at their adopted target headroom risk profile.

⁶⁰ Email correspondence between Steffi Johnson of MWH and Marcus O'Kane of STWL on 18 October 2010

Figure 5-10 The Severn WRZ Planned Supply Demand Projection

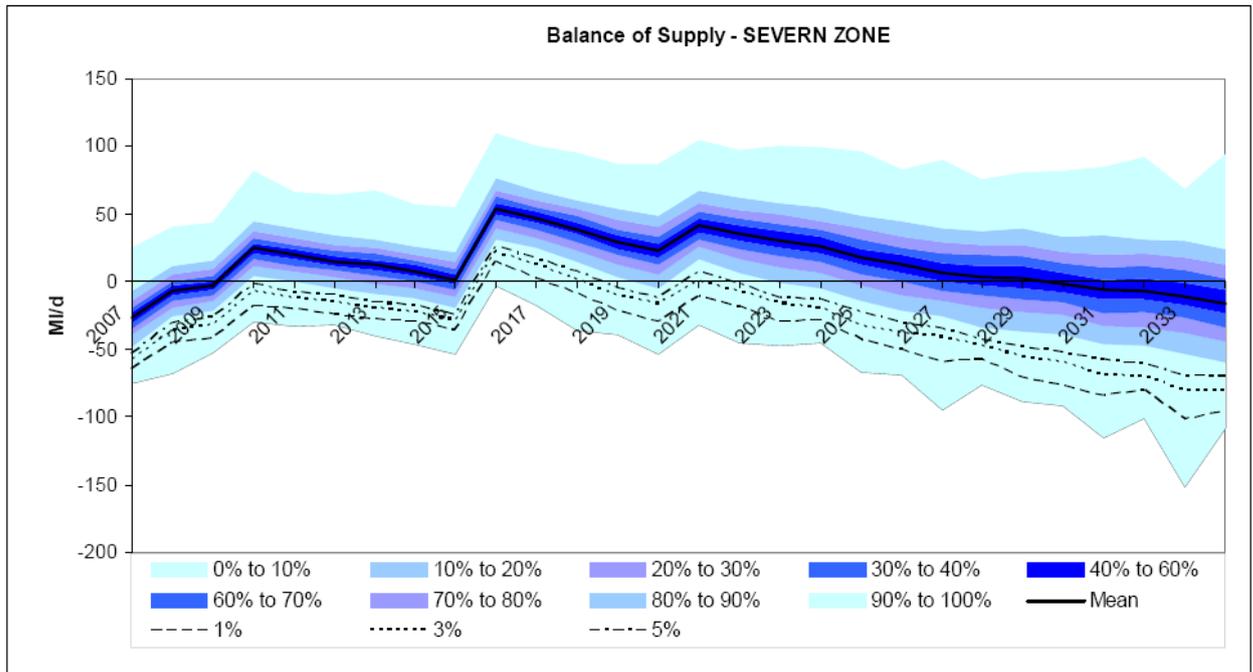
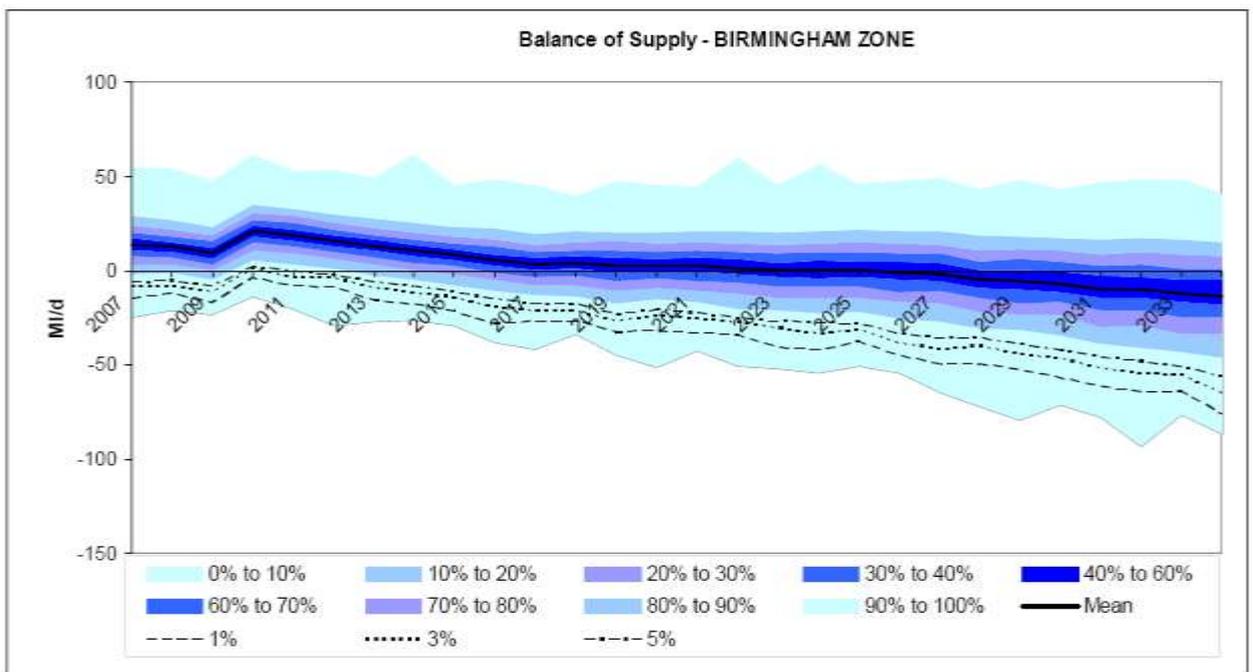


Figure 5-11 The Birmingham WRZ Planned Supply Demand Projection



5.11 Environmental Constraints on Water Resources Availability

5.11.1 As part of the AMP4 RSA Programme, from 2005 to 2010, STWL undertook low flow investigations at 12 of their existing sources. Options appraisals for these sites are ongoing. For those sites where significant environmental impacts have been identified due to STWL abstractions, STWL may be required to reduce their abstracted volumes. Where this is the case, STWL will need to review impacts of any changes on their WRMP once options appraisals have been completed. There may therefore be a need to invest further in additional demand and / or supply measures to offset any impact on public water supply.

5.11.2 STWL has included a loss of 1 MI/d in their deployable output calculations for the Severn WRZ due to abstraction reductions associated with impacts on the Hewell Grange SSSI.

STWL consider that although there are a number of other rivers and wetland sites within the STWL area where licensed abstractions may be contributing to environmental damage, uncertainty remains with respect to confirmation of their impact on these sites. However, based on guidance from the Environment Agency, they were not included within the deployable output or headroom estimates.

- 5.11.3 As part of their AMP5 RSA Programme, the Environment Agency has identified a further 31 licensed abstractions for investigation during the AMP5 period from 2010 to 2015 which may be having a negative impact on designated water bodies. Those abstractions relevant to the Severn and Birmingham WRZs are presented in Figure 5-12. Any reductions in the licensed abstractions from these sources may put significant pressure on future water resources management. The development of alternative measures will need to be carefully considered to ensure that solutions are affordable and environmentally sustainable, including that there are no net negative impacts in terms of carbon costs.
- 5.11.4 The Environment Agency Worcestershire Middle Severn⁶¹ (which covers the main rivers in Bromsgrove District), Warwickshire Avon⁶² (which covers most of Redditch Borough and part of Bromsgrove District) and Tame, Anker and Mease⁶³ (which includes the River Cole in the far north east corner of Bromsgrove District) CAMS identify designated sites that may be influenced by licensed abstractions in Bromsgrove District and Redditch Borough. These include European designated sites (SPA and SAC), Ramsar sites (wetland sites of international conservation importance) and SSSIs.
- 5.11.5 The Warwickshire Avon CAMS classifies the Bromsgrove Groundwater Management Unit (GWMU) as 'Over abstracted' and the Avon Confined GWMU as 'Over licensed' (Figure 5-13). Further, all Water Resource Management Units within this CAMS area (which includes Bromsgrove District and Redditch Borough) have been assessed within an integrated analysis as either 'No available water', 'Over Licensed', or 'Over abstracted' at low flows.
- 5.11.6 Similarly, the Worcestershire Middle Severn CAMS classifies the whole of the Worcestershire Middle Severn GWMU as 'Over abstracted' and the Water Resource Management Units and rivers across the whole CAMS area, (which includes Bromsgrove District and Redditch Borough) designated as either 'No available water' or 'Over abstracted', at low flows (Figure 5-14).
- 5.11.7 Within the Tame, Anker and Mease CAMS, the River Cole, in contrast, is designated as 'Water available' within its upper reaches, which fall within Bromsgrove District.
- 5.11.8 The status of the main water resource for Redditch Borough and Bromsgrove District, groundwater from the Permo-Triassic Sandstones, was assessed as part of the development of the RBMP for the Severn River Basin District.⁶⁴ The outcome of this assessment indicates that these Main Aquifers have both poor quantitative status and a poor (deteriorating) quality status (Figure 5-15). No change in status is forecast for these aquifers by 2015.^{65,66}

⁶¹ http://www.environment-agency.gov.uk/static/documents/Research/worcs_cams_1872801.pdf

⁶² <http://publications.environment-agency.gov.uk/pdf/GEMI0706BLAR-E-E.pdf>

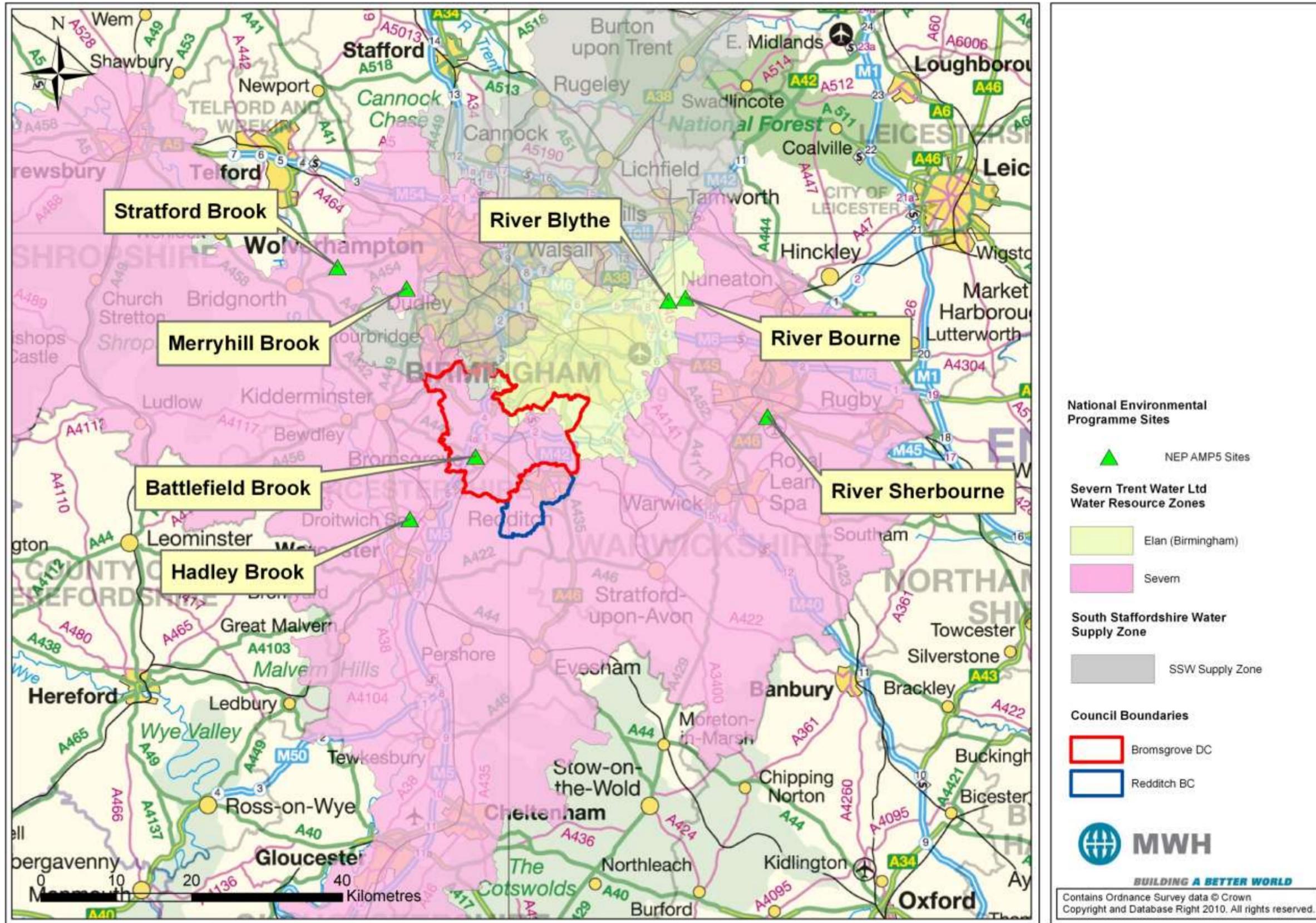
⁶³ <http://publications.environment-agency.gov.uk/pdf/GEMI0308BNPR-E-E.pdf>

⁶⁴ <http://wfdconsultation.environment-agency.gov.uk/wfdcms/en/severn/Intro.aspx>

⁶⁵ http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopic&lang=_e

⁶⁶ Note however that the RBMP for the Severn Basin District (December 2009) Annex B Water Body Status Objectives [<http://www.environment-agency.gov.uk/research/planning/33106.aspx>] shows different assessment results for the Worcestershire Avon Bromsgrove South Groundwater Body, with current 'good' rather than 'poor (deteriorating)' chemical status

Figure 5-12 STWL AMP5 NEP Investigation Sites Within the Severn and Birmingham (Elan) WRZs



- 5.11.9 Given the stressed nature of the water resources within the Midlands Region, and locally from sources that supply Redditch Borough and Bromsgrove District as outlined earlier, the planned measures included within the STWL WRMP for the current AMP5 planning period (2010 to 2015) and beyond to 2035 focus on both demand management measures and use of aquifer storage and recovery projects, with a major infrastructure enhancement and abstraction licence variation to increase deployable output to the Severn (and Birmingham (Elan)) WRZ, rather than the development of new water supply sources per se to address the baseline negative balance of supply for the Severn WRZ through the AMP planning period to 2035.
- 5.11.10 It should be noted, however, that until both the NEP AMP4 and AMP5 investigations have been completed, the potential for reductions in deployable output from sources identified as having negative impacts on designated water bodies remains uncertain. If reductions in deployable output from these sources are required, then alternative sources as well as other measures will require investigation to ensure that the Severn WRZ remains in a positive balance of supply and demand through the planning period of interest. New measures will need to be demonstrated as affordable and environmentally sustainable.
- 5.11.11 To mitigate and manage potential negative impacts on water supply to Redditch Borough and Bromsgrove District on outcomes from these environmental investigations, it is important that both LPAs maintain links with the STWL Water Strategy Team. This is to foster cooperation and develop joint programmes that can achieve common policy objectives in areas such as demand management and water neutrality for new developments and existing STWL customers.

Figure 5-13 Resource Availability Assessment Warwickshire Avon CAMS

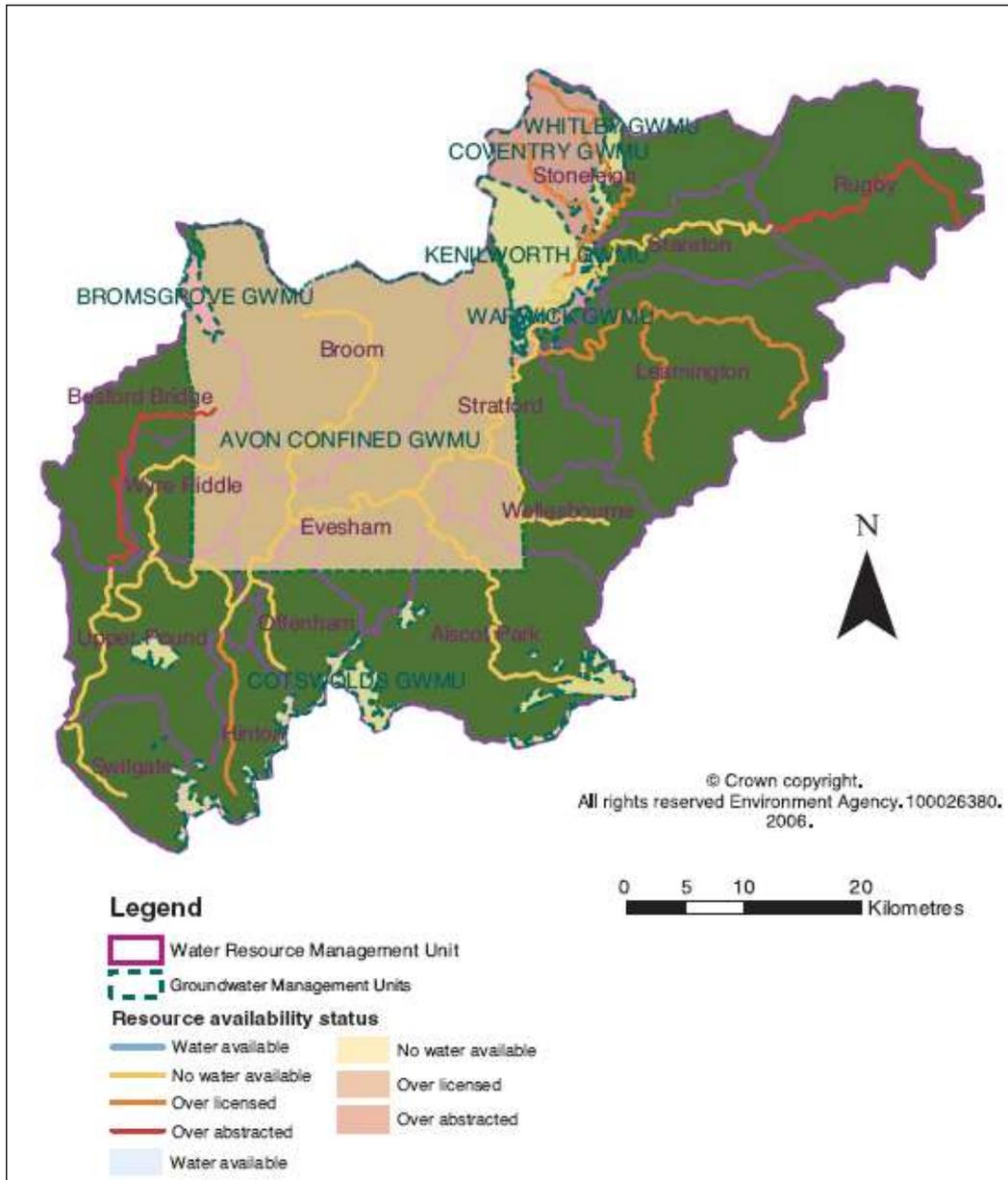


Figure 5-14 Resource Availability Assessment Worcestershire Middle Severn CAMS

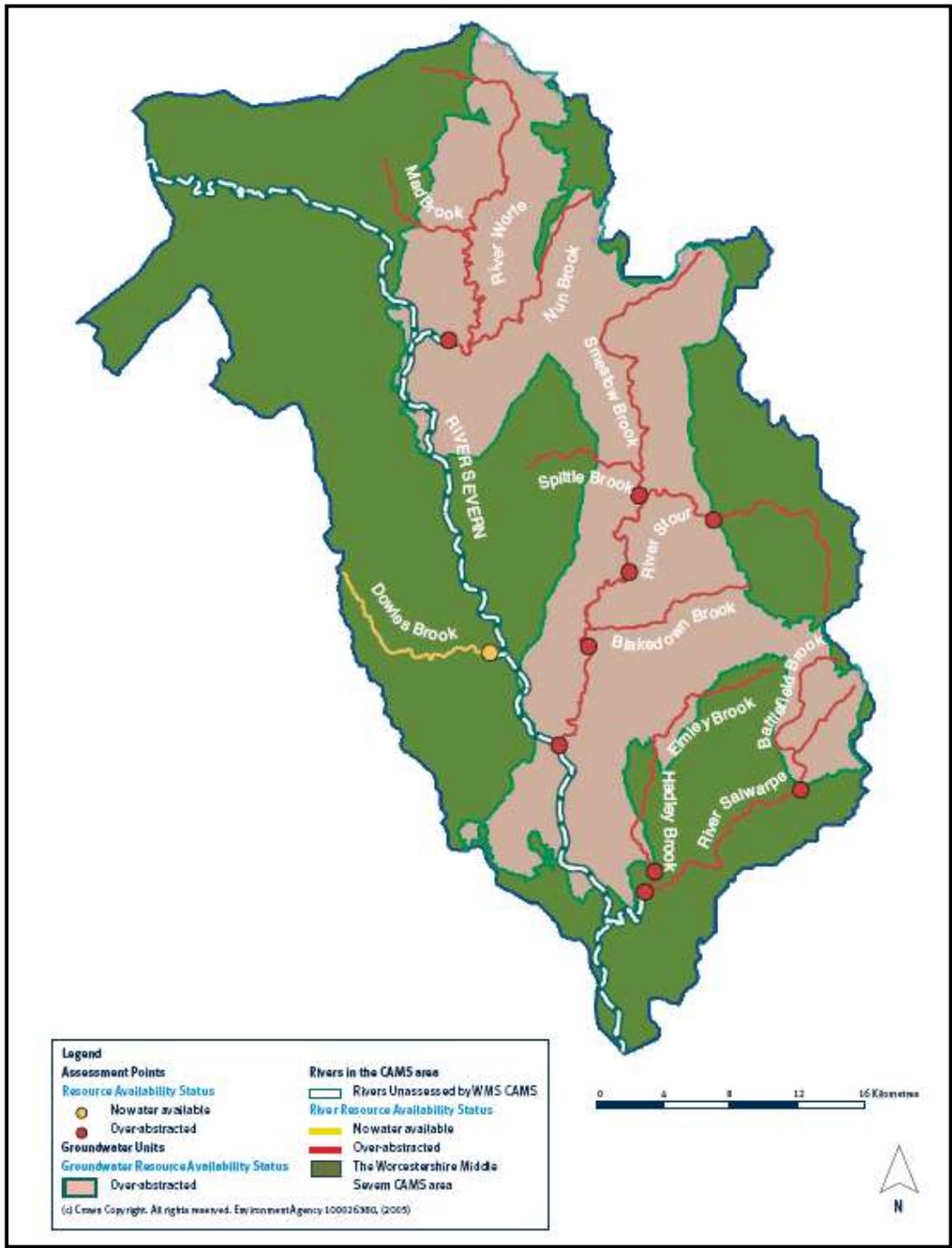
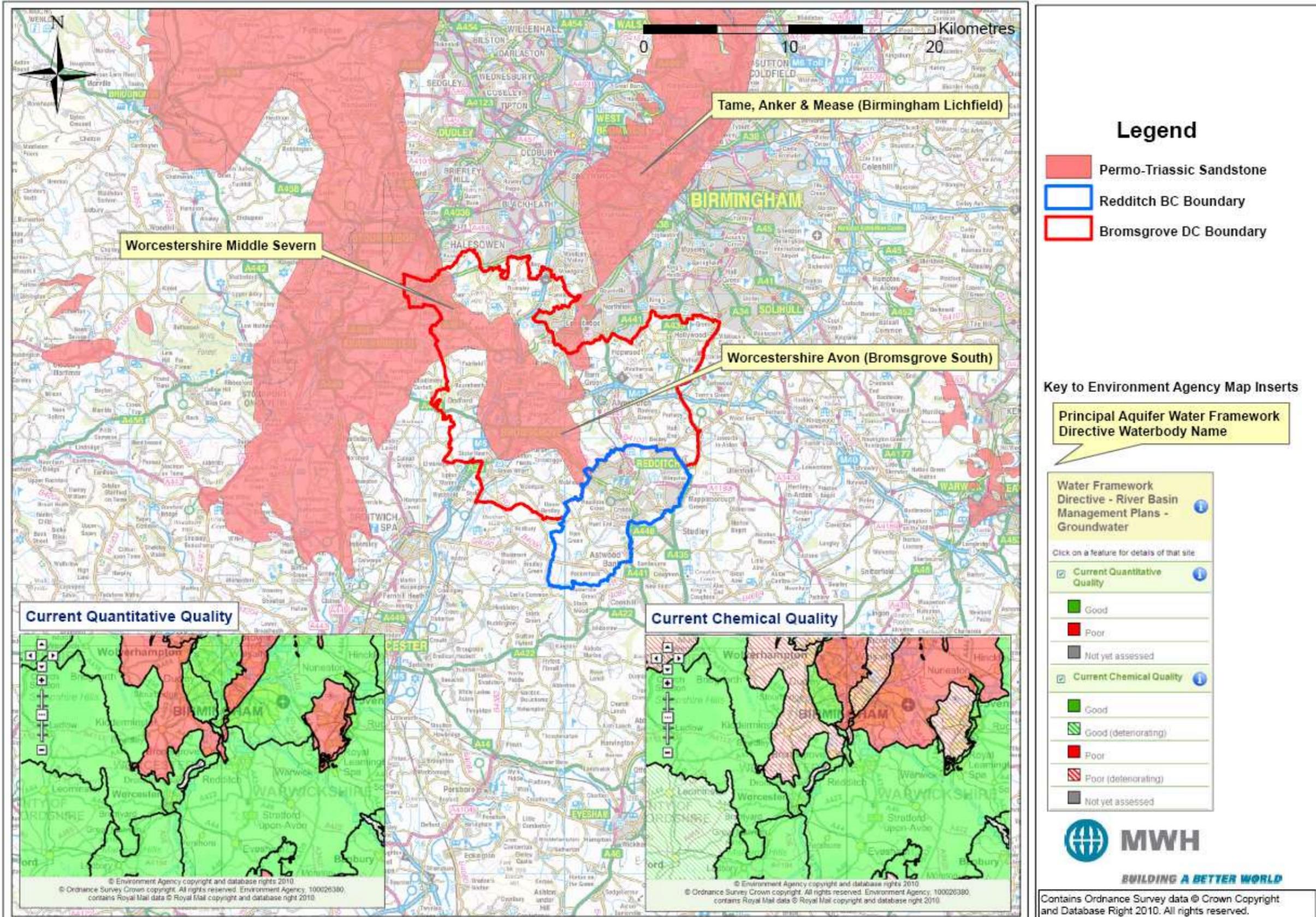


Figure 5-15 River Basin Management Plan Current Groundwater Body Assessment Results for Midlands Permo-Triassic Sandstone Principal Aquifers



5.12 Water Infrastructure Constraints to Development

- 5.12.1 At a WRZ level, the outcomes from the analysis presented in Sections 5.8, 5.9 and 5.10 have demonstrated that for the Severn WRZ, the planned measures proposed within the STWL WRMP will result in water supply to Redditch Borough and Bromsgrove District being maintained at STWL's Level of Service at their adopted target headroom risk profile through to 2035. There is some uncertainty related to potential future reductions in abstractions from STWL sources as a result of the RSA programme. The Strategic Water Grid offers some measure of mitigation against these risks. However, if reductions in deployable output from these sources are required, then alternative sources as well as other measures will require investigation to ensure that the Severn WRZ remains in a positive balance of supply and demand through the planning period of interest at least overall cost as commented earlier in Paragraph 5.11.3.
- 5.12.2 At the scale below the WRZ level of analysis, there is a need to ensure that there are no water supply infrastructure constraints to the delivery of water to the potential development sites included within the growth and development scenarios presented in Chapter 3. To assist with this assessment, STWL was provided with details regarding the proposed development locations and requested to identify any known issues associated with water supply infrastructure at these locations i.e. listing locations by exclusion where infrastructure constraints are known to exist, and where measures are planned within AMP5 and beyond to address these constraints.
- 5.12.3 STWL confirmed that they envisage that the strategic supply to the study area will support the proposed development. However, they noted that the local distribution network is likely to require reinforcement in many cases. STWL further commented that the extent of reinforcements will depend upon detailed modelling of the network on a site by site basis together with consideration given to the cumulative effect of other development in the locality.
- 5.12.4 STWL noted that for development consisting of a single, or very few units, it is likely that individual connections only will be needed to existing mains i.e. no on-site mains will be required. Where development is proposed in isolated areas where no mains exist, extensions to the network will be required at the developer's expense. The majority of the sites, however, are likely to need on-site mains connected to the existing network that may need to be reinforced to ensure that adequate supplies can be maintained to new and existing customers. STWL concluded that the extent of reinforcement can only be determined by modelling on a site by site basis.
- 5.12.5 The following sections of this chapter summarise the responses from the evidence and analysis presented with respect to answering questions 1 to 5 and separately questions 6 to 8 as presented in Section 5.1.2.

5.13 Response to Requirements 1 to 5

Requirement Description	Summary of Assessment	Conclusion / Recommendation
Compare and confirm the water company population estimates and projections in the WRMP against the latest forecast population projection.	<ul style="list-style-type: none"> The growth and development scenarios that form the basis of this Outline WCS are not aligned with STWL's own projections as used within their water resources planning process. STWL has taken a less conservative approach with respect to housing projections and non-domestic water demands than the earlier WMRSS and for the Scenario 1 and Scenario 2 projections prepared for this Outline WCS. 	<ul style="list-style-type: none"> The population projections developed by STWL were developed following feedback and discussions with stakeholders regarding the level of housing growth proposed in the WMRSS and observed historic rates of growth in the STWL region.
Confirm that the forecast population growth can be accommodated with the water resource and supply schemes proposed in the WRMP.	<ul style="list-style-type: none"> Estimates of the demand for water based on Scenario 1 are likely to be lower for both Redditch Borough and Bromsgrove District than those included within the STWL WRMP. For Scenario 2, the estimates are again likely to be lower for Bromsgrove District, but are higher for Redditch Borough from 2013 onwards. 	<ul style="list-style-type: none"> The projected STWL baseline balance of supply is likely to be marginally over-predicting the level of risk of not being able to provide a positive supply demand balance for the Severn WRZ as a whole. However, it should be noted that uncertainty is explicitly included within the supply demand balance projections, and that STWL has already identified uncertainty in demand projections as a key component of the overall risk of not being able to maintain a positive supply demand balance.
Confirm demand management, leakage reduction measures, and new resource schemes identified in the WRMP are adequate for the projected development and population increase.	<ul style="list-style-type: none"> STWL view greater uncertainties in the WRMP planning process are associated with climate change and water quality than for demand estimates. The programmes of measures included within the WRMP to address the baseline supply demand balance deficit within the Severn WRZ and share supply within the neighbouring Elan (Birmingham) WRZ are a balance between demand management, leakage reduction, infrastructure investment and new source developments. 	<ul style="list-style-type: none"> As Bromsgrove District and Redditch Borough are located within the Severn WRZ, these results show that in water resources planning terms, it is very likely that both LPAs will be supplied within STWL's Level of Service at their adopted target headroom risk profile. Adoption of the planned programme of measures, within both the Severn and Birmingham WRZs' to provide a positive supply demand balance through the planning period to 2035.
Assess the risk of sustainability reductions or RBMPs reducing abstraction licenses.	<ul style="list-style-type: none"> Ongoing RSA AMP4 and AMP5 investigations may result in the need for reductions in STWL abstractions from those sources identified as having a negative impact on designated water bodies. If reductions result in a change to WRZ balance of supply and demand, then new measures may be required to maintain STWL Level of Service. 	<ul style="list-style-type: none"> Bromsgrove District and Redditch Borough to maintain links with STWL Water Strategy Team. This is to develop joint programmes that can achieve common policy objectives in areas such as demand management and water neutrality for new developments and existing STWL customers if reductions in abstractions from existing sources are required.

Requirement Description	Summary of Assessment	Conclusion / Recommendation
<p>Assess the balance of demand management and leakage reduction schemes against new resources schemes, and identify opportunities for further demand management schemes in new and existing developments.</p>	<ul style="list-style-type: none"> The stressed nature of the water resources within the Midlands Region, and locally from sources that supply Bromsgrove District and Redditch Borough is reflected in the planned measures included within the STWL WRMP for the current AMP5 planning period (2010 to 2015) and beyond to 2035. This focuses on both demand management measures and use of aquifer storage and recovery projects, with a major infrastructure enhancement and abstraction licence variation to increase deployable output to the Severn (and Birmingham (Elan)) WRZ, rather than the development of new water supply sources per se to address the baseline negative balance of supply for the Severn WRZ through the AMP planning period to 2035. 	<ul style="list-style-type: none"> Redditch Borough has adopted demanding targets within its 'Preferred Draft Core Strategy Document' with respect to water efficiency. However, it is clear that there is a hierarchy of demand management measures that need to be considered when developing a demand management programme. Reference should therefore be made to available guidance and advice (as outlined in Appendix 5) in the preparation of such programmes. This should be carried out in consultation with STWL to maximise water efficiency and related energy efficiency gains.

5.14 Response to Requirements 6 to 8

Summary of Evidence	Summary of Assessment	Conclusion / Recommendation
<p>Identify if there are opportunities to save money or improve sustainability through an integrated approach with other elements of the water cycle study. Where this is the case, the Outline study will need to identify what further work is required in the Detailed study to achieve the benefits. An example of this would be rainwater harvesting or grey-water recycling.</p>	<ul style="list-style-type: none"> A number of development sites are located in areas with sewerage system capacity constraints. These are listed in Section 6.7. 	<ul style="list-style-type: none"> These development sites offer a number of potential trial study locations for the assessment of water efficiency measures and their impacts on reducing runoff as well as water demands. This would require co-ordination with STWL, the Environment Agency and other organisations to develop funding support for such trials. The results from these trials could then be disseminated to the water industry through the mechanisms described in Appendix 5.
<p>Identify high level policy advice on water efficiency measures for developers.</p>	<ul style="list-style-type: none"> Water efficiency measures and guidance are available. The evidence base for applying these measures cost-effectively and in alignment with carbon reduction commitments is growing. 	<ul style="list-style-type: none"> As recommended by the Environment Agency, new development should seek to meet the highest level of water efficiency measures to achieve a water conservation target of CSH Level 3/4 (≤ 105 l/p/d) for residential buildings, BREEAM certification for new office buildings and a minimum of 25% water savings for any other development. To facilitate the achievement of these objectives, BDC and RBC, with developers, should seek support from STWL in obtaining best available data from micro-component models of household demands. Only by understanding the current and future use of water by the different household components, i.e. fixtures and appliances, can the most appropriate water efficiency measures be targeted to achieve the greatest savings and efficiency improvements.

Summary of Evidence	Summary of Assessment	Conclusion / Recommendation
		<ul style="list-style-type: none"> • The application of least cost planning demand management tools can provide an important part of the decision-making process and can provide support in future planning decisions. In addition to the evaluation of the cost benefits of demand management measures, these tools can determine future carbon reductions by implementing a set of efficiency measures. Water companies have recently started to make use of highly developed least cost planning tools for their determination of AMP5 water efficiency programmes. These tools can be customised to different demand sectors and can also be applied at smaller local planning areas for BDC and RBC. • Trial studies can provide important conclusions about future investment options. BDC and RBC, with developers, could liaise with STWL, the Environment Agency and other organisations to identify potential pilot project areas where such trial studies are needed and to share funding requirements. The results from these trials could then be disseminated to the water industry through the mechanisms described in Appendix 5. • There is an increasing evidence base addressing the costs and benefits of water efficiency measures. BDC and RBC, with developers, could make use of the information that is now available and include this as part of their planning process to assist in achieving water efficiency policy targets. • To achieve indoor demand targets preference should be given to the installation of water efficient fixtures and appliances first and then to source substitution options (i.e. rainwater harvesting and grey water recycling). • If considering the installation of source substitution, priority should be given to smaller systems for external use only. In the case of installing larger collection and recycling systems these should be assessed on an individual basis according to the guidance given in Appendix 5.

Summary of Evidence	Summary of Assessment	Conclusion / Recommendation
		<ul style="list-style-type: none"> • If the estimated water demand from new dwellings impose a higher stress on local supplies, then BDC and RBC with the developers, should seek actions to reduce the demand of existing properties by adopting the implementation of the following measures: <ul style="list-style-type: none"> • Support STWL and the Environment Agency in promoting voluntary meter installation for existing customers. • Liaise with STWL and the Environment Agency to undertake retrofit programmes in council owned buildings, i.e. social housing and public institutions. • Promote water efficiency products either on council websites, newsletters or by other third parties.¹¹ • Consider subsidising water efficiency products for low-income households. • Raise water efficiency awareness through public events, newsletters and online publications. • Support STWL's efforts of school education in rolling out sustainability education programmes in schools. • Further work should include water efficiency and energy audits of BDC's and RBC's own buildings as part of the programme of measures to contribute to sustainable water cycle management and meet carbon targets within each local authority area.
<p>Identify any information, data, funding or policy gaps that need further investigation.</p>	<ul style="list-style-type: none"> • STWL has identified a need for detailed distribution modelling of the local water supply network associated with the majority of the proposed development sites. This is to identify locations requiring infrastructure reinforcement, and associated costs. 	<ul style="list-style-type: none"> • Distribution modelling of local water supply network as part of a Detailed WCS.

5.15 Conclusions and Recommendations

- 5.15.1 The STWL WRMP presents a programme of measures that address a projected baseline negative balance of supply in both the Severn and Birmingham WRZs through to the 2035 planning horizon. As Bromsgrove District and Redditch Borough are located within the Severn WRZ, it is very likely that both BDC and RBC will be supplied within STWL's Level of Service at their adopted target headroom risk profile.
- 5.15.2 Environmental uncertainties and risks have, however, been identified that may place this forecast situation at risk. The Agency's AMP5 RSA programme has identified 7 STWL sources within the Severn and Birmingham WRZs as potentially having a negative impact on a number of water bodies. Any reductions in the licensed abstractions from these sources may put significant pressure on future water resources management. The development of alternative measures will need to be carefully considered to ensure that solutions are affordable and environmentally sustainable, including that there are no net negative impacts in terms of carbon costs.
- 5.15.3 A review of the local CAMS and Severn River Basin District RBMP has indicated the stressed nature of the water resources within the Midlands Region, and locally from sources that supply Bromsgrove District and Redditch Borough. This is reflected in the planned measures included within the STWL WRMP for the current AMP5 planning period (2010 to 2015) and beyond to 2035. This focuses on both demand management measures and use of aquifer storage and recovery projects, with a major infrastructure enhancement and abstraction licence variation to increase deployable output to the Severn (and Birmingham (Elan)) WRZ rather than the development of new water supply sources to address the baseline negative balance of supply for the Severn WRZ through the AMP planning period to 2035.
- 5.15.4 The importance of the adoption of a twin track approach to addressing supply demand balance deficits is clearly demonstrated for the Severn and Birmingham WRZs. The adoption of demand management measures by STWL should be supported and encouraged by both BDC and RBC. An alternative to this would be the supply of water from elsewhere within the STWL supply area using the Strategic Treated Water Grid, with the risk of local environment impacts being transferred to other sources, as well as negative impacts such as increased carbon costs.
- 5.15.5 As a general target all new residential developments should seek to meet the highest level of water efficiency measures to achieve a water conservation target of CSH Level 3/4 (≤ 105 l/p/d) and a CSH water category Level 5 (≤ 80 l/p/d) after 2016 in water stressed areas. New office developments should demonstrate the highest achievable BREEAM certification with respect to water demand and all other developments should provide evidence of achieving a minimum of 25% water savings.
- 5.15.6 To support both BDC and RBC in the development of locally specific demand management measures and standards it is recommended that a micro-component demand model is developed. This can be used to assess the impact of demand management measures on the final end-uses of each user group. The development of an appropriate model is a necessary exercise if appropriate cost benefit analysis is to be undertaken and realistic estimates of water savings are to be made. This would be based on the definition of an agreed baseline scenario, and different demand management scenarios which consider a range of measures. Once the best scenario has been identified, local demand targets can be set, within agreed guidance and criteria on appropriate demand management measures.
- 5.15.7 BDC, RBC and developers should work together with STWL and the Environment Agency in seeking solutions to reduce water demand in existing development areas, e.g. through water efficiency audits and retrofit programmes in schools and Local Authority buildings and local

educational programmes. This will ensure that selected measures and programmes can be most efficiently implemented in order to offset increased demand by new developments on local supplies.

- 5.15.8 STWL has identified a need for detailed distribution modelling of the local water supply network associated with the majority of the proposed development sites. This is to identify locations requiring infrastructure reinforcement, and associated costs. It is recommended that this work is undertaken as part of the Detailed Water Cycle Study.

6 Wastewater Collection

6.1 Introduction

6.1.1 Effective drainage is key to the sustainable management of wastewater. In Redditch Borough and Bromsgrove District capacity exceedance (e.g. flooding, excessive operation of sewer overflows) of piped sewerage systems has arisen due to the historical practice of discharging storm water to foul sewers. This problem has been exacerbated by the paving of front gardens and other permeable areas thereby increasing the volume and speed of surface water runoff to public sewers (both foul and surface water) which were not designed for this purpose.

6.1.2 The purpose of this chapter is to answer three broad questions:

- i. Is there sufficient wastewater collection capacity (pipe network capacity) to meet the proposed growth and development scenarios presented in Chapter 3?
- ii. Can sustainable solutions be recommended to meet potential wastewater collection constraints, and in so doing, provide broad policy direction for the Core Strategy documents?
- iii. Is there a requirement for further investigation, i.e. a Detailed WCS?

6.1.3 The Environment Agency's WCS Guidance document⁶⁷ fleshes out these broad questions in the form of information requirements; these are described below:

1. Identify if major strategic improvements to the sewerage system are required. If they are required, the study should identify if funding is available, and if there are opportunities for environmental enhancement as part of the strategic improvements.
2. In collaboration with the water cycle steering group, identify those issues that need to be looked at in more detail during the detailed water cycle study.
3. Identify if there are other environmental capacity constraints that may need to be resolved. For example, will increased discharge from a STW lead to an unacceptable increase in flood risk?
4. Identify if there are any missing data that need to be sourced before any detailed planning applications can be assessed.

6.2 Chapter Outline

6.2.1 The remainder of this chapter is set out to answer the three questions listed in Paragraph 6.1.2 and to meet the information requirements listed in Paragraph 6.1.3. Accordingly, the remainder of the chapter is structured as follows:

- Section 6.3 presents an overview of the wastewater collection system in Redditch Borough and Bromsgrove District. It also presents the projected increase in the number of dwellings and employment land within each of the eight Drainage Area Plan (DAP) areas;
- Section 6.4 describes the wastewater collection system (current baseline) in the three DAP areas within Redditch Borough;

⁶⁷ <http://environment-agency.gov.uk/research/planning/33368.aspx>

- Section 6.5 describes the wastewater collection system (current baseline) in the five DAP areas within Bromsgrove District;
- Section 6.6 describes the approach used in assessing the wastewater collection (pipe network) constraints to development;
- Section 6.7 describes those development sites whose wastewater collection infrastructure will constrain future growth and development;
- Section 6.8 presents the implications of the assessment for future growth; and
- Section 6.9 presents the conclusion and recommendations.

6.3 Wastewater Collection in Redditch Borough and Bromsgrove District

6.3.1 Publicly maintained wastewater collection within Redditch Borough and Bromsgrove District is managed by STWL. There are, however, rural areas which are not connected to the public sewerage network.⁶⁸ There may be opportunities to connect some of these properties as part of the development. However, this is beyond the scope of this assessment and is not considered further in this report.

6.3.2 The area comprising Redditch Borough and Bromsgrove District has been divided into eight DAP areas by STWL (Figure 6-1). Drainage Area Plans are used by STWL to assess sewerage network performance in regard to hydraulic, structural, operational and environmental performance criteria. They are used as the basis for considering sewerage improvement options for different design horizons for investment planning to meet regulatory and customer service objectives. This assessment makes reference to these DAP areas.

6.3.3 Table 6-1 presents the projected increase in the number of dwellings and employment land within each of the eight DAP areas for Redditch Borough and Bromsgrove District. These values were used in the assessment⁶⁹, as described later in Section 6.6.

Table 6-1 Projected Increase in the Number of Dwellings and Employment Land Within Each DAP Area for Redditch Borough and Bromsgrove District

DAP Area	Bromsgrove District		Redditch Borough		Total Number of Dwellings	Total Employment Land Area (ha)
	Number of Dwellings	Employment Land Area (ha)	Number of Dwellings	Employment Land Area (ha)		
Spernal – L-874-01	0	0.0	2,337	41.49	2,337	41.49
Priest Bridge – L-874-02	0	0	15	0.11	15	0.11
Redditch RAMPS – L-874-02	0	0.0	627	0.23	627	0.23
Bromsgrove – L-872-01	2,821	5.0	0	0.0	2,821	5.0

⁶⁸ Areas not connected to the wastewater collection system are not considered in this assessment as they do not contribute any flows to it

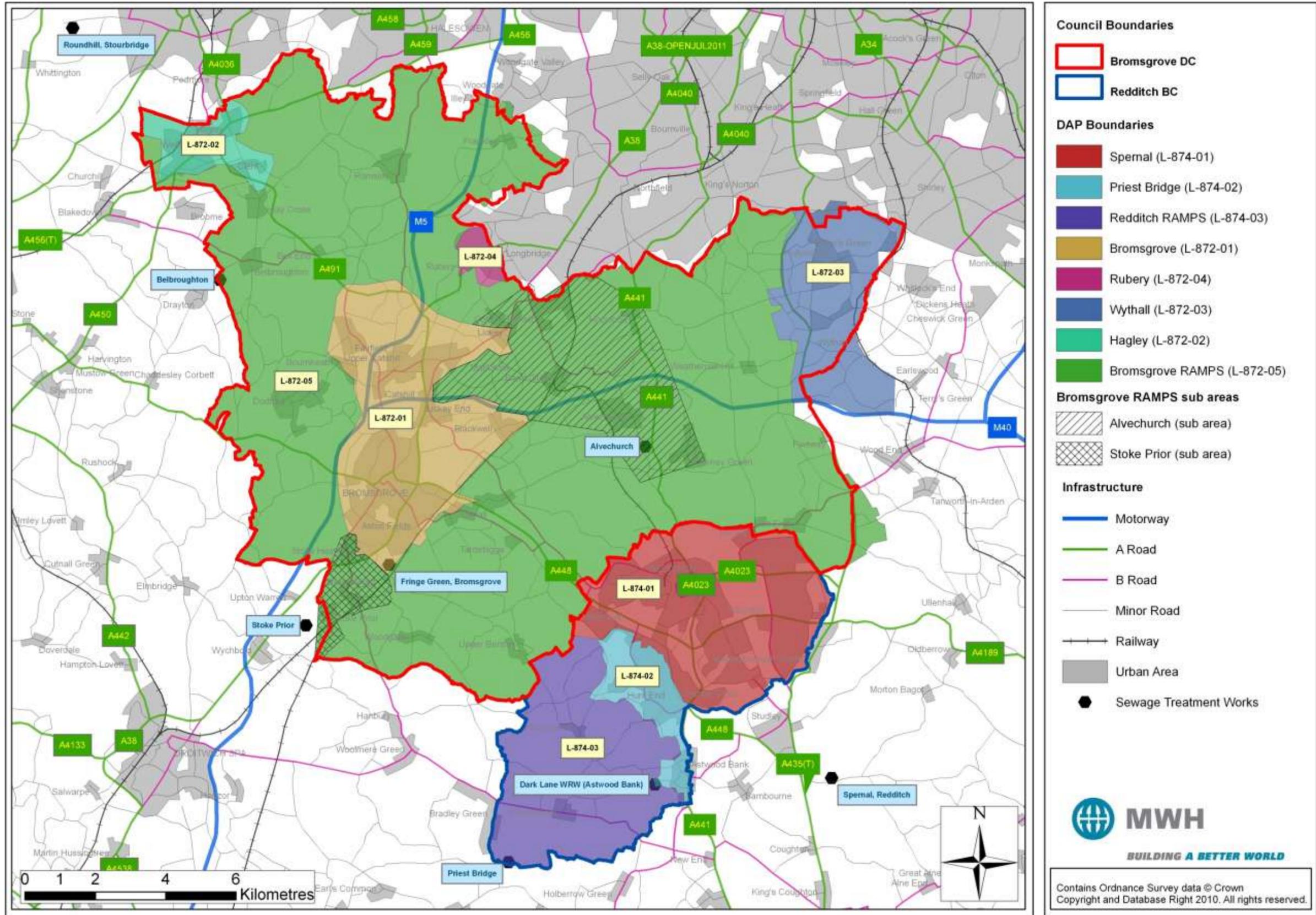
⁶⁹ See Paragraph 3.9.5

DAP Area	Bromsgrove District		Redditch Borough		Total Number of Dwellings	Total Employment Land Area (ha)
	Number of Dwellings	Employment Land Area (ha)	Number of Dwellings	Employment Land Area (ha)		
Rubery – L-872-02	91	0.0	0	0.0	91	0.0
Wythall – L-872-03	239	0.0	0	0.0	239	0.0
Hagley – L-972-04	514	0.0	0	0.0	514	0.0
Bromsgrove RAMPS ⁷⁰ – L-872-05	190	0.6 ⁷¹	0	0.0	190	0.6 ⁷¹
TOTAL	3,855	5.6	2,979	41.83	6,834	47.43

⁷⁰ Rural Asset Management Plan

⁷¹ Revised figure is 1.8 ha. This would result in an additional 4 l/s of flow. However, as this is in an area which has already been identified as being at risk of flooding to existing properties it does not change the recommendations for this area

Figure 6-1 Drainage Area Plan Areas in Bromsgrove District and Redditch Borough



6.4 Redditch Borough Drainage Areas

Spernal Drainage Area - STWL DAP ref L-874-01

- 6.4.1 Spernal Drainage Area incorporates the majority of the town of Redditch. These areas drain to Spernal STW which also receives flows from the villages of Studley, Sambourne and Middletown.
- 6.4.2 The sewerage system is fairly typical of a town of this age. The central area is partially separate with storm runoff from most of the older buildings draining directly to the foul system⁷² alongside foul flows; the areas towards the outskirts of the town are totally separate with storm runoff draining to storm sewers. All roads in the catchment drain either to the storm system or to highway drains.
- 6.4.3 The foul / combined system drains by gravity to Spernal STW. There are, however, 11 pumping stations that pump flows into the sewer network from some of Redditch town's suburbs. In the west there are pump stations at Norgrove, Webheath, Foxlydiate and Plymouth Close which pump flows into the local network. In the south there are pump stations at Washford Bridge, Kiln Close, Oak Tree Lane, Middletown Lane and Sambourne which also pump into the local network.
- 6.4.4 There is only one known interaction between the Spernal and Priestbridge catchments where excess flows from the Malvern Road / Vaynor Drive bifurcation⁷³ spill into the Priest Bridge Drainage Area.
- 6.4.5 There are six Overflows in the catchment, three of which are still operating as Combined Sewer Overflows (CSOs)⁷⁴, a fourth at Brook Street has been abandoned. There are also two pumping station overflows.
- 6.4.6 The storm water drainage system is made up of a number of individual catchments which generally outfall to the River Arrow and local brook courses and ponds. There are numerous open balancing areas throughout the area.
- 6.4.7 The STWL Spernal DAP report⁷⁵ identified a number of flood risk areas. Notional Improvements were identified for the problems highlighted by the study.
- 6.4.8 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Spernal Drainage Area will need to accommodate up to an additional 2,337 new dwellings and 41.49 ha of new employment land (Table 6-1). The development sites located within Spernal Drainage Area are listed in Appendix 6.

⁷² There are three types of sewerage systems: foul sewers which carry flows from business and domestic water use to STWs, surface water sewers which carry rainwater to a suitable discharge point (not a STW), and combined sewers which carry business and domestic wastewater and rainwater in the same pipes to a STW for treatment prior to discharge

⁷³ A bifurcation is a split in flows between two combined / foul sewers

⁷⁴ CSOs are responsive to high rainfall; they act as 'release valves' which carry excess flows by underground pipes to an outfall point, usually a local watercourse. CSOs convey high flows in a combined sewer system in a controlled manner

⁷⁵ Spernal Drainage Area Plan L-874-01 Needs Report, September 2007

Priestbridge Rural Drainage Area, STWL DAP ref L-874-02

- 6.4.9 The majority of Priest Bridge Drainage Area drains into Redditch RAMPS Drainage Area and via the former Hunt End STW storage tanks before reaching Priest Bridge STW to the south west of Redditch. Flows enter this STW via gravity and flow through a 6 times Dry Weather Flow⁷⁶ (DWF) overflow and a 3 times DWF overflow before entering the primary treatment phase of the works.
- 6.4.10 The Priest Bridge DAP area is predominantly residential and has mostly separate wastewater and stormwater drainage.
- 6.4.11 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Priest Bridge Drainage Area will need to accommodate an additional 15 new dwellings and 0.11 ha of new employment land (Table 6-1). The development sites located within Priest Bridge Drainage Area are listed in Appendix 6.

Redditch RAMPS Drainage Area, STWL DAP ref L-874-03

- 6.4.12 Redditch RAMPS Drainage Area is predominantly rural and drains via a principal sewer system into Priest Bridge STW. The village of Feckenham is drained by a separate sewerage system which connects into the principal sewer.
- 6.4.13 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Redditch RAMPS Drainage Area will need to accommodate an additional 627 new dwellings and 0.23 ha of new employment land (Table 2-1). The development sites located within Redditch RAMPS area are listed in Appendix 6.
- 6.4.14 The 2009 STWL DAP report⁷⁷ identified the flooding issues within Priest Bridge Drainage Area and Redditch RAMPS Drainage Area as follows:
- 11 reported foul flooding locations;
 - 6 reported surface water flooding locations; and
 - 28 predicted flooding clusters on an up to 40 year design storm.

6.5 Bromsgrove District Drainage Areas

Bromsgrove Town Drainage Area, STWL DAP ref L-872-01

- 6.5.1 Combined sewers were constructed in Bromsgrove town in the 1880s. These extend from the Prince of Wales Community Hospital, through the town centre to Bromsgrove STW located on the southern boundary at Fringe Green. The majority of the remaining trunk sewers were constructed in the 1930s. The system remained unchanged until the early 1980s when several new sewers were constructed to drain some of the outlying rural areas of the District such as Linthurst, Burcot Fairfield and Bourneheath. A new southern interceptor sewer was also constructed in the 1980s to transfer flows from the original and overloaded western and central outfall sewers to the newer eastern outfall.

⁷⁶ DWF has been defined by the Institute of Water Pollution Control as the average daily flow to the STW during seven consecutive days without rain (excluding a period which includes public holidays) following seven days during which the rainfall did not exceed 0.25 mm on any one day. It is used for STW design, to determine the baseflow in sewerage modelling and to set and enforce effluent discharge consents

⁷⁷ Redditch RAMPS L-874-03

- 6.5.2 There are known problems with overloading during times of heavy rainfall at the Bromsgrove (Fringe Green) STW with flooding both inside and upstream of the inlet to the works. STWL are investigating a number of solutions in a bid to reduce operational issues.
- 6.5.3 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Bromsgrove Town Drainage Area will need to accommodate an additional 2,821 new dwellings (Table 6-1). The development sites located within Bromsgrove Town Drainage Area are listed in Appendix 7.
- 6.5.4 The 2010 DAP report⁷⁸ highlights a number of flooding problems within this Drainage Area. The hydraulic analysis, however, did not identify any strategic deficiencies within the existing sewer network.

Rubery Drainage Area STWL DAP ref L-872-02

- 6.5.5 Rubery Drainage Area is a small, semi-urban, mostly residential development adjacent to the Birmingham conurbation. It was developed to provide local housing for the now redundant car manufacturing plant in nearby Longbridge. The area does not have a STW within its boundary; rather flow discharges by gravity to the Upper Rea Main sewer which eventually discharges to the Minworth STW.
- 6.5.6 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Rubery Drainage Area will need to accommodate an additional 91 new dwellings (Table 6-1). The development sites located within Rubery Drainage Area are listed in Appendix 7.
- 6.5.7 There are minor flooding problems in the Drainage Area which can be attributed to the public sewerage system.⁷⁹ There is also a known highway drainage problem in Callowbrook Lane where the Callow Brook passes under the highway.

Wythall Drainage Area STWL DAP ref L-872-03

- 6.5.8 Wythall Drainage Area is semi-rural; nested within it is development at Hollywood, Drakes Cross and Grimes Hill to the east of the Alcester Road. The trunk sewers built in the late 1930s originally discharged to a treatment works just north of Houndsfield Lane. In 1972, the extension to the Upper Cole Valley sewer which discharges to Minworth STW north of Birmingham enabled the works to be decommissioned and also facilitated first time sewerage to be provided for Inford and Tanners Green.
- 6.5.9 Until 1995, there were no major changes to the sewerage infrastructure in Wythall Drainage Area. However, the office development off Middle Lane for Britannic Assurance necessitated the provision of 2.4 km of sewer, roughly following the Shaw Brook, South of Houndsfield Lane.
- 6.5.10 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Wythall Drainage Area will need to accommodate an additional 239 new dwellings (Table 6-1). The development sites located within Wythall Drainage Area are listed in Appendix 7.

⁷⁸ Bromsgrove Drainage Area Plan L – 872 – 01 - m06, October 2009

⁷⁹ Rubery Drainage Area Plan L-872-04-M03 Needs Report, February 2005

Hagley Drainage Area, STWL DAP ref L-972-04

- 6.5.11 Hagley Drainage Area's sewer network generally flows from east to west to the former STW. This was converted to a Terminal Pumping Station (TPS) which now pumps to Roundhill STW near Stourport. The original sewer network was built between 1903 and 1906, following the main roads, leading to a ribbon-type development. During the 1920s and 1930s, there was some estate development which required minor extensions to the system. Post-1945 development also took the form of estate development with some additions to the treatment works in the late 1950s. As part of the original network was overloaded, a new relief sewer discharging directly to the treatment works was constructed in 1969 / 70; this effectively intercepted flows from ~60% of the catchment. During 1987, a short length of relief sewer was constructed to provide a link from the aforementioned relief sewer and a section of the older system where roots and flat gradients caused persistent blockages and foul flooding in some properties in Cavendish Drive and The Greenway.
- 6.5.12 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Hagley Drainage Area will need to accommodate an additional 514 new dwellings (Table 6-1). The development sites located within Hagley Drainage Area are listed in Appendix 7.

Bromsgrove RAMPS Drainage Area, STWL DAP ref L-872-05

- 6.5.13 There are a number of discrete catchments within the Bromsgrove RAMPS Drainage Area; two (Alvechurch to the east and Stoke Works to the south) are impacted by the proposed growth and development outlined in Chapter 3. These areas have their own STW and associated wastewater collection systems. They are discussed further below.
- 6.5.14 Alvechurch sub area drains to the Alvechurch STW located to the south of Alvechurch town; it consists of five semi-urban areas including Cofton Hackett, Barnt Green, Hopwood, Rowney Green and Alvechurch. All are low density residential land uses with substantial areas of soakaway drainage. Each of these is described below:
- Cofton Hackett is the furthest from Alvechurch STW and was constructed in the inter-war period close to the railway line to the east of the village. The catchment is a mixture of combined sewers to Alvechurch STW and soakaways / private surface water drains which discharge to nearby watercourses. The industrial developments were located closest to the railway line and are separated from the village by Grovelly Lane. No significant development of the Cofton Hackett catchment has occurred in the post-war period.
 - The village of Barnt Green was constructed in the pre-war period. This small area contains combined sewers draining medium density residential development (>20 years old) with some high density residential development off Hewell Road to the east of the village. The remainder of the village is low density residential and was constructed in the post-war period. It is drained by a partially separate drainage system with surface water being discharged privately to either soakaways or local watercourses.
 - Hopwood is a mainly separate system with soakaways. Rowney Green, however, has predominantly combined sewers while the ribbon development along Birmingham Road has fully combined sewers. Both areas were constructed in the post-war period and have predominantly low density residential land use.
 - Central Alvechurch was constructed in the pre-war period and is a mixture of medium density residential (>20 years old) with high density residential land uses. The surrounding urban areas in Alvechurch were constructed in the post-war period and are predominantly low density residential land use. The majority of the sewerage system is

partially separate⁸⁰ with surface water draining into soakaways. A small estate to the south drains to a local watercourse via a separate storm system.

- 6.5.15 The Stoke Works sub area drains to Stoke Works STW. This STW receives partially separate flow from a number of small rural villages including Stoke Works, Stoke Prior, Stoke Wharf and Whitford Bridge and a small area to the south of Bromsgrove town at Stoke Heath.
- 6.5.16 Based on the growth and development scenarios presented in Chapter 3, and the development sites available for meeting the proposed growth, Bromsgrove RAMPS Drainage Area will need to accommodate an additional 190 new dwellings and 0.6 ha of employment land (Table 6-1). 181 of these new dwellings will be located within the Alvechurch sub area and 9 new dwellings in Stoke Works sub area. The 0.6 ha of employment land will be located in the Stoke Works sub area. The development sites located within Bromsgrove RAMPS Drainage Area are listed in Appendix 7.

6.6 Assessment Approach

- 6.6.1 Existing STWL InfoWorks models were used to assess the implications of proposed growth and development (described in Chapter 3) on the wastewater collection system within each of the eight DAP areas described in Section 6.5. This was achieved by comparing the hydraulic performance of the wastewater collection system within each DAP area for the baseline case (i.e. the current development status and existing wastewater collection system) against a future case in which increased flows (increased water consumption and impermeable area creep) had been added from the proposed growth and development identified in Table 6-1.
- 6.6.2 STWL has been consulted on the potential impact of the proposed growth and development on the wastewater collection system within the District and Borough. STWL has undertaken a high level desktop study which advises on potential capacity constraints but have undertaken no hydraulic modelling as part of their assessment. This information, presented in Appendix 8, has been used by MWH together with the approach described in Paragraph 6.6.1 to identify wastewater collection constraints to the proposed growth and development in the District and Borough.
- 6.6.3 The InfoWorks models supplied by STWL are type II verified drainage planning models and are suitable for identifying hydraulic problems within a drainage area, identifying the need for possible hydraulic upgrading schemes, for establishing the hydraulic operation of stormwater overflows, and for assessment of the impact of proposed developments. However, these models are not suitable for detailed investigations, scheme appraisals or for the detailed design of schemes.
- 6.6.4 The models have been used to simulate the impact of the proposed development scenarios by comparing the hydraulic performance of the existing 'Needs model' (this is the most suitable version of the model to simulate the sewerage system as it operates today) with the performance of the same model, but with flows added to represent various development scenarios, impermeable area creep and future water consumption.
- 6.6.5 It should be noted that the impact of climate change has not been included as part of this assessment as there is no current UK standard methodology for applying wide scale climate change predictions to small scale urban catchments. STWL do not include for any climate change impact in their assessments or design standards. There is, however, an ongoing

⁸⁰ A partially separate system is a system where part of the storm flows go to a combined sewer and part goes to either a storm sewer or a soakaway

project to assess the potential impact of climate change on STWL assets based on the recommendations of the UKCP09 program.

- 6.6.6 The Known Short Term Model (0-5 years) is as per the existing network with the addition of:
- residential and employment growth up to 2015 as per the growth scenarios;
 - impermeable area creep for housing less than 15 years old; and
 - changes in measured and unmeasured per capita consumption (PCC).
- 6.6.7 The Predicted Long Term model (6-25 years) is as per the Known Short Term model with the addition of:
- residential and employment growth up to 2026 as per the growth scenarios;
 - impermeable area creep for areas of housing less than 6 years old;
 - changes in measured and unmeasured PCC; and
 - no capital schemes, committed or uncommitted have been included in the models.
- 6.6.8 Residential development has been identified from SHLAA report shape files. Where the growth scenario requires a lower level of development than the area available, the development sites have been added to the model based on the following criteria:
- timescale - from the SHLAA report, developments with the shortest timescale have been added to the model first;
 - location - developments closest to the existing sewerage networks have been added to the model in preference to those further away as it is generally easier to provide more capacity nearer the STW;
 - where strategic development sites have been required to make up a shortfall under the growth scenario, the housing density as stated in Paragraphs 3.6.1 and 3.6.2 has been adopted to generate a wastewater flow for the additional development;
 - flows from new residential developments have been modelled as having an occupancy rate of 2.8⁸¹ head per property, 0.5% of total development area as impermeable runoff to the foul / combined sewer network and the measured PCC;
 - creep from existing residential development has been applied as 1% of the total subcatchment areas for the most recent residential areas only, this additional area has been split evenly between roof area and paved area;
 - employment development has been identified from the draft Bromsgrove Core Strategy and Redditch Land Availability Assessment⁸². Employment land has been allocated to the model by adding those developments closest to existing employment land first;

⁸¹ Specified by STWL for the assessment of new development in network sewer modelling

⁸² <http://redditch.whub.org.uk/cms/pdf/ELR%202010%20ownership%20removed.pdf>

- flows from employment land have been modelled with a trade element of 1 l/s/ha and a domestic flow element of 0.5 l/s/ha. No impermeable area has been assigned to the foul / combined network from employment land; and
- growth over and above the areas identified in the strategic sites, SHLAA reports and Land Availability Assessments have not been included in the network model for any of the Growth scenarios. However the plans of the Network Headroom Analysis in Appendix 11 to Appendix 19 can be used to identify preferred areas for additional development.

6.6.9 Appendix 9 and Appendix 10 present the parameter values applied in the InfoWorks models setup for the eight DAP areas. The models were run for design events with a return periods of 1 month, 1, 2, 5, 10, 20, 30 and 40 years and durations of 15, 30, 60, 90, 120, 240, 340 and 480 minutes. No simulations were undertaken to account for climate change.

6.6.10 The results of these design runs were used to help assess the potential wastewater collection constraints to development. The results of these runs and their implications are discussed in Section 6.7.

6.7 Potential Wastewater Collection Constraints to Growth and Development

6.7.1 It should be noted there are existing wastewater collection issues within the Borough and District. This assessment, however, focuses on the potential wastewater collection constraints to the proposed growth and development as a result of the likely increased flows described in Paragraph 6.6.1.

6.7.2 The results of this analysis have been used to identify those development sites where future development will be constrained by the current sewerage infrastructure capacity.⁸³ For consistency, these (constrained development sites) are grouped by DAP Drainage Areas, as presented below.

Redditch Borough Drainage Areas

6.7.3 The STWL desktop study has indicated that the proposed growth and development in Redditch Borough may have an unacceptable impact at five proposed development sites. Four of these development sites are in Sernal DAP Drainage Area (2010/11 Brockhill ADR, 2010/13 Brockhill Green Belt, 2010/14 Foxlydiat Green Belt and EL63 (IN67) North of Red Ditch) and one is in Redditch RAMPS Drainage Area (2010/12 Webheath ADR). These development sites are in the upper reaches of the catchment where there are small diameter local collection sewers. The proposed development sites are also on the opposite side of Redditch to the Sernal STW and therefore will have an impact on the existing sewerage system and its performance from the point of connection to its point of discharge to the works. The impact at each of these development sites based on the additional hydraulic modelling undertaken by MWH is described below in more detail.

6.7.4 Redditch RAMPS DAP Drainage Area – Residential Development Site 2010/12 – there is potential for the Webheath ADR site to be drained either by gravity to the Priest Bridge sewerage system or by pumping flow into the Sernal catchment. STWL has indicated that as the local sewers in both catchments are of small diameter, upsizing is likely to be required to accommodate the flows from the additional 600 properties. The InfoWorks models for the two options (i.e. Priest Bridge DAP Drainage Area or Sernal DAP Drainage Area) confirm that the development impacts the performance of the sewerage system both within the

⁸³ All development sites were assessed. Those development sites that are not described below have no wastewater collection capacity constraints to the proposed growth and development projections described in Chapter 3

immediate area and at various locations downstream to their point of discharge at the Sernal or Priestbridge works. RBC has expressed concern over the capacity of the existing outfall sewer in the Windsor Road area of Redditch and where the sewer currently passes under the River Arrow. A potential solution proposed by RBC is to provide additional capacity in the Priestbridge catchment by transferring flows which currently discharge into the Priestbridge Drainage area into the Sernal catchment at Hunt End. It is evident that significant investment would be required on the sewerage infrastructure before this area could be developed. This would require either laying a significant length of gravity sewer through greenbelt land and / or the construction of a Sewerage Pumping Station (SPS) to transfer flows across the ridge to a suitable connection point in the Sernal catchment.

- 6.7.5 Sernal DAP Drainage Area – Residential Development Sites 2010/11 and 2010/13 – these Brockhill development sites would drain via small diameter local sewers. Additional flows from 825 properties will have a significant impact on the local sewerage system. As detailed above, RBC has expressed concern over the capacity of the existing outfall sewer in the Windsor Road area of Redditch and where the sewer currently passes under the River Arrow. The InfoWorks modelling results demonstrate that approximately 300 m of the downstream sewers would be surcharged more often as a result of the proposed development.
- 6.7.6 Sernal DAP Drainage Area – Residential Development Site 2010/14 – the Foxlydiate Green Belt development is located upstream of small diameter local collection sewers. It is likely that the local sewers will not have the capacity to accept flows from the 230 proposed properties without some local increases in pipe network capacity. InfoWorks modelling indicates that local sewers are already at capacity up to 500 m downstream of this site.
- 6.7.7 Sernal DAP Drainage Area – Employment Land Development Site EL63 (IN67) – this development site is adjacent to the Brockhill residential development sites 2010/11 and 2010/13. As with development sites 2010/11 and 2010/13, the existence of small diameter local collection sewers means that the site would negatively impact the local sewerage system. Similarly, the InfoWorks model results have demonstrated that increases in capacity will be required before this development proceeds. The extent of the increase in capacity will be dependent on the industry developed in this area and the phasing of the nearby residential development.

Bromsgrove District Drainage Areas

- 6.7.8 The STWL desktop study has indicated that the proposed growth and development in a number of areas in the Bromsgrove District may have an unacceptable impact at nine proposed development sites. Four of these development sites are in Bromsgrove DAP Drainage Area (BDC20, BDC80, BDC81 and BDC85) and five are in Hagley Drainage Area (BDC35b, BDC49, BDC189, BDC51 and BDC188). The impact at each of these development sites based on the additional hydraulic modelling undertaken by MWH is described below in more detail.
- 6.7.9 Bromsgrove DAP Drainage Area – Residential and Employment Site BDC20 - the sewerage systems in this area will need upgrading to accommodate the additional flow from the proposed 1,500 properties and 5 hectares of employment land. This is a large development in the upper reaches of the catchment and in an area where there are known existing hydraulic capacity issues.⁸⁴ Analysis of the InfoWorks model results confirm that approximately 250 m of downstream sewers would be surcharged more frequently.

⁸⁴ Bromsgrove Drainage Area Plan L – 872 – 01 - m06 October 2009

- 6.7.10 Bromsgrove DAP Drainage Area – Residential Development Site BDC80 - the sewerage systems in this area will need upgrading to accommodate the additional flow from the proposed 500 properties. The InfoWorks model results indicate that approximately 300 m of the downstream system lacks capacity under storm conditions. No future connections should be allowed between surface water and foul / combined sewers.
- 6.7.11 Bromsgrove DAP Drainage Area – Residential Development Site BDC81 – the sewerage system in the immediate vicinity of the proposed development has capacity to accept the proposed additional 350 properties. There are, however, capacity issues downstream on the sewerage system in the Bromsgrove High Street where internal flooding has been reported. A flood alleviation scheme was proposed by STWL which was subsequently deferred to 2012 due to the high unit cost. InfoWorks modelling results indicate that there is local capacity within the area but that flooding is exacerbated in the High Street. Careful consideration will therefore need to be given to completing the deferred scheme prior to any development upstream of this area.
- 6.7.12 Bromsgrove DAP Drainage Area – Residential Development Site BDC85 – the proposed development would drain to an existing SPS which has not been designed to accommodate the additional flows generated by the 212 additional properties. The SPS will therefore need to be upgraded or an additional SPS constructed prior to the development being constructed.
- 6.7.13 Hagley DAP Drainage Area – Residential Development Sites BDC35B and BDC49 – these two development sites would potentially drain to sewers which have small diameters and reported hydraulic flooding problems. The InfoWorks model results demonstrate that the impact of an additional 313 properties would increase the frequency of surcharge.
- 6.7.14 Hagley DAP Drainage Area – Residential Development Sites BDC189, BDC51 and BDC188 – while these three development sites could potentially be connected downstream of the reported flooding problem in Worcester Road, there would still be capacity issues with the local system. The InfoWorks model results confirm that the system is already at capacity during a 1-year storm downstream of the proposed development. Additional capacity will need to be provided to enable these developments to progress.
- 6.7.15 To summarise, infrastructure capacity limits will increase the volume and frequency of sewer flooding at the following development sites in Redditch Borough and Bromsgrove District:
- 2010/12 Webheath ADR;
 - 2010/11 Brockhill ADR;
 - 2010/14 Foxlydiate Green Belt;
 - EL63 (IN67) North of Red Ditch;
 - BDC20 Perryfields Road;
 - BDC80 Whitford Road;
 - BDC81 Norton Farm;
 - BDC85 Land adjacent to Wagon Works, St Godwald's Road;
 - BDC35b Kidderminster and Stourbridge Roads;
 - BDC49 Gallows Brook Pig Farm;

- BDC189 233 Worcester Road;
- BDC51 Land at Algoa House; and
- BDC188 Rose Cottage, Thicknall Cottage and Land at rear of Western Road.

6.7.16 There are a number of ways in which this additional capacity can be provided. Possible solutions include:

- local upsizing - increasing diameters to provide additional capacity;
- new gravity sewers – the construction of new sewers to enable the new development to discharge to a point on the existing system which has adequate spare capacity;
- on line balancing – the construction of a balancing tank on the line of an existing sewer to provide storage during times of heavy rain;
- off line balancing – the construction of a storage tank off the line of an existing system to provide storage during times of heavy rain. This usually requires a pumped return to empty the tanks once the flow in the existing system has reduced;
- reducing stormwater flow from existing developments through:
 - ✓ SuDS;
 - ✓ separation of stormwater at large sites; and
 - ✓ separate stormwater network for upper part of currently combined sewer network; and
- reducing foul sewer flow through:
 - ✓ low flow toilet systems for a) all new developments, and b) retrofit to existing properties; and
 - ✓ water efficiency measures (see Chapter 5).

6.7.17 Wastewater collection is linked to the application of SUDs to ensure that storm flows do not enter the foul sewers, as proposed in Chapter 5.

6.7.18 A summary of the potential issues highlighted by STWL and the modelling assessments undertaken by MWH plus possible measures at those development sites constrained by wastewater collection infrastructure capacity constraints are presented in Table 6-2.

Table 6-2 Summary of Issues and Possible Measures at Development Sites Constrained by Wastewater Collection Infrastructure Capacity Constraints

Development Site	Issue(s)	Possible Measure(s)
2010/12 – Webheath ADR	<ul style="list-style-type: none"> • Small diameter sewerage systems in Priest Bridge DAP Drainage Area and Sernal DAP Drainage Area • Downstream pipe network impacts above and below STW 	<ul style="list-style-type: none"> • Local upsizing • New gravity sewer • New Sewage Pumping Station (SPS)
2010/11 – Brockhill ADR	<ul style="list-style-type: none"> • No known <i>existing</i> sewer flooding locally although trunk sewers downstream in Windsor Road are at capacity • Small diameter sewerage systems • Downstream pipe network impacts 	<ul style="list-style-type: none"> • Local upsizing
2010/13 – Brockhill Green Belt	<ul style="list-style-type: none"> • No known <i>existing</i> sewer flooding locally although trunk sewers downstream in Windsor Road are at capacity • Small diameter sewerage systems • Downstream pipe network impacts 	<ul style="list-style-type: none"> • Local upsizing
2010/14 – Foxlydiate Green Belt	<ul style="list-style-type: none"> • No known <i>existing</i> sewer flooding locally although trunk sewers downstream in Windsor Road are at capacity • Small diameter sewerage systems • Downstream pipe network impacts 	<ul style="list-style-type: none"> • Local upsizing
EL63 (IN67) – North of Red Ditch, Enfield	<ul style="list-style-type: none"> • No known <i>existing</i> sewer flooding locally although trunk sewers downstream in Windsor Road are at capacity • Small diameter sewerage systems • Downstream pipe network impacts 	<ul style="list-style-type: none"> • Local upsizing
BDC20 – Perryfields Road, Bromsgrove	<ul style="list-style-type: none"> • Foul flows to impact different parts of sewerage system • <i>Known</i> internal sewer flooding • Small diameter sewerage systems • Significant downstream pipe network impacts 	<ul style="list-style-type: none"> • Local upsizing • Catchment separation • Online / offline balancing
BDC80 – Whitford Road, Bromsgrove	<ul style="list-style-type: none"> • No known <i>existing</i> sewer flooding • Small diameter sewerage systems 	<ul style="list-style-type: none"> • Local Upsizing
BDC81 – Norton Farm, Birmingham Road, Bromsgrove	<ul style="list-style-type: none"> • No capacity issues at site, but downstream in Bromsgrove High Street • <i>Known</i> internal sewer flooding in Bromsgrove High Street 	<ul style="list-style-type: none"> • Complete deferred capacity upsizing scheme
BDC85 – Land adjacent to Wagon Works, St Godwald's Road, Bromsgrove	<ul style="list-style-type: none"> • SPS not designed to accommodate increased flows 	<ul style="list-style-type: none"> • Upgrade / build new SPS
BDC35B – Kidderminster and Stourbridge Road, Hagley	<ul style="list-style-type: none"> • <i>Known</i> internal sewer flooding • Small diameter sewerage systems 	<ul style="list-style-type: none"> • Complete deferred capacity upsizing scheme • Local upsizing

Development Site	Issue(s)	Possible Measure(s)
BDC49 – Gallows Road, Kidderminster Road, Hagley	<ul style="list-style-type: none"> • <i>Known</i> internal sewer flooding • Small diameter sewerage systems 	<ul style="list-style-type: none"> • Complete deferred capacity upsizing scheme • Local upsizing
BDC189 – Stratheam, Western Road, Hagley	<ul style="list-style-type: none"> • <i>Known</i> internal sewer flooding • Small diameter sewerage systems 	<ul style="list-style-type: none"> • Local upsizing • Connect downstream of known flooding area
BDC51 – Land at Algoa House, Western Road, Hagley	<ul style="list-style-type: none"> • <i>Known</i> internal sewer flooding • Small diameter sewerage systems 	<ul style="list-style-type: none"> • Local upsizing • Connect downstream of known flooding area
BDC188 – Rose Cottage, Thicknall Cottage and Land at Rear of Western Road, Hagley	<ul style="list-style-type: none"> • <i>Known</i> internal sewer flooding • Small diameter sewerage systems 	<ul style="list-style-type: none"> • Local upsizing • Connect downstream of known flooding area

6.8 Implications for Further Development

Phasing

- 6.8.1 Whilst this assessment has considered the phasing of development in line with the projections presented in Chapter 3, the overriding issue is the provision of adequate additional capacity in the affected wastewater collection systems. Phasing is therefore not the most significant wastewater collection constraint to development within Redditch Borough and Bromsgrove District.
- 6.8.2 STWL has stated "Due to the financial issues of providing underutilised capacity we are reluctant to commit investment to provide additional sewerage capacity. We would only trigger investment once specific developer enquiries are received. Where the timescale for providing additional growth could delay the timing of development we will endeavour to identify these issues also as part of our input to the WCS we will aim to identify sewerage works where future development could result in possible showstoppers. These will be site locations where the costs of providing additional capacity are unreasonably high and where site constraints make it difficult to for us to envisage timing. In a summary we need the development confidence that the site will certainly go ahead."

Allocation of Shortfall in Development

- 6.8.3 Chapter 3 identified a shortfall in land available for development. Accordingly, there is a need to identify additional development sites to make up the shortfall. To contribute to identifying suitable development sites, the InfoWorks models have been used to prepare plans of projected sewer capacity based on current STW capacity (see Chapter 7). The plans, which are presented in Appendix 11 to Appendix 19, have been prepared using a number of typical design storms as described in Section 6.6. The locations of spare capacity can be used as part of the decision-making process to help identify additional locations for development sites. It should be noted, however, that STWL would need to be consulted prior to any agreement on future development and the available capacity in the sewerage network.
- 6.8.4 STWL stated "Generally windfall developments will have no capacity issues as long as the Surface Water Sewers are managed through a conventional piped system or through the use of sustainable drainage systems".
- 6.8.5 Additional development sites should, where possible, be located in:

- larger catchments such as Bromsgrove, Sernal or Priestbridge where development flows will make up a smaller proportion of the existing flows;
- areas of adequate capacity highlighted in green in Appendix 11 to Appendix 19;
- areas of sufficient elevation to allow new flows to gravitate to the existing network / STW and be designed in accordance with 'Sewers for Adoption'⁸⁵ i.e. *"To provide a self-cleansing regime with foul gravity sewers, the minimum flow velocity should be 0.75 m/s at one-third design flow. Where this requirement cannot be met, then this criterion would be considered to be satisfied by a 150 mm nominal internal diameter gravity sewer having a gradient of not flatter than 1:150 where there are at least 10 dwellings connected. Where the sewer is 100 mm nominal i.d. serving 10 or less properties the minimum acceptable gradient is 1:80 where there is at least 1 WC (toilet) connected and 1:40 if there is no WC connected".* It goes on to add *"These parameters are not to be taken as the norm when the topography permits steeper gradients."* and *"When a choice has to be made between gravity sewerage and pumped sewerage, these criteria should not be regarded as inflexible and the Developer should consult the Undertaker."*; and
- catchments with additional available STW hydraulic capacity as identified in Chapter 7.

6.8.6 Development should, where possible, avoid:

- smaller catchments;
- areas at or upstream of limited capacity highlighted in red in Appendix 11 to Appendix 19;
- areas of limited elevation which will require pumping of flows to the existing network / STW; and
- catchments with limited STW hydraulic capacity.

Need for a Detailed WCS

6.8.7 A Detailed WCS would provide the opportunity to:

- further enhance the hydraulic models in the locations of the developments from the current type II DAP models as described in Paragraph 6.6.3 to more detailed type III models to provide additional confidence in their predictions as required by a Detailed WCS. It should be noted that STWL will be carrying out their own strategic modelling assessment of the proposed growth as part of their Sewerage Management Plan (SMP). This will help the Councils' future planning policies. A Detailed WCS would therefore enable STWL to engage fully with the WCS steering group and give all involved advance warning of the potential need for capital investment and therefore allow them to make adequate provision in their future capital program;
- develop notional solutions with costs to enable the wastewater flows from the additional development to be accommodated in the existing system; and
- prioritise interventions to ensure the required capacity is available prior to the development being completed and therefore enable the development of a coherent WCS.

6.8.8 Once a detailed WCS has been completed it is our understanding that it would be the developers' responsibility to design any new infrastructure on the development site and

⁸⁵ Sewers for Adoption, 2011: A Design and Construction Guide for Developer, 7th Edition

offsite in public land to the point where it discharged to an existing public sewer. At this point any design for upgrading the system would be the responsibility of STWL. However STWL may look to recover the costs of the pre-planning assessment from developers. STWL official response "Developers will need to provide a drainage plan of the development site showing the proposed connection points. However STWL will cover the costs for the offside drainage."

- 6.8.9 The findings of the assessment of wastewater collection are summarised in Table 6-3, against the Guidance requirements. Conclusions and recommendations are also presented in this table.

Table 6-3 Wastewater Collection Summary of WCS Findings

Description of Requirement	Assessment Summary	Conclusion / Recommendation
<p>Identify if major strategic improvements to the sewerage system are required. If they are required the study should identify if funding is available, and if there are opportunities for environmental enhancements as part of the strategic improvements.</p>	<ul style="list-style-type: none"> • Development is likely to be constrained by current wastewater collection infrastructure at five development sites in Redditch Borough and nine sites in Bromsgrove District. • At four of the five development sites in Redditch Borough (2010/11, 2010/13, 2010/14 and EL63 (IN67)) there is no known current sewer flooding. However, the small diameter sewerage systems will need to be upsized to accommodate the increased flow. • At the Webheath ADR development site (2010/12) flow can drain either via gravity to the Priest Bridge sewerage system or by pumping flow into the Sernal catchment. Either way, upsizing will be required together with a new gravity sewer or a SPS. • There are known (existing) internal sewer flooding issues at or immediately downstream of seven of the nine development sites in Bromsgrove District (BDC20, BDC35B, BDC49, BDC189, BDC51, BDC188 and BDC81). The small diameter sewerage systems at these sites will need to be upsized to accommodate the increased flow. Upsizing will be required at each of these sites. At sites BDC35B, BDC49 and BDC81 this can be achieved through completing deferred capacity upsizing schemes. At development sites BDC189, BDC51 and BDC188, as well as upsizing, connections can be made downstream of known flooding areas. At development sites BDC20 and BDC81, no connection should be made between surface water and foul / combined sewers. 	<ul style="list-style-type: none"> • None of the identified constraints are of strategic concern. However, a number of areas will require additional / upgraded wastewater collection infrastructure prior to development progressing. • Detailed InfoWorks hydraulic modelling should be undertaken to help identify the most cost-effective, sustainable solutions at development sites which have been highlighted in Section 6.7 as having a significant impact on the existing sewerage system. • The water efficiency / demand management measures recommended in Chapter 5 should be implemented to reduce water consumption and runoff. This will increase wastewater collection capacity and potentially reduce the investment required to provide the required capacity. Significant consideration should be given to this in a Detailed WCS, particularly the cost-effectiveness and benefits of implementing demand measures, through, for example, applying CSH targets. It is likely that any reduction in design values will need to be agreed with stakeholders. • The water efficiency / demand management measures recommended in Chapter 5 should be implemented to reduce water consumption and runoff. This will increase wastewater collection capacity and potentially reduce the investment required to provide the required capacity. Significant consideration should be given to this in a Detailed WCS, particularly the cost-effectiveness and benefits of implementing demand measures, through, for example, applying CSH targets. It is likely that any reduction in design values will need to be agreed with stakeholders.

Description of Requirement	Assessment Summary	Conclusion / Recommendation
	<ul style="list-style-type: none"> There is no known current sewer flooding at development site BDC80. However, the small diameter sewerage systems will need to be upsized to accommodate the increased flow. No connection should be made between surface water and foul / combined sewers. The SPS at development site BDC85 will need to be upgraded, or a new SPS built to accommodate increased flows at this location. 	<ul style="list-style-type: none"> The wastewater collection system for all future development should ensure that only foul flows enter the existing sewerage network. This will ensure that the overall impact on the foul / combined sewerage systems of domestic flows are relatively low and there should be limited additional storm flow due to creep.⁸⁶ The successful management of surface water is crucial to eliminate the temptation of connecting inadequate or poorly maintained surface water drainage systems to the local foul sewers. Surface water should be managed in line with Future Water which sets out a vision for more effective management of surface water to deal with the dual pressures of climate change and housing development. STWL's 'Strategic Direction Statement 2010-2035' aligns with Future Water which states that it will prevent sewer flooding by 'improving the capacity of our network to cope with all but the most extreme forms of weather, through separation of foul and surface water drainage, and promotion of SuDS' Surface water needs to be managed more sustainably, by allowing for the increased capture and reuse of water, slow absorption through the ground, and more above-ground storage.
<p>In collaboration with the water cycle study steering group, identify those issues that need to be looked at in more detail during the detailed water cycle study.</p>	<ul style="list-style-type: none"> A Detailed WCS is required to identify sustainable solutions to the identified wastewater collection constraints. It is recommended that a full Cost Benefit Analysis (CBA) is completed that includes / incorporates appropriate sustainability criteria / indices. 	<ul style="list-style-type: none"> Agreement should be reached on a methodology for quantifying sewer system flood risk. Stakeholders should help determine an acceptable level of risk from the network and should also help set trigger points for infrastructure investment. The impact of demand measures should form an important part of the Detailed WCS assessment.

⁸⁶ Impermeable area creep is the term for additional impermeable areas which become connected to the foul / combined sewerage system over time due to misconnection of new paving, extensions, conservatories and so on

Description of Requirement	Assessment Summary	Conclusion / Recommendation
<p>Identify if there are other environmental capacity constraints that may need to be resolved. For example, will increased discharge from STW lead to any unacceptable increase in flood risk?</p>	<ul style="list-style-type: none"> Overloaded sewers which flood may pollute the environment locally and downstream if the flooding is conveyed to local watercourses via local surface water sewers / highway drains. 	<ul style="list-style-type: none"> Detailed InfoWorks hydraulic modelling to quantify the level of pollution risk at constrained development sites.
<p>Identify if there are any missing data that need to be sourced before any detailed planning applications can be assessed.</p>	<ul style="list-style-type: none"> No further data are required. STWL has indicated that additional detailed modelling will be required to accompany any detailed planning application to enable them to make a detailed assessment of the potential impact on the existing wastewater infrastructure. 	<ul style="list-style-type: none"> STWL should be contacted at the earliest opportunity once detailed planning permission has been requested. This will enable them to program any off site upgrading works deemed necessary to accommodate the additional development.

7 Wastewater Treatment

7.1 Introduction

7.1.1 The purpose of this chapter is to answer the following broad questions:

- i What are the water quality objectives for the study area now and in the future?
- ii Is there sufficient wastewater treatment capacity to meet the proposed growth and development scenarios presented in Chapter 3?
- iii If not, can sustainable solutions be recommended to meet the present and future water quality objectives?
- iv Are there other environmental capacity constraints that may need to be resolved?

7.1.2 The Environment Agency's WCS Guidance document⁸⁷ describes these requirements in more detail as summarised below:

1. Identify and agree the water quality objectives for the study area with the Environment Agency.
2. Identify, in consultation with the Environment Agency, the future target standards – for example, the WFD Standards or targets to be achieved under the Habitats Directive. These will be identified for all water bodies in the final RBMPs. Where further studies are needed to develop locally relevant standards, it should be clear that these will be carried out in the detailed stage.
3. Identify the capacity of the STW, both actual and consented, and identify when this capacity is likely to be reached.
4. Confirm that the population figures and PCC rates used are consistent with the water company's latest estimates, with the WRMP, and with the steering group's aspirations to achieve a CSH level.
5. Identify process and physical capacity constraints at the STW, and determine feasible options for overcoming these. For example, is land available for extension of the STW?
6. In collaboration with the water cycle steering group, identify those issues that need to be looked at in more detail during the Detailed WCS.
7. Identify if there are other environmental capacity constraints that may need to be resolved. For example, will increased discharge from a STW lead to an unacceptable increase in flood risk?
8. Identify if there are any missing data that need to be sourced before any detailed planning applications can be assessed.

7.1.3 Our approach to assessing the wastewater treatment capacity and the effect it may have on development plans has consisted of the following steps:

⁸⁷ <http://www.environment-agency.gov.uk/research/planning/33368.aspx>

- collect and review information on the existing STW within the study area to identify the existing treatment capacity, discharge consents and performance in meeting environmental standards;
- identify what schemes have currently been given funding within AMP5;
- carry out an assessment at each of the works of the current operational DWF versus the Consented Dry Weather Flow (CDWF) to identify remaining flow headroom. For those sites with AMP5 funding, identify what additional headroom may be generated from implementation of the scheme; and
- using development figures and average per household occupancy levels, identify the likely increase in development feasible in each catchment without breaching the current / AMP5 consent.

7.2 Chapter Outline

7.2.1 The STWs considered in the study are listed in Table 7-1. The number of treatment works has reduced in recent years due to consolidation of treatment at fewer large works. In Redditch Borough, wastewater is treated by two main STWs, Redditch (Spernal), which lies just outside the Borough boundary and Priest Bridge STW. A small area near the southern boundary of the Borough is served by Astwood Bank STW (also referred to as Dark Lane STW). Wastewater from the Bromsgrove District is treated by two main works within the District boundary: Bromsgrove (Fringe Green) STW and Alvechurch STW. Two smaller works at Stoke Prior and Belbroughton are also situated within the District. The remainder of the sewerage network is connected to large STWs outside the boundaries of the District. The Hagley area in the north west of the District is served by Roundhill STW while wastewater from some areas in the north and east of the District (Rubery, Hollywood and Wythall) is treated at Minworth STW.

Table 7-1 Sewerage Treatment Works Considered in the Study

STW	Borough / District Served	Receiving Water
Redditch (Spernal)	Redditch	River Arrow
Priest Bridge	Redditch	Bow Brook
Astwood Bank (Dark Lane)	Redditch	Doe Bank Brook
Alvechurch	Bromsgrove	River Arrow
Belbroughton	Bromsgrove	Hoo Brook
Bromsgrove (Fringe Green)	Bromsgrove	Sugar Brook
Minworth	Bromsgrove	River Tame
Roundhill, Stourbridge	Bromsgrove	River Stour
Stoke Prior	Bromsgrove	Hen Brook

7.2.2 Details of these STWs and their current performance are given in Section 7.3. How the proposed development would affect wastewater treatment and environmental quality and the measures which might need to be taken to maintain WFD⁸⁸ objectives and standards are considered in Sections 7.4, 7.5 and 7.6 respectively.

⁸⁸ The WFD commits EU member states to achieve either good qualitative and quantitative status or good ecological potential of all water bodies by 2015.

7.2.3 The following information is provided for each STW in Section 7.3:

- a short description of the STW, its setting, consented flow and quality parameters;
- any known problems with its current operation (such as failure to meet consent standards);
- any planned upgrades to the works;
- the receiving water that the works discharges to, the WFD objectives and standards for this water and any current problems in river water quality; and
- any environmentally sensitive areas downstream of the discharge.

7.3 Wastewater Treatment Works Details and Current Performance

Redditch (Spernal) STW, Redditch Borough

Figure 7-1 Aerial Image of Redditch (Spernal) STW



7.3.1 This is the largest STW serving Redditch Borough and uses the activated sludge process with diffused air aeration. It treats flows from the Spernal Drainage Area that serves the majority of the towns of Redditch and Studley. The Works lies outside and to the south east of Redditch Borough. Summary information for the works is shown on Table 7-2.

The directive defines 'surface water status' as the general expression of the status of a body of surface water, determined by the poorer of its ecological status and its chemical status. Thus, to achieve 'good surface water status' both the ecological status and the chemical status of a surface water body need to be at least 'good'. Ecological status refers to the quality of the structure and functioning of aquatic ecosystems of the surface waters

7.3.2 Table 7-2 and the similar tables for other STWs described in this section show the following information: the consented DWF and Flow to Full Treatment (FFT) for the STW, measured mean flows for the STW discharge and for the river upstream of the discharge, the permitted concentrations (consent values) of potentially toxic substances in the STW discharge and the WFD objectives and standards for the river downstream of the STW. Where no value is shown because a particular determinand or statistic is not included in the STW consent or WFD objectives and standards, this is marked with a dash (-). Where data are missing and were not available for this study, they have been marked NA.

7.3.3 A simple traffic light system has been used to show whether the receiving water immediately downstream of the STW complied with its WFD objectives and standards for the period 2006-08 for which the Environment Agency have provided their assessments. The colours used are as follows:

Comply	
Marginal Fail	
Significant Fail	

7.3.4 Where a parameter is shown as failing, this does not mean that the STW is necessarily the cause of the failure nor that conditions may not have improved since 2008. In particular, Phosphorus appears to be significantly failing in all the watercourses and this is true for data both upstream and downstream of the STWs, suggesting that other factors, such as diffuse pollution, are contributing to this lack of compliance. For other parameters, where upstream data are available to help clarify the reasons for a lack of compliance, this is discussed for individual STWs.

Table 7-2 Details of Redditch (Spernal) STW and Receiving Water

		STW		River Arrow
Flow (m ³ /d)	DWF (Consented)	27,500		
	FFT (Consented)	52,186		
	Mean (Actual) ⁸⁹	31,033 ⁹⁰		95,954
		Consent Values		WFD Objective
Quality Determinand	95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)	
BOD	15	50	5 (90%ile)	
Suspended Solids	25	-	-	
Ammonia (Summer)	5	20	0.6 (90%ile)	
Ammonia (Winter)	10	37		
Iron	-	4000 µg/l	-	
Dissolved Oxygen (% satn.)	-	-	60% (10%ile)	
Reactive Phosphorus	-	-	0.12 (Annual Avg.)	

7.3.5 The WCS Scoping Study (Royal Haskoning 2009) reported that there were no known problems regarding capacity or river quality at Spernal STW, although it was noted that there might be scope to increase capacity at this site. However, the Environment Agency assessments for 2006-08 provided for the present study show that the WFD objectives and

⁸⁹ A total flow and not a dry weather flow

⁹⁰ Mean value for the two years 2007-2008. The same statistic is used for all the STWs described

standards for Ammonia and Phosphorus were significantly failed in the River Arrow. The fact that the WFD objectives and standards for Ammonia was in compliance at the sampling point upstream of the STW, suggests that discharge from the STW could be a contributory factor. Moreover, more recent data for the quality of the effluent show that the works narrowly exceeded its consent limit for Ammonia in summer 2009. Levels of Phosphorus significantly fail the WFD objectives and standards for much of the River Arrow, including sampling points upstream of Sernal STW.

7.3.6 The works discharges to the River Arrow. The WFD objectives and standards for the river are shown on Table 7-2.

Priest Bridge STW, Redditch Borough

Figure 7-2 Aerial Image of Priest Bridge STW



7.3.7 Priest Bridge STW is situated in the south west corner of Redditch Borough and serves the Priestbridge and Redditch Rural Drainage Areas. Treatment is provided in an oxidation ditch. Summary information for the works is shown on Table 7-3.

Table 7-3 Details of Priest Bridge STW and Receiving Water

		STW	Bow Brook
Flow (m ³ /d)	DWF (Consented)	3,576	
	FFT (Consented)	15,663	
	Mean (Actual) ⁹¹	4,656	28,639
		Consent Values	
Quality Determinand	95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)
BOD	10	38	4 (90%ile)
Suspended Solids	20	-	-
Ammonia (Summer)	3	12	0.6 (90%ile)
Ammonia (Winter)	5	20	
Iron	4000 µg/l		
Dissolved Oxygen (% satn.)	-	-	75% (10%ile)
Reactive Phosphorus	-	-	0.12 (Annual Avg.)

- 7.3.8 The WCS Scoping Study (Royal Haskoning 2009) noted that although Priest Bridge STW was at that time complying with its WFD objectives and standards, comments had been made regarding its lack of capacity to treat additional flow and on the sensitivity of the receiving environment.
- 7.3.9 Priest Bridge STW discharges to Bow Brook. Bow Brook is designated a sensitive area (eutrophic) under the Urban Waste Water Treatment Directive (UWWTD) from Priest Bridge STW to the confluence with the River Avon. Bow Brook is designated as a salmonid water under the Freshwater Fish Directive (FwFD) from its source to the A442 bridge at Upton Snodsbury, downstream of Priest Bridge STW. Bow Brook is designated a cyprinid water onwards from the A422 bridge at Upton Snodsbury. Wylde Moor, Feckenham SSSI and Tiddsley Wood SSSI are situated at Bow Brook.

⁹¹ A total flow and not a dry weather flow

Astwood Bank STW, Redditch Borough

Figure 7-3 Aerial Image of Astwood Bank STW



7.3.10 Astwood Bank STW treats wastewater from a small part of the Redditch Rural Drainage Area by means of re-circulating filters. It is situated on the south east boundary of Redditch Borough. Summary information for the works is shown on Table 7-4.

Table 7-4 Details of Astwood Bank (Dark Lane) STW and Receiving Water

		STW	Doe Bank Brook
Flow (m ³ /d)	DWF (Consented)	550	
	FFT (Consented)	1,426	
	Mean (Actual) ⁹²	636	641
		Consent Values	
Quality Determinand	95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)
BOD	15	50	4 (90%ile)
Suspended Solids	25	-	-
Ammonia (Summer)	5	20	0.3 (90%ile)
Ammonia (Winter)	10	37	
Copper	-	45 µg/l	-
Dissolved Oxygen (% satn.)	-	-	75% (10%ile)
Reactive Phosphorus	-	-	0.12 (Annual Avg.)

- 7.3.11 The WCS Scoping Study (Royal Haskoning 2009) reported that Astwood Bank STW had recently been improved so should not be affected by a minor increase in load. The Agency's compliance assessment for 2006-08 shows that the WFD objectives and standards for Ammonia and Phosphorus in Doe Bank Brook downstream of the STW were significantly failed and the WFD objectives and standards for BOD was marginally failed. However, the effluent quality data suggest that, in 2008 and 2009, the STW complied with its discharge consent for all parameters including Ammonia and BOD.
- 7.3.12 Astwood Bank STW discharges to Doe Bank Brook which is a tributary of Bow Brook. The environmental designations for Bow Brook are given above for Priest Bridge STW.

⁹² A total flow and not a dry weather flow

Alvechurch STW, Bromsgrove District

Figure 7-4 Aerial Image of Alvechurch STW



7.3.13 This STW treats flows from the Alvechurch sub-area of the Bromsgrove Rural Drainage Area in the east of the District. Treatment is provided in an oxidation ditch. Summary information for the works is shown on Table 7-5.

Table 7-5 Details of Alvechurch STW and Receiving Water

		STW		River Arrow
Flow (m ³ /d)	DWF (Consented)	3,000		
	FFT (Consented)	8,519		
	Mean (Actual) ⁹³	4,026		NA
		Consent Values		WFD Objective
Quality Determinand		95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)
BOD		15	50	4 (90%ile)
Suspended Solids		30	-	-
Ammonia		5	20	0.3 (90%ile)
Dissolved Oxygen (% satn.)		-	-	75% (10%ile)
Reactive Phosphorus		-	-	0.12 (Annual Avg.)

7.3.14 The WCS Scoping Study (Royal Haskoning 2009) reported that STWL consider Alvechurch STW to be under pressure although it is currently operating satisfactorily.

⁹³ A total flow and not a dry weather flow

7.3.15 The works discharges to the River Arrow, to the north of Redditch, upstream of the discharge from Sernal STW. The WFD objectives and standards for the river are shown on Table 7.5.

Belbroughton STW, Bromsgrove District

Figure 7-5 Aerial Image of Belbroughton STW



7.3.16 This STW treats flows from a small area in the west of the District. Treatment is provided by re-circulating filters. Summary information for the works is shown on Table 7-6.

Table 7-6 Details of Belbroughton STW and Receiving Water

		STW		Hoo Brook
Flow (m ³ /d)	DWF (Consented)	500		
	FFT (Consented)	-		
	Mean (Actual) ⁹⁴	1,425		710
		Consent Values		WFD Objective
Quality Determinand		95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)
BOD		15	50	5 (90%ile)
Suspended Solids		30		
Ammonia		5	20	0.6 (90%ile)
Dissolved Oxygen (% satn.)		-	-	60% (10%ile)
Reactive Phosphorus		-	-	0.12 (Annual Avg.)

⁹⁴ A total flow and not a dry weather flow

- 7.3.17 The WCS Scoping Study (Royal Haskoning 2009) had no comments to make on this STW.
- 7.3.18 The works discharges to Hoo Brook. The Wilden Marsh & Meadows SSSI lies on this watercourse.

Bromsgrove (Fringe Green) STW, Bromsgrove District

Figure 7-6 Aerial Image of Bromsgrove (Fringe Green) STW



- 7.3.19 This is the largest STW in Bromsgrove District. It treats flows from the Bromsgrove Town Drainage Area. Treatment is provided by a diffused air activated sludge plant. Summary information for the works is shown on Table 7-7.

Table 7-7 Details of Bromsgrove (Fringe Green) STW and Receiving Water

		STW	Sugar Brook
Flow (m ³ /d)	DWF (Consented)	11,500	
	FFT (Consented)	31,000	
	Mean (Actual) ⁹⁵	14,004	32,903
		Consent Values	
Quality Determinand	95%ile (mg/l)	Maximum (mg/l)	WFD Objective Statistic as Shown (mg/l)
BOD	10	38	5 (90%ile)
Suspended Solids	20	-	-
Ammonia (Summer)	3	12	0.6 (90%ile)
Ammonia (Winter)	5	20	
Iron	-	300 µg/l	-
Copper	-	35 µg/l	-
Dissolved Oxygen (% satn.)	-	-	60% (10%ile)
Reactive Phosphorus	-	-	0.12 (Annual Avg.)

- 7.3.20 The WCS Scoping Study (Royal Haskoning 2009) reported that Fringe Green STW was assessed by the Environment Agency as being at high risk and STWL stated that the works would be under pressure if it had to treat additional flows. As noted in Section 6.5 of this report, there are known hydraulic problems with the sewers connecting to Fringe Green STW, with flooding both inside and upstream of the inlet of the works.
- 7.3.21 Upgrading of the treatment works is planned during AMP5 in order to meet a standard of 2 mg/l for Total Phosphorus by 30 September 2014 to comply with the UWWTD.
- 7.3.22 Fringe Green STW discharges to Sugar Brook which is a tributary of the River Salwarpe. The River Salwarpe is designated a sensitive area (eutrophic) under the UWWTD. The River Salwarpe is designated a cyprinid water under the FwFD from its source to the confluence with the River Severn. Upton Warren Pools SSSI and Westwood Great Pool SSSI lie within the catchment.

⁹⁵ A total flow and not a dry weather flow

Minworth STW, Bromsgrove District

Figure 7-7 Aerial Image of Minworth STW



7.3.23 This very large STW treats flows from a large part of the Birmingham conurbation and areas to the west, including a small area in the north and east (Rubery, Wythall and Hollywood) of the Bromsgrove District. Treatment is provided by a diffused air activated sludge plant. Summary information for the works is shown on Table 7-8. Because no data are available for the sampling point on the River Tame immediately downstream of Minworth STW for BOD, Ammonia or Phosphorus it has not been possible to assess compliance for these parameters.

Table 7-8 Details of Minworth STW and Receiving Water

		STW	River Tame
Flow (m ³ /d)	DWF (Consented)	450,000	
	FFT (Consented)	1,069,978	
	Mean (Actual) ⁹⁶	-	NA
		Consent Values	
Quality Determinand	95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)
BOD	15	50	5 (90%ile)
Suspended Solids	25	-	-
Ammonia	3	12	0.6 (90%ile)
Iron	-	2,000 µg/l	-
Cadmium	-	1 µg/l	-
Nickel	-	300 µg/l	-
Chloroform	-	8 µg/l	-
Mercury	-	0.1 µg/l	-
Trichloroethylene	-	4 µg/l	-
Arsenic	-	12 µg/l	-
Antimony	-	5 µg/l	-
Dissolved Oxygen (% satn.)	-	-	60% (10%ile)
Reactive Phosphorus	-	-	0.12 (Annual Avg.)

- 7.3.24 Upgrading of the STW is planned during AMP5 in order to meet a standard of 1 mg/l for Total Phosphorus by 30 September 2014 to comply with the UWWTD. No current problems with the works were identified in the WCS Scoping Study (Royal Haskoning 2009).
- 7.3.25 The works discharges to the River Tame via two outfalls. The WFD objectives and standards for the River Tame are shown on Table 7-8. No data are available for the sampling point on the River Tame immediately downstream of Minworth STW for BOD, Ammonia or Phosphorus but Dissolved Oxygen was compliant for the period 2006-2008 for which data were provided.

⁹⁶ A total flow and not a dry weather flow

Roundhill STW, Bromsgrove District

Figure 7-8 Aerial Image of Roundhill STW



- 7.3.26 This large STW treats flows from a substantial area around Stourbridge to the west of Birmingham including a small area in the northwest (Hagley) of the Bromsgrove District. Treatment is provided by a diffused air activated sludge plant. Summary information for the works is shown on Table 7-9.

Table 7-9 Details of Roundhill STW and Receiving Water

		STW	River Stour
Flow (m ³ /d)	DWF (Consented)	59,836	
	FFT (Consented)	153,878	
	Mean (Actual) ⁹⁷	69,422	200,491
		Consent Values	
Quality Determinand	95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)
BOD	10	38	5 (90%ile)
Suspended Solids	20	-	-
Ammonia	5	20	0.6 (90%ile)
Iron	-	3,000 µg/l	-
Copper	-	100 µg/l	-
Zinc	-	400µg/l	-
Cadmium	-	5 µg/l	-
Chromium	-	50 µg/l	-
Lead	-	100 µg/l	-
Nickel	-	100 µg/l	-
Aluminium	-	1,000 µg/l	-
Dissolved Oxygen (% satn.)	-	-	60% (10%ile)
Reactive Phosphorus	-	-	0.12 (Annual Avg.)

- 7.3.27 The WCS Scoping Study (Royal Haskoning 2009) reported that there are future plans to upgrade the treatment works. No problems were reported with the current treatment but limited capacity at Hagley SPS which transfers flows from Bromsgrove District to Roundhill was identified as an issue with risk of flooding under storm flows, as described in Chapter 6.
- 7.3.28 The works discharges to the River Stour. WFD objectives and standards are shown on Table 7-9. The River Stour is designated a sensitive area (eutrophic) under the UWWTD. The River Stour is also designated a cyprinid water under the FwFD (from source to confluence with the River Severn). Stourvale Marsh SSSI, Puxton Marshes SSSI, Wilden Marsh & Meadows SSSI and the River Stour Flood Plain SSSI all lie on this watercourse. The Environment Agency compliance assessments for 2006-2008 show that the River Stour at Stourton downstream of the STW significantly failed its WFD objectives and standards for Phosphorus and marginally failed its WFD objectives and standards for BOD. However, data for effluent quality in 2008 and 2009 suggest that the STW was compliant with its consent for all parameters including BOD for these two years.

⁹⁷ A total flow and not a dry weather flow

Stoke Prior STW, Bromsgrove District

Figure 7-9 Aerial Image of Stoke Prior STW



7.3.29 This STW receives flows from several small villages in the south west of the District. Treatment is provided by an oxidation ditch. Summary information for the works is shown on Table 7-9.

Table 7-10 Details of Stoke Prior STW and Receiving Water

		STW		Hen Brook
Flow (m ³ /d)	DWF (Consented)	1,200		
	FFT (Consented)	4,208		
	Mean (Actual) ⁹⁸	1,086		6,833
		Consent Values		WFD Objective
Quality Determinand		95%ile (mg/l)	Maximum (mg/l)	Statistic as Shown (mg/l)
BOD		10	38	5 (90%ile)
Suspended Solids		20	-	-
Ammonia		5	20	0.6 (90%ile)
Dissolved Oxygen (% satn.)		-	-	60% (10%ile)
Reactive Phosphorus		-	-	0.12 (Annual Avg.)

7.3.30 The WCS Scoping Study (Royal Haskoning 2009) reported the Council's view that this STW struggles to cope with treating current flows and loads and also reported a significant failure

⁹⁸ A total flow and not a dry weather flow

to comply with the WFD objectives and standards. The WFD objectives and standards compliance data provided for the present study by the Environment Agency also show that for the period 2006-08 for which compliance is reported, Hen Brook significantly failed its RQO for Phosphorus downstream of the STW (sampling Location: Hen Brook at A38 Henbrook Bridge). However, the same data also show that the river significantly failed its WFD objectives and standards for Phosphorus at the two sampling points in the river upstream of the STW (sampling Locations: Hen Brook Culvert Entry U/S Bayer and Hen Brook D/S Shaw Lane Bayer). Therefore, it is not clear whether the STW is contributing to the downstream failure of the WFD objectives and standards for Phosphorus or whether this is due to high levels of Phosphorus that originate further upstream. In any case, the current STW consent does not include a limit for Phosphorus and the STW is currently compliant for the parameters that are included in its discharge consent. Hence, the basis of the concern expressed by the Council is unclear and does not appear to be supported by the available evidence.

7.3.31 The works discharges to Hen Brook which is a tributary of the River Salwarpe. The River Salwarpe is designated a sensitive area (eutrophic) under the UWWTD. The River Salwarpe is designated a cyprinid water under the FwFD from its source to the confluence with the River Severn. Upton Warren Pools SSSI and Westwood Great Pool SSSI lie within the catchment.

7.4 Allocation of Proposed Development to STW Catchments

7.4.1 The number of dwellings and the employment area estimated to fall within each STW catchment are shown on Table 7-11.

Table 7-11 Allocation of Proposed Development to STW Catchments

STW Catchment	Bromsgrove District		Redditch Borough		Total	
	Housing (No. of Dwellings)	Employment Area (ha)	Housing (No. of Dwellings)	Employment Area (ha)	Housing (No. of Dwellings)	Employment Area (ha)
Redditch (Spernal)	0	0	2,332	28.37	2,332	28.37
Priest Bridge	0	0	642	0	642	0
Astwood Bank	0	0	5	0	5	0
Alvechurch	169	0	0	0	169	0
Belbroughton	12	0	0	0	12	0
Bromsgrove (Fringe Green)	2,821	5.0	0	0	2,821	5.0
Minworth	330	0	0	0	330	0
Roundhill	514	0	0	0	514	0
Stoke Prior	9	1.8	0	0	9	1.8
Total	3,855	6.8	2,979	28.37	6,834	35.17

7.4.2 In addition to the areas shown on Table 7-11, a further 9.3 ha of Strategic Sites for possible development has been identified in the Redditch (Spernal) catchment as explained in Chapter 3. This is not included in the figures shown on the table as the nature of any future development is uncertain.

7.4.3 The capacity of the existing STW to treat the additional flows and loads produced by the developments shown on Table 7-11 is assessed in the next section.

7.5 Assessment of the Capacity to Treat Wastewater from Proposed Development

7.5.1 The capacity of the STWs to treat the additional flows and loads from the proposed developments and the implications for discharge quality and the receiving environment have been assessed using the information provided by the Environment Agency and STWL that is summarised in Section 7.3. Severn Trent Water Limited has presented their analysis of the potential impacts of proposed developments on STWs in a standard tabular form that is included in Appendix 20. The two main aspects of the capacity assessment for a treatment works are:

- hydraulic capacity - can a works discharge the flows from new developments without exceeding the maximum flow permitted by the Environment Agency? This maximum permitted flow is referred to as the consented flow; and
- treatment capacity - is there sufficient capacity for the predominantly biological treatment processes to treat the incoming load to the required standard? This concerns such aspects of the works as tank sizes (to give adequate retention time) and aeration capacity.

7.5.2 A further consideration in relation to hydraulic capacity is whether the treatment works can physically accept the flow and has pipework, channels etc. of sufficient size to pass the consented flow without flooding either at the treatment works, or upstream. It is reasonable to assume that a works would be able to pass flows up to its consented flow. Further, there is no information to suggest that there are any hydraulic limitations at the STW below this level. The assessments of hydraulic and treatment capacity are presented in the following sections.

Hydraulic Capacity

7.5.3 A simple assessment of hydraulic capacity is presented on Table 7-12 which is based on the analysis provided by STWL. Appendix 21 and Appendix 22 present the allocation of RBC and BDC development sites to STW catchments respectively.

7.5.4 Table 7-12 shows the observed and consented DWF for each STW. The difference between the observed and consented flow represents potential spare hydraulic capacity at the works. The spare hydraulic capacity is shown in three different ways as:

- flow in m³ / day;
- Population Equivalent (PE)⁹⁹ calculated from flow using STWL's assumed per capita figure of 160 litres per household per day (l/h/d) for wastewater flow; and
- dwellings calculated from PE assuming an occupancy rate of 2.4 / dwelling.

⁹⁹ PE is the Population Equivalent used to express loads from domestic and industrial sources on a common basis. Industrial loads are converted to PE using a factor of 60 g BOD/day. For domestic inputs one person has a PE of one

Table 7-12 Comparison of Spare Hydraulic Capacity and Proposed Development

STW	Current Observed DWF (m ³ /d)	Consented DWF (m ³ /d)	Spare Hydraulic Capacity			Proposed Development	
			m ³ /d	PE	Dwellings	m ³ /d	PE
Redditch (Spernal)	21,006	27,500	6,494	40,588	16,912	4,519	28,245
Priest Bridge	2,404	3,576	1,172	7,325	3,052	291	1,816
Astwood Bank	395	550	155	969	404	2	12
Alvechurch	2,391	3,000	609	3,806	1,586	65	406
Belbroughton	469	500	31	194	81	5	29
Bromsgrove (Fringe Green)	10,608	11,500	892	5,575	2,322	1,731	1,0819
Minworth	326,530	450,000	123,470	771,687	321,536	127	792
Roundhill	46,222	59,836	13,614	85,088	35,453	197	1,234
Stoke Prior	769	1,200	431	2,694	1,120	237	1,480

- 7.5.5 The last two columns of the table show the proposed development (taken from Table 7-11) expressed in m³/day and PE. The proposed development figures on Table 7-12 include an estimate of flows arising from the Employment areas which are proposed in the catchment areas of Redditch (Spernal), Priest Bridge, Bromsgrove (Fringe Green) and Stoke Prior STWs. Daily flows from these areas have been calculated as 1.5 l/s/hectare for 12 hours in accordance with STWL’s design guide. The flow rate shown on Table 7.12 is the peak flow rate calculated during the 12 hours when flow from the employment area is 1.5 l/s.
- 7.5.6 The analysis shows that for all the STWs, except Bromsgrove (Fringe Green), the spare hydraulic capacity exceeds the capacity required for the proposed development up to the planning horizon of 2026¹⁰⁰. This means that acceptance of the additional flows from the proposed development will not exceed the consented flow for the works. Provided that the STW is able to treat the increased flow to the quality standards required by the Environment Agency’s consent (which is considered further below), the earlier River Quality Objectives (RQOs) should still be met¹⁰¹.
- 7.5.7 The Environment Agency has a policy of “No deterioration” that is intended to maintain environmental quality and aligns with the objective of maintaining good status in the WFD. The Agency typically applies this policy in practice by defining no deterioration as a deterioration of no more than 10% in the value of WFD objectives and standards. At the same time there is also a condition that no WFD objectives and standards shall be failed by the deterioration. For flow increases that do not exceed the consented flow, the prior RQOs should not be exceeded¹⁰¹ as the discharge consent would have been calculated to achieve those objectives with the consented flow.
- 7.5.8 Table 7-13 compares the observed and consented flows and shows the increase in observed flow due to the proposed development. The figures confirm that for all STWs except Bromsgrove (Fringe Green), flows with proposed development do not exceed the consented flow. At Bromsgrove (Fringe Green), the flow from the proposed development is

¹⁰⁰ See Paragraph 3.9.5

¹⁰¹ It should be noted that limits in existing permits will not have been set to meet WFD objectives and standards. Therefore it cannot be assumed that WFD objectives and standards will be met if flows stay within the permitted DWF. Changes to existing permits may be required to contribute to meeting WFD Good Status and this need will be assessed by the Environment Agency as part of River Basin Management Planning, rather than being driven by growth

assessed as exceeding the consented flow for the works. The new development would require an increase of about 7.3% in the consented DWF. A revised consent to discharge this flow would need to be obtained from the Agency. The Agency would need to assess whether the increase in flow would require tighter limits on concentrations in order to maintain compliance with the WFD objectives and standards and the Agency's policy of no deterioration¹⁰¹. However, as the increase in flow is within the 10% limit that would definitely require a review of the consent, it is possible that no changes to the consent would be required¹⁰¹.

Table 7-13 Increase In Flow Due to Proposed Development

STW	Current Observed DWF (PE)	Consented DWF (PE)	Total Flow with Proposed Development (PE)	Current Flow as % of Consented	Total Flow as % of Consented
Redditch (Spernal)	21,006	27,500	25,525	76.4%	92.8%
Priest Bridge	2,404	3,576	2,695	67.2%	75.4%
Astwood Bank	395	550	397	71.8%	72.2%
Alvechurch	2,391	3,000	2,456	79.7%	81.9%
Belbroughton	469	500	474	93.8%	94.7%
Bromsgrove (Fringe Green)	10,608	11,500	12,339	92.2%	107.3%
Minworth	326,530	450,000	326,657	72.6%	72.6%
Roundhill	46,222	59,836	46,419	77.2%	77.6%
Stoke Prior	769	1,200	1,006	64.1%	83.8%

Treatment Capacity

7.5.9 The other aspect of the assessment is the treatment capacity available at the STW to maintain the quality of the discharge when flow is increased by new development. Even for the majority of the works where flows from proposed development are within the consented flow, capacity may be insufficient to treat the additional flow to the existing quality limits. STWL has advised on the likelihood of limitations in treatment capacity and the physical constraints to removing these limits. This information is summarised on Table 7-14.

7.5.10 The works fall into three main groups in terms of the assessment of their treatment capacities:

- **STWs with minimal or negligible spare treatment capacity:** these comprise: Redditch (Spernal), Priest Bridge and Belbroughton. Of these, Belbroughton probably has the most seriously restricted treatment capacity, although there are no known physical constraints that would prevent additional capacity being provided to meet future development needs;
- **STWs with reasonable spare treatment capacity:** these comprise: Astwood Bank, Alvechurch, Bromsgrove (Fringe Green) and Stoke Prior. However, as noted above, the hydraulic capacity of Bromsgrove (Fringe Green) would be exceeded; and
- **STWs with substantial spare capacity:** Minworth and Roundhill. Although substantial spare capacity exists at these two large works there are also likely to be many demands on this capacity from other developments in the greater Birmingham area. Therefore, it cannot be assumed that a large amount of capacity would necessarily be available to treat flow from Redditch Borough and Bromsgrove District.

7.5.11 For all the STWs in the categories of minimal / negligible and reasonable spare capacity, STWL report that there is no land or other constraints preventing expansion (Table 7-5).

Table 7-14 Assessment of Treatment Capacity and Constraints on Upgrading

STW	Comments on Treatment Capacity	Physical Constraints on Provision of Additional Treatment Capacity
Redditch (Spernal)	Whilst comparison of current measured dry weather flow against the consented dry weather flow indicates there is significant hydraulic headroom within the current discharge consent, initial process assessments indicate that actual spare capacity is negligible due to the capacity limitations with the secondary treatment process.	No land or other constraints preventing expansion
Priest Bridge	Whilst comparison of current measured dry weather flow against the consented dry weather flow indicates there is significant hydraulic headroom within the current discharge consent, initial process assessments indicate that actual spare capacity is negligible due to the capacity limitations with the secondary treatment process.	No land or other constraints preventing expansion
Astwood Bank	Comparison of current measured dry weather flow against the consented dry weather flow indicates there is reasonable spare capacity at this treatment works.	No land or other constraints preventing expansion
Alvechurch	Comparison of current measured dry weather flow against the consented dry weather flow indicates there is reasonable spare capacity at this treatment works.	No land or other constraints preventing expansion
Belbroughton	Comparison of current measured dry weather flow against the consented dry weather flow and current quality performance assessments indicate there is limited spare capacity at this treatment works. Whilst there is minimal current spare capacity at this work we do not envisage any issues should additional capacity be required for the small level of development being proposed in the Belbroughton STW catchment.	No land or other constraints preventing expansion
Bromsgrove (Fringe Green)	Whilst comparison of current measured dry weather flow against the consented dry weather flow indicates there is significant hydraulic headroom within the current discharge consent, initial process assessments indicate that actual spare capacity is slightly lower due to the capacity limitations with the secondary treatment process. Whilst the National Environmental Programme proposes a 2 mg/l P consent by September 2014 we do not envisage any issues associated with providing additional growth capacity.	No land or other constraints preventing expansion
Minworth	This large works is not expected to have any issues with dealing with the level of potential growth in Wythall. Whilst the National Environmental Programme proposes a 1mg/l P consent by September 2014 we do not envisage any issues associated with providing additional growth capacity.	No land or other constraints preventing expansion
Roundhill	This large works is not expected to have any issues with dealing with the level of development being proposed in West Hagley.	No land or other constraints preventing expansion

STW	Comments on Treatment Capacity	Physical Constraints on Provision of Additional Treatment Capacity
Stoke Prior	Comparison of current measured dry weather flow against the consented dry weather flow indicates there is reasonable spare capacity at this treatment works.	No land or other constraints preventing expansion

7.6 Implications for Further Development

Phasing

- 7.6.1 The assessment of wastewater treatment capacity does not point to any strong implications for the phasing of development. Sufficient consented hydraulic capacity exists at all but Fringe Green STW to accommodate planned development up to 2026. At Fringe Green, hydraulic capacity exists for about 50% of the increase in flow predicted from the planned development. Almost all the development in this catchment is planned to be completed by 2020 and much of it is scheduled within the next five years. Hence the hydraulic capacity at Fringe Green is likely to need to be increased by about 2015, assuming a uniform rate of development over the period from 2010 to 2020. Under Section 94 of the Water Industry Act 1991 the sewerage undertaker has an obligation to provide treatment capacity for future domestic development. Where STWL need to increase capacity significantly, either hydraulically or in terms of treatment, they will need to apply for a revised consent from the Environment Agency. This process can take up to three years and STWL would need the certainty of development before additional capacity is provided.
- 7.6.2 With the exception of Bromsgrove (Fringe Green), the capacity to treat additional loads will be exceeded before the consented flow limit is reached. Where STWL has identified that there is minimal / negligible spare treatment capacity, the conservative assumption is that no further load could be treated until the STW has been upgraded. Where treatment capacity is judged to be reasonable, the urgency for upgrading is less, but there is insufficient detail at this stage to estimate when upgrading would be required. STWL has indicated that the requirement to provide additional capacity for domestic growth will need to be managed efficiently to minimise customer bills. Consequently there will often be minimal headroom at sewage treatment works but more treatment capacity will be provided once developments are confirmed. A more detailed assessment of spare treatment capacity to better understand the implications for phasing of development is one of the reasons why a Detailed WCS would be of benefit.

Allocation of Shortfall in Development

- 7.6.3 Table 7-15 shows the hydraulic capacity available within the current consent, after the proposed development shown on Table 7-11 has been allowed for. This gives an indication of where, in terms of hydraulic capacity, the shortfall in the present development allocation or any further growth might best be located.
- 7.6.4 The greatest amounts of spare capacity are at the two large STWs, Minworth and Roundhill. However, it is likely that there will be demand on this capacity from many other developments in the wider area. STWL are currently in talks with other Local Authorities concerning the use of this capacity and so, at this stage, it is not possible to assess how much might be available for developments in RBC and BDC. Of the other STWs serving Redditch Borough and Bromsgrove District, the largest spare hydraulic capacities exist at Redditch (Spernal), Priest Bridge, Alvechurch and Stoke Prior STWs. As noted in the previous section, there is only minimal / negligible treatment capacity at Redditch (Spernal)

and Priest Bridge STWs and, even at Alvechurch and Stoke Prior, it is uncertain whether capacity would be adequate to treat the load from the proposed development, let alone an allocation of the shortfall above this level. STWL need to be kept informed of development plans and be given sufficient notice of confirmed developments to allow them to plan any additional capacity required, taking account of factors such as effective treatment processes and environmental costs. As noted in Section 7.6.1, time also needs to be allowed to obtain revised discharge consents from the Environment Agency.

Table 7-15 Spare Hydraulic Capacity after Proposed Development

STW	Spare Hydraulic Capacity After Proposed Development (PE)	Spare Hydraulic Capacity After Proposed Development (Dwellings @ 2.4)
Redditch (Spernal)	12,344	5,143
Priest Bridge	5,506	2,295
Astwood Bank	956	399
Alvechurch	3,400	1,417
Belbroughton	163	69
Bromsgrove (Fringe Green)	-5,244	None
Minworth	770,894	321,206
Roundhill	83,855	34,939
Stoke Prior	1,213	1,113

7.6.5 Another consideration is the interaction between the wastewater network and the treatment works. The sewerage assessment has identified constraints in the sewerage network that may modify the conclusions as to where the shortfall in development would best be allocated based on STW capacity alone. Aspects of sewerage network performance that interact with STW capacity include:

1. The proposed development at Webheath ADR development site (2010/12) could be directed either as a gravity flow to Priest Bridge STW or as a pumped flow to Redditch (Spernal) STW. In the assessment presented in this chapter, the flow from the 600 dwellings proposed for development site 2010/12 has been allocated to Priest Bridge STW. There are other options that should be considered before deciding where the additional flow is best treated. The study notes that there appears to be sufficient spare hydraulic capacity at Spernal STW to accept the flow from Webheath ADR, in addition to the other planned developments in the Spernal catchment. However, this would involve pumping the additional flow whereas it could gravitate to Priest Bridge STW with benefits in terms of energy consumption and carbon footprint. In order to overcome the present limit on hydraulic capacity at Priest Bridge STW, part of the existing flow (for example from Hunts End) could be re-routed to Spernal STW, thus creating additional spare hydraulic capacity to receive the Webheath flow at Priest Bridge STW¹⁰². The spare treatment capacity at both works is negligible and will need to be addressed whatever option is chosen for the Webheath flows. The choice of which STW to connect the Webheath ADR to will depend on the relative magnitudes of the whole life costs and

¹⁰² Not that there is inadequate hydraulic capacity at Priest Bridge STW to accept the proposed flows. It is a suggestion for an alternative, possibly more cost-effective solution. Under this option, some flow would be diverted from Priest Bridge STW to Spernal STW and the spare capacity thus created would be used to treat future flows from the Webheath development which could gravitate to Priest Bridge STW (rather than having to be pumped to Spernal STW)

sustainability of upgrading the sewerage network and STWs for the Priest Bridge and Sernal catchments.

2. The Hagley catchment is pumped to Roundhill STW. The substantial spare treatment capacity at Roundhill make this an attractive catchment in which to seek to allocate some of the shortfall in development. However, the flooding problems associated with Hagley Pumping Station may detract from this option.

Need for a Detailed WCS

7.6.6 In terms of wastewater treatment a Detailed WCS would provide the opportunity to:

- assess in detail the constraints on treatment, when treatment capacity limits will be reached and the options for upgrading STWs to provide a cost-effective programme for increasing STW capacity;
- investigate the interactions between the sewerage network and wastewater treatment to optimize development allocations and timing; and
- further assess the trends in river water quality and future WFD objectives and standards in order to comply with present and future legislation and the impacts of changes in catchment characteristics and management over time, for example, whether changes in agricultural practice or surface drainage may modify river flow and quality over time.

7.7 Summary of Findings against WCS Guidance

7.7.1 The findings of the assessment of wastewater treatment are summarised in Table 7-16, against the Guidance requirements.

Table 7-16 Wastewater Treatment Summary of WCS Findings

Description of Requirement	Assessment Summary	Conclusion / Recommendation
Identify and agree the water quality objectives for the study area with the Environment Agency.	<ul style="list-style-type: none"> WFD objectives and standards for the rivers that receive discharges from the STWs that will treat flows from the planned development have been obtained from the Environment Agency. 	<ul style="list-style-type: none"> No persistent significant failures of WFD objectives and standards have been identified that can be clearly attributed to STW discharges.
Identify, in consultation with the Environment Agency, the future target standards – for example, the WFD Standards or targets to be achieved under the Habitats Directive. These will be identified for all water bodies in the final RBMP. Where further studies are needed to develop locally relevant standards, it should be clear that these will be carried out in the detailed stage.	<ul style="list-style-type: none"> The WFD objectives and standards provided by the Environment Agency reflect the final RBMPs and take account of the effects of the WFD as currently assessed. The WFD objectives and standards relevant to each STW are presented in Table 7-2 to Table 7-10. 	<ul style="list-style-type: none"> No further studies have been identified as necessary to establish WFD objectives and standards.
Identify the capacity of the STW, both actual and consented, and identify when this capacity is likely to be reached.	<ul style="list-style-type: none"> Consented and Actual DWFs for each STW are compared on Table 7-12. In addition, Flows to Full Treatment and Actual Mean STW Flows are shown on Table 7-2 to Table 7-10. For all STWs, except Bromsgrove (Fringe Green), Actual DWFs are well below Consented DWFs, and the STWs therefore have hydraulic capacity to accept the flows from the allocated development planned up to 2026. There is additional spare hydraulic capacity over and above what is required to accept the allocated development up to 2026 at all STWs except Bromsgrove (Fringe Green), as shown on Table 7-15. At Bromsgrove (Fringe Green), the Consented DWF is likely to be exceeded by about 2020 if development proceeds as planned. However, this finding is sensitive to the assumptions made about per capita flows as noted below. Treatment capacity (process and physical constraints) is more limited at all STWs than hydraulic capacity and this assessment is summarised later in this table. 	<ul style="list-style-type: none"> For all STWs, except Bromsgrove (Fringe Green), Actual DWFs are well below Consented DWFs and the STWs therefore have hydraulic capacity to accept the flows from the allocated development planned up to 2026.

Description of Requirement	Assessment Summary	Conclusion / Recommendation
<p>Confirm that the population figures and per capita consumption rates used are consistent with the water company's latest estimates, with the WRMP, and with the steering group's aspirations to achieve a CSH level.</p>	<ul style="list-style-type: none"> The per capita wastewater flow rate (160 l/h/d) and occupancy rate (2.4 / dwelling) used in the assessment are consistent with the figures used by STWL. STWL use 160 l/h/d for general sewage treatment works flow assessment which is based on an average water supply residential consumption rate of 140 l/h/d, plus 10% infiltration plus a small allowance for non-residential / commercial flows. Going forward, STWL recognise that initiatives to reduce domestic water consumption will help reduce waste water flow rates but, for planning purposes, 160 l/h/d is still being used as an average. The conclusions about hydraulic capacity are sensitive to the flow rate used. 	<ul style="list-style-type: none"> The assessment of hydraulic capacity is sensitive to the per capita DWF flow rate used. The value of 160 l/h/d used by STWL and adopted for this assessment is higher than the per capita rate used for water demand. The reasons for this difference should be established.
<p>Identify process and physical capacity constraints at the STW, and determine feasible options for overcoming these. For example, is land available for extension of the STW?</p>	<ul style="list-style-type: none"> Although hydraulic capacity for the allocated planned development exists at all but one STW, treatment capacity is assessed as much more limited as summarised below: <ul style="list-style-type: none"> minimal or negligible spare treatment capacity: Redditch (Spernal), Priest Bridge and Belbroughton. STWs; reasonable spare treatment capacity: Astwood Bank, Alvechurch, Bromsgrove (Fringe Green) and Stoke Prior STWs; and substantial spare capacity: Minworth and Roundhill STWs. 	<ul style="list-style-type: none"> The treatment capacity at Redditch (Spernal), Priest Bridge and Belbroughton STWs will be exceeded by the planned development. Treatment capacity at Astwood Bank, Alvechurch, Bromsgrove (Fringe Green) and Stoke Prior STWs may be exceeded by the planned development. Treatment capacity at Minworth and Roundhill STWs is sufficient to accept all the allocated planned development. STWL have reported that there are no land or other constraints preventing expansion.

Description of Requirement	Assessment Summary	Conclusion / Recommendation
<p>In collaboration with the water cycle steering group, identify those issues that need to be looked at in more detail during the detailed water cycle study</p>	<ul style="list-style-type: none"> • The issues to be looked at in a Detailed WCS that have been identified by the assessment, but not yet discussed with the water cycling steering group are: <ul style="list-style-type: none"> ▪ the physical and process constraints on treatment, when treatment capacity limits will be reached, and the options for upgrading STWs to provide a cost-effective programme for increasing STW capacity; ▪ the interactions between the sewerage network and wastewater treatment to optimize development allocations and timing; and ▪ trends in river water quality and future WFD objectives and standards, in order to comply with present and future legislation and the impacts of changes in catchment characteristics and management over time. 	<ul style="list-style-type: none"> • Issues to be addressed in a Detailed WCS have been identified as shown in the previous column.
<p>Identify if there are other environmental capacity constraints that may need to be resolved. For example, will increased discharge from a STW lead to an unacceptable increase in flood risk?</p>	<ul style="list-style-type: none"> • No other environmental capacity constraints. • The predicted increases in DWF from STWs of no more than about 10% is small in comparison with rainfall induced flows. 	<ul style="list-style-type: none"> • No other environmental capacity constraints have been identified.
<p>Identify if there are any missing data that need to be sourced before any detailed planning applications can be assessed</p>	<ul style="list-style-type: none"> • More detailed information on the physical and process constraints at STWs is required to optimize proposals for new development. 	<ul style="list-style-type: none"> • Recommendation as noted in the assessment.

8 Ecological and Geological Sites of Importance

8.1 Introduction

- 8.1.1 The purpose of this chapter is to identify and assess national, regional and local sites of ecological and geological importance that may be impacted by the proposed development sites within Redditch Borough and Bromsgrove District.
- 8.1.2 Policy recommendations are made through the identification of appropriate mitigation measures and development management recommendations that will allow the proposed development to be brought forward in a manner that protects and enhances the statutory and non-statutory designated sites within and beyond the boundaries of Bromsgrove District and Redditch Borough. These policy recommendations have been identified by reference to research, accepted good practice and other guidance, such as Environment Agency Guidelines.
- 8.1.3 Whilst natural areas outwith the designated sites of ecological and geological importance are not specifically addressed, their ecological value is recognized and the policy recommendations and mitigation measures are equally applicable to these areas.

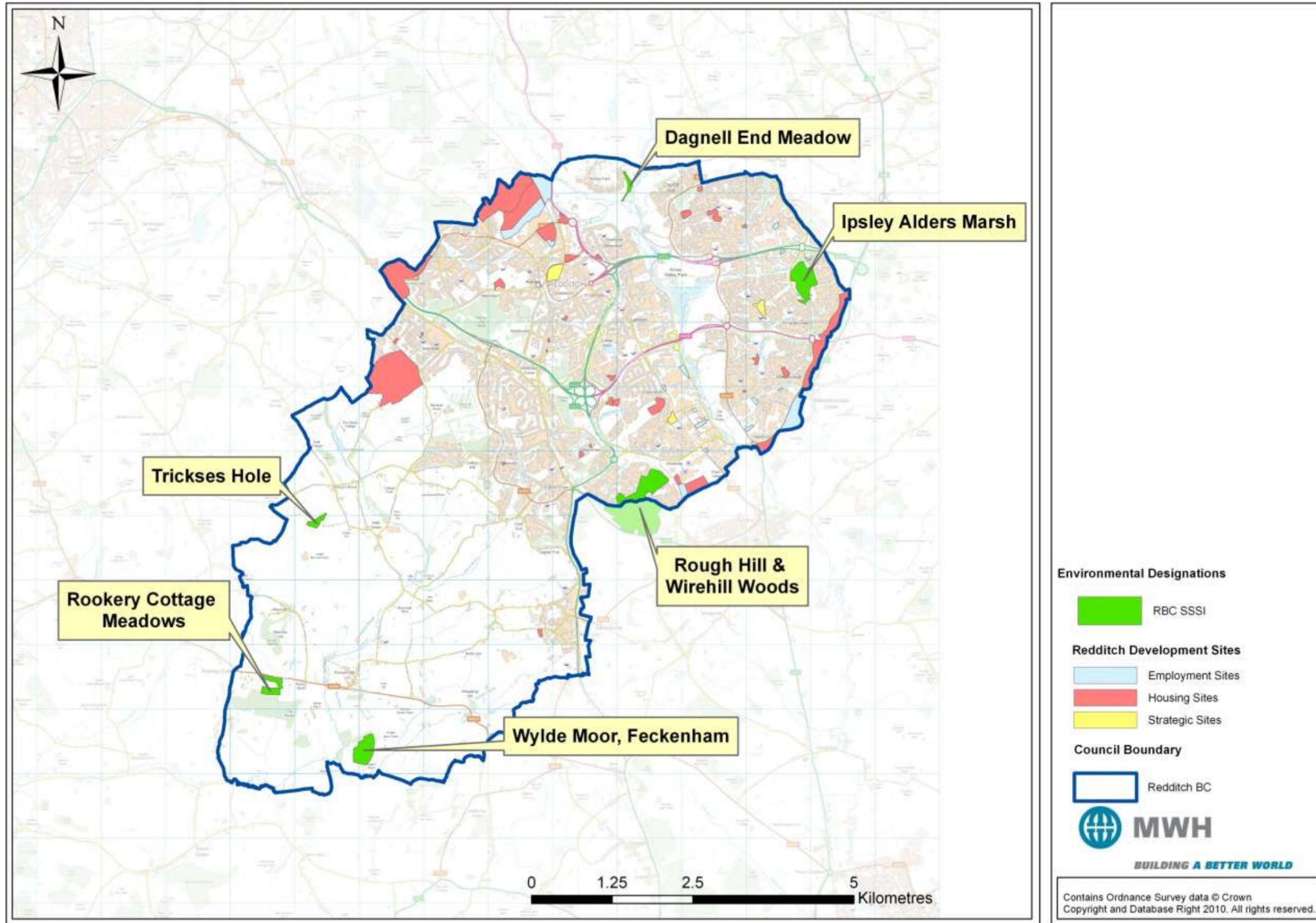
8.2 Chapter Outline

- 8.2.1 The remainder of this chapter is structured as follows:
- Section 8.3 and Section 8.4 contain brief summaries of the ecological and geological sites of importance within Redditch Borough and Bromsgrove District respectively. Where development sites are located within close proximity, the ecological / geological site is briefly described, the development site(s) identified, the level of impact assessed and appropriate mitigation measures described. Summaries are provided in Table 8-1 and Table 8-2 for Redditch Borough and Bromsgrove District respectively.
 - Section 8.5 contains a brief summary of the relevant planning policy regarding biodiversity and geological conservation within the UK and locally within Redditch Borough and Bromsgrove District.
 - Section 8.6 presents the policy recommendations.

8.3 Baseline Environment and Impact Assessment – Redditch Borough

- 8.3.1 Redditch Borough contains no Ramsar Sites, SAC, SPA or NNR.
- 8.3.2 There are six Sites of Special Scientific Interest (SSSI) within Redditch Borough:
- SP051692: Dagnell End Meadow;
 - SP078676: Ipsley Alders Marsh;
 - SP053642: Rough Hill & Wirehill Woods;
 - SP003638: Trickses Hole;
 - SO996612: Rookery Cottage Meadows; and
 - SP010603: Wylde Moor, Feckenham.
- 8.3.3 The location of these SSSIs is shown in Figure 8-1.

Figure 8-1 Redditch Borough Sites of Special Scientific Interest



- 8.3.4 Dagnell End Meadow SSSI is a 2.16 ha area of ancient permanent pasture lying in the valley of the River Arrow. It represents one of the last surviving areas of such pasture in this area. It is located over 800 m from the nearest Development Site WYG04 and nearly 900 m from Development Site LPX05. This SSSI will be unaffected by the development proposals.
- 8.3.5 Ipsley Alders Marsh SSSI is a 15.37 ha area of meadow within which is a marsh receiving calcium-rich water from springs arising from the underlying Triassic Mercia Mudstones. It is currently managed as a nature reserve by Worcestershire Wildlife Trust. The SSSI is predominantly surrounded by residential development although industrial / commercial development is present to the north west. It is located approximately 280 m from the nearest Development Site EL53, 280 m from EL21 and 290 m from EL51. Development Sites EL21 and EL51 are separated from the site by the A4023 roundabout at Moon's Moat. The nearest housing Development Site, 2010/10, is located approximately 430 m to the east at its nearest point. The nearest Strategic Site, St2, is located approximately 500 m to the south east. Employment Sites 2 and 11, located within Bromsgrove District, are located approximately 400 m and 300 m respectively from the SSSI, but separated by the A4023 Coventry Highway dual carriageway and residential development around Far Moor Lane. These strategic employment allocations are located within the Ipsley Alders catchment and could have direct impacts on the quality and quantity of water entering the reserve as hydrological links are present. Although likely to remain unaffected by the proposed development sites due to distances involved and the presence of existing development, development proposals within the Redditch and Bromsgrove areas, as well as any strategic sites located outside these council boundaries should include biodiversity-led SuDS and pollution prevention measures within designs to ensure that surface run-off volumes are controlled and water quality is maintained. In addition, developments with deeper foundations have the potential to affect the groundwater and springs feeding the marsh if hydrogeological, as well as hydrological links are present. Further hydrological and hydrogeological assessments should be undertaken prior to development to determine the magnitude of potential impacts and establish appropriate mitigation measures both during the construction and operational phases.
- 8.3.6 Rough Hill & Wirehill Woods SSSI is a 50.8 ha area comprising two areas of contiguous ancient woodland which straddles the Borough boundary with Warwickshire. The woods have developed on a ridge of glacial sands and gravels overlying Mercia Mudstones. The varied soil conditions have given rise to six different woodland types. Much of the woodland is dominated by sessile oak with downy birch and silver birch. The northern Wirehill Wood, the section within Redditch Borough, is surrounded to the west and east by residential development. The nearest Development Site, 2010/09, is located less than 100 m to the east. Development Site EL61 is located approximately 160 m to the south east at its nearest point. Separated from the development sites by open ground, Nine Days Lane and a Public Right of Way and cycle route, the woodland will not be directly affected by the proposed development, although limited disturbance impacts may arise during construction.
- 8.3.7 Trickses Hole SSSI is a 2.91 ha area comprising two fields maintained by traditional management, one as a hay meadow and the other as pasture. It is located over 2 km from the urban areas of Redditch Borough and approximately 2 km from the nearest Development Site, 2010/12. Due to the distances, this SSSI will not be impacted by proposed development.
- 8.3.8 Rookery Cottage Meadows SSSI comprises an area of 5.72 ha made up of three meadows overlying medieval ridge and furrow that has been maintained by traditional hay cutting with grazing by cattle. The SSSI is located in the extreme south west of Redditch Borough, at least 5 km from the urban areas of Redditch Borough. No development sites are in close proximity and the SSSI will remain unaffected by proposed development.

8.3.9 Wylde Moor SSSI comprises 11.3 ha of a once extensive area of wetland known as Feckenham Moor, most of which has been drained and reclaimed for agriculture. The high water table and underlying base rich Keuper Marl and alluvium have led to the development of deep fen peat and associated marsh and fen vegetation, with drier species-rich grassland. The SSSI is managed as a nature reserve by Worcestershire Wildlife Trust. The SSSI is located in the extreme south west of Redditch Borough, at least 5 km from the urban areas of Redditch Borough. No development sites are in close proximity, the nearest being WYG06 located on the western edge of Astwood Bank; the SSSI will remain unaffected by proposed development.

8.3.10 Redditch Borough contains 24 SWS (Appendix 23):

- SO95/09: Bow Brooks;
- SO96/24: Old Rectory Meadows;
- SO96/25: Bradley Green Meadows;
- SO96/26: Upper Beanhall Meadows;
- SO96/27: Berrow Hill;
- SP06/02: Brook House Meadow and Feckenham Bank;
- SP06/05: Brandon Brook Meadow;
- SP06/06: Burial Lane;
- SP06/10: Shurnock Meadows;
- SP06/11: Foxlydiate and Pitcheroak Woods;
- SP06/13: Downsell Wood;
- SP06/15: Walkwood Coppice;
- SP06/17: Pitcheroak Golf Course;
- SP06/18: River Arrow;
- SP06/19: Southcrest Wood;
- SP06/20: Oakenshaw Wood;
- SP06/21: New Coppice;
- SP06/22: Oakenshaw Spinney;
- SP06/24: Oakenshaw Fenny Rough;
- SP06/25: Lodge Pool;
- SP06/26: Abbey and Forge Mill Ponds;
- SP06/29: Arrow Valley Park Lake;

- SP06/30: Ravensbank Drive Bridle Track; and
- SP06/31: Ipsley Alders Marsh.

8.3.11 The SWSs listed below are located in the extreme south west of Redditch Borough, at least 5 km from the urban areas of Redditch Borough. No development sites are in close proximity to them, the nearest being WYG06 located on the western edge of Astwood Bank and approximately 1.9 km from Shurnock Meadows SWS. As such, the following SWSs will remain unaffected by proposed development:

- Old Rectory Meadows;
- Bradley Green Meadows;
- Upper Beanhall Meadows;
- Berrow Hill;
- Brookhouse Meadow and Feckenham Bank;
- Brandon Brook Meadow;
- Burial Lane; and
- Shurnock Meadows.

8.3.12 The following SWSs are located within the urban area of Redditch but are considered likely to be unaffected by the development sites due to distance and intervening existing development:

- Downsell Wood;
- Walkwood Coppice;
- Pitcher Oak Golf Course;
- Oakenshaw Wood;
- New Coppice;
- Lodge Pool; and
- Ipsley Alders Marsh.

8.3.13 The following SWSs are located in closer proximity or immediately adjacent to development sites and are assessed in more detail:

- Bow Brooks;
- Foxlydiate and Pitcher Oak Woods;
- River Arrow;
- Southcrest Wood;
- Oakenshaw Spinney;

- Oakenshaw Fenny Rough;
- Abbey Forge and Mill Pond;
- Arrow Valley Park Lake;
- Ravensbank Drive Bridle Track; and
- SP06/12: Brockhill Wood.¹⁰³

- 8.3.14 Bow, Shell, Swan and Seeley Brooks SWS are small watercourses which flow south and west before draining via the Bow Brook into the River Avon at Defford, some distance to the south. Although the brooks vary in quality along their lengths, they are rich in aquatic and emergent vegetation, with Bow Brook particularly known for its aquatic and emergent flora.
- 8.3.15 Development Site 2010/12 is approximately 700 m from the northernmost extremity of this SWS, which is located within Bromsgrove District. The topography of this area generally slopes towards these stream valleys and measures should be put in place, during both construction and post-completion phases, to prevent drainage, which may contain silts and other potentially harmful substances, from entering these streams.
- 8.3.16 Foxlydiate and Pitcheroak Woods SWS comprise two large ancient semi-natural woodlands split into four compartments. Both woods are listed on the Nature Conservancy Council (NCC) Inventory of Ancient Woodland and have a diverse structure with significant open glade areas. These are predominantly oak woodlands with both pedunculate and sessile oak dominating the canopy, but with a diversity of other tree species. The ground flora is similarly diverse with a range of woodland indicators. Both woods are also designated as Local Nature Reserves.
- 8.3.17 Development Site 2010/14 lies immediately adjacent to the west of the North West section of the SWS, which is bordered to the east by residential development. Much of Development Site 2010/14 is separated from the SWS by B4184 Brockhill Drive (the developable portion of the site), although a section is located to the south of this road, bordered by the B4184 to the north, Birchfield Road to the west, the A448 Bromsgrove Highway to the south and the SWS to the east. Whilst the SWS will not be directly affected by the development of Development Site 2010/14, some disturbance impacts are likely to occur during the construction phase and measures should be put in place to protect the SWS from encroachment during construction, ensuring the continued ecological viability of the site. These measures should include pollution prevention measures to any watercourses and ditches which provide a hydrological link from the development site to the SWS. Boundary fencing should also be provided to separate the SWS from the development site along common borders, to ensure that access by the general public into the SWS is made only via authorised access points. No new accesses and paths into the SWS from the development site should be provided unless proposals can demonstrate no significant impacts. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the adjacent woodland.
- 8.3.18 Development Site RB03 lies approximately 65 m, at its closest point, to the north of the main central section of the SWS (Pitcheroak Wood). In general, the development site is separated from the SWS by the residential properties and gardens to the north and south of Bromsgrove Road, except at the point where access into the SWS is provided from Bromsgrove Road. The SWS will not be affected by the development of Development Site RB03.

¹⁰³ This SWS is within Bromsgrove District

- 8.3.19 The River Arrow SWS flows south through Redditch Borough to join the River Avon at Salford Priors in Warwickshire. For much of its length it is lined with trees and shrubs and is an important wildlife corridor. Flowing through the centre of Redditch town, the river and valley form a significant green wedge through the town and the river supports a reasonable diversity of aquatic fauna. Otters are known to be present and kingfishers breed in several places.
- 8.3.20 The nearest development sites are EL16, EL22, EL23, EL44, EL12 and EL17, which are located approximately 30 m (EL23) to 140 m (EL12) to the west of the SWS and separated from the SWS by Holloway Drive / Old Forge Drive and scrub / woodland in places. Whilst the development sites themselves will not directly impact on the SWS, several watercourses, including Park Brook and Broadground Ditch, are present which connect directly with the River Arrow. As a precaution, pollution prevention measures should be put in place, both during construction and after completion of the developments, to prevent potentially harmful substances from entering these watercourses which provide a hydrological link from the development sites to the River Arrow.
- 8.3.21 Southcrest Wood SWS is a predominantly acidic oak and birch woodland. It is shown as ancient semi-natural woodland on the NCC's Inventory of Ancient Woodland but parts of the site have been heavily modified. The understorey is dominated by hazel and hawthorn and the ground flora often indicative of the acidic substrate and includes heather and bilberry with a range of woodland indicators such as bluebells and wood anemone. Faunal records for the site include toads, slow-worm and a wide range of butterflies. The site will also provide suitable habitat for a range of breeding birds and foraging opportunities for bats. The wood is designated as a Local Nature Reserve.
- 8.3.22 Development Site LP13 is located approximately 20 m to the west of the most north westerly spur of the SWS, separated only by the Pool Bank road. Whilst the SWS will not be directly affected by the development of LP13, some localised disturbance impacts may occur during the construction phase, particularly from construction vehicles which may use Pool Bank to access the site. However, Development Site LP13 is very small and the volume of construction traffic is likely to also be small. As a precaution, measures could be put in place to protect the SWS from encroachment during construction, ensuring the continued ecological viability of the site.
- 8.3.23 Oakenshaw Spinney SWS is a small woodland site extending along a stream valley. There are two pools in the centre of the wood, although these have become heavily silted up. The woodland blocks retain a sizeable natural component, though some areas have been partly planted with ornamental vegetation. It is highly likely that bats make use of the woodland for foraging.
- 8.3.24 Development Site LPX02 is immediately adjacent to the SWS. A watercourse / ditch currently flows along the western boundary of the development site into the SWS. Whilst the SWS will not be directly affected by the development of Development Site LPX02, some disturbance impacts are likely to occur during the construction phase and measures should be put in place to protect the SWS from encroachment during construction, ensuring the continued ecological viability of the site. These measures should include pollution prevention measures to the watercourse / ditch which provides a hydrological link from the development site to the SWS. Boundary fencing should also be provided to separate the SWS from the development site along the common border, to ensure that access by the general public into the SWS is made only via authorised access points. No new accesses and paths into the SWS from the development site should be provided unless proposals can demonstrate no significant impacts. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the adjacent woodland.

- 8.3.25 Development Site WYG02 is approximately 110 m east of the SWS, separated by housing and gardens on either side of Pheasant Lane. Development Site WYG02 is a small site and its development will have no impact on the integrity of Oakenshaw Spinney SWS.
- 8.3.26 Oakenshaw Fenny Rough SWS is a small wooded site running along the banks of the Wharrington Brook. It lies close to, and just downstream of Oakenshaw Wood and Oakenshaw Spinney. The woodland is predominantly semi-natural with a mixed broadleaf canopy with some coniferous planting. Ground flora is not particularly rich, but records exist of old-woodland indicators including bluebell and dog's mercury.
- 8.3.27 Development Sites LPX06 and LPX07 are located approximately 100 m and 115 m to the north of the SWS respectively, and separated by playing fields and allotment gardens. Whilst the SWS will not be directly affected by the development of these development sites, some disturbance impacts may occur during the construction phase and measures should be put in place to minimise disturbance impacts, ensuring the continued ecological viability of the site.
- 8.3.28 Abbey Forge and Mill Pond SWS is a group of four ancient mill and fish ponds associated with the remains of Bordesley Abbey and fall within the wider Scheduled Ancient Monument. The pools feed into the River Arrow, which flows to the north of the pool complex via a narrow outflow stream and are fringed with woodland and grassland. They support a reasonable aquatic flora and marginal swamp vegetation.
- 8.3.29 The nearest Development Site, LPX05, is located approximately 180 m to the north west of the SWS and is separated by the roundabout of the A441 Alvechurch Highway. Whilst the development site itself will not have a direct impact on the SWS, a watercourse (Batchley Brook) is present to the south of the B4184 Middlehouse Lane, which forms the southern boundary of the development site. This watercourse flows in an easterly direction, beneath the A441, and into Batchley Brook and also, potentially, into the Mill Pond of the SWS. Pollution prevention measures should be put in place, both during construction and after completion of the development, to prevent potentially harmful substances from entering the watercourse which provides a hydrological link from the development site to the SWS.
- 8.3.30 Arrow Valley Park Lake SWS comprises a large artificial lake and its associated marginal habitats. It falls within the wider Arrow valley green wedge, which runs north to south through the centre of Redditch town. The lake has suffered from a range of pressures in the past but active management and the establishment of reed beds and swamp vegetation has helped to increase botanical diversity. Kingfishers and reed warblers are known to use the margins of the lake.
- 8.3.31 The nearest Development Site, EL16, is located approximately 135 m to the west of the SWS and separated from the SWS by Holloway Drive, woodland, and the River Arrow. Whilst the development site itself will not have a direct impact on the SWS, a watercourse (Park Brook) is present to the north of the Shawbank Road, which forms the northern boundary of the development site. This watercourse flows in an easterly direction, beneath Holloway Road, and into the River Arrow (which is a SWS at this location), although the river at this confluence flows in a southerly direction away from the lake and is unlikely to connect into the SWS. Regardless of this, and as a precaution, pollution prevention measures should be put in place, both during construction and after completion of the development, to prevent potentially harmful substances from entering the watercourse which provides a hydrological link from the development site to the River Arrow and potentially to the SWS.
- 8.3.32 Ravensbank Drive Bridle Track SWS is a 2.1 km double hedged trackway that has become overgrown providing an important wildlife corridor around the north-eastern edge of Redditch Borough, bordering with Bromsgrove. The site comprises a double hedge with associated scrub, small areas of more mature woodland, a small watercourse with wet flushes and

seasonally inundated marginal ditches, more permanent water features and remnant patches of grassland. Although the habitats are not rare, the linear nature of the track enhances its value, particularly as a foraging and commuting corridor for a range of species through an otherwise urban environment.

- 8.3.33 The nearest development site within Redditch is EL24, located approximately 20 m to the south west, and separated only by Ravensbank Drive. Whilst the SWS will not be directly affected by the development of EL24, some disturbance impacts may arise during the construction phase, particularly from construction vehicles which are likely to use this road to access the site. Measures should be put in place to protect the SWS from encroachment during construction, ensuring the continued ecological viability of the site. Development Sites EL15 and EL33 are also close by, at approximately 180 m and 300 m respectively, although the existing intervening development of Centech Park and the road will mean that the SWS will not be affected.
- 8.3.34 Bromsgrove Development Sites 2 and 11 (Ravensbank) in Bromsgrove lie immediately adjacent to the SWS because Sites 2 and 11 though physically located in Bromsgrove District are put under development sites of Redditch as they are allocated to meet the needs of Redditch. These are described in more detail in Section 8.4.16.
- 8.3.35 Brockhill Wood SWS is a 28.3 ha woodland. Although shown on the Inventory of Ancient Woodland much of the woodland comprises replaced commercial such as aspen, sycamore, birch, sweet chestnut and grey alder, with only the original canopy trees retained around the boundaries. The SWS is extensive, with varied terrain, springs, ditches, damp grassland rides and different broadleaved woodland habitats.
- 8.3.36 Although Brockhill Wood SWS is within Bromsgrove District, it is located on the border with Redditch Borough and is in close proximity to Development Site 2010/13, which is situated approximately 50 m to the east and separated only by Brockhill Lane. Whilst the SWS will not be directly affected by the development of 2010/13, some disturbance impacts may arise during the construction phase, particularly from construction vehicles which are likely to use Brockhill Lane to access the site. Measures should be put in place to protect the SWS from disturbance issues during construction, ensuring the continued ecological viability of the site. A watercourse is present through the development site, but this watercourse flows in a south easterly direction away from the SWS and does not provide a hydrological link.
- 8.3.37 There are six Local Nature Reserves (LNR) within Redditch District (Appendix 24):
- SP058687 Proctor's Barn Wood;
 - SP017674 Foxlydiate Woods;
 - SP027671 Pitcheroak Woods;
 - SP042656 Oakenshaw Woods;
 - SP040663 Southcrest Woods; and
 - SP027650 Walkwood Coppice.
- 8.3.38 Proctor's Barn Woods LNR is not located in close proximity to any development sites and will remain unaffected.
- 8.3.39 Foxlydiate Woods and Pitcher Oak Woods LNRs are also SWSs and have been assessed in Section 8.3.17.

- 8.3.40 Oakenshaw Wood LNR is not located in close proximity to any development sites, is separated by intervening development and a significant dual carriageway separated junction (A448 / A441) and will remain unaffected.
- 8.3.41 Southcrest Wood LNR is also a SWS and has been assessed in Section 8.3.22.
- 8.3.42 Walkwood Coppice LNR is not located in close proximity to any development sites and will remain unaffected.
- 8.3.43 There are approximately 30 discrete areas of ancient and semi-natural and ancient replanted woodland within Redditch Borough, many of which are component parts of larger woodlands or have ecological designations. Ancient woodlands include; Wirehill Wood (part of a SSSI), Pitcher Oak Wood (part SWS and LNR), Oakenshaw Wood (SWS and LNR), Southcrest Wood (SWS and LNR), Walkwood Coppice (SWS and LNR), Brockhill Wood (SWS) and New Coppice (SWS).
- 8.3.44 Areas of woodland within Redditch Borough listed on the Inventory of Ancient Woodland are shown in Appendix 25.
- 8.3.45 In the majority of cases, the proposed development sites are sufficient distance from areas of ancient and semi-natural and ancient replanted woodland that it is considered likely that no impacts will arise. The closest development site is 2010/14 which is located immediately adjacent to Foxlydiate Woods (SWS and LNR) (see Section 8.3.17). Development Site 2010/13 is approx 50 m from Brockhill Wood (Bromsgrove SWS) (see Section 8.3.35). Other development sites within 100 m of an ancient woodland are 2010/09 and RB03, which are in close proximity to Rough Hill & Wirehill Woods and (see Section 8.3.6) Pitcher Oak Wood (see Section 8.3.18) respectively.
- 8.3.46 There are no Local Geological Sites (LGS) within Redditch Borough.
- 8.3.47 A summary of geological and ecological designations within Redditch Borough is presented in Table 8-1. This demonstrates that for the minority of designated areas identified to be potentially at risk from construction and other activities at the proposed development sites, relatively simple and straightforward mitigation measures can be put in place to minimize the potentially minor local impacts

Table 8-1 Summary of Geological and Ecological Designations Within Redditch Borough

Ecological Designation	Number Within Redditch Borough	Site Name	Nearest Development Site	Comments / Recommendations
Ramsar	0	-	-	-
SAC	0	-	-	-
SPA	0	-	-	-
NNR	0	-	-	-

Ecological Designation	Number Within Redditch Borough	Site Name	Nearest Development Site	Comments / Recommendations
SSSI	6	Dagnell End Meadow	WYG04 (>800 m)	No impacts
		Ipsley Alders Marsh	EL53 (~280 m) EL21 (~280 m) EL51 (~290 m) 2010/10 (~430 m) St2 (~500 m) Site 2 (~400 m) Site 11 (~300 m)	Although unlikely to be affected due to distances and intervening development, hydrological, and potentially hydrogeological, linkages exist and further assessment is required prior to development. Biodiversity-led SUDs and pollution prevention measures required during construction and operation. Deeper foundations have the potential to affect groundwater and springs feeding the marsh if hydrological links are present
		Rough Hill & Wirehill Woods	2010/09 (<100 m) EL61 (~160 m)	No impacts although limited disturbance impacts may arise during construction
		Trickses Hole	2010/12 (~2 km)	No impacts
		Rockery Cottage Meadow	None	No impacts
		Wylde Moor, Feckenham	WYG06	No impacts
SWS	24	Old Rectory Meadows	None	No impact due to large distances
		Bradley Green Meadows		
		Upper Beanhall Meadows		
		Berrow Hill		
		Brookhouse Meadow and Feckenham Bank		
		Brandon Brook Meadow		
		Burial Lane		
		Shurnock Meadows		
		Downsell Wood		
		Walkwood Coppice		
		Pitcher Oak Golf Course		
		Oakenshaw Wood		
		New Coppice		
		Lodge Pool		
Ipsley Alders Marsh				
Bow Brooks	2010/12 (~700 m)	Due to topography, pollution prevention measures are required		

Ecological Designation	Number Within Redditch Borough	Site Name	Nearest Development Site	Comments / Recommendations
		Foxlydiat and Pitcher Oak Woods	2010/14 (immediately adjacent) RB03 (~65 m)	No direct impacts although disturbance impacts may arise during construction. Measures required to prevent encroachment, pollution prevention, fencing along common boundaries. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the woodland
		River Arrow	EL16 EL23 (~30 m) EL44 EL12 (~140 m) EL17	No direct impacts but watercourses are present connecting directly to the River Arrow. Pollution prevention measures required during construction and operation
		Southcrest Wood	LP13 (~20 m)	Very small development site. No direct impacts although disturbance impacts may arise during construction
		Oakenshaw Spinney	LPX02 (immediately adjacent) WYG02 (~110 m)	No direct impacts although disturbance impacts may arise during construction. Watercourse / ditch also provides a hydrological link to the SWS. Measures required to prevent encroachment, pollution prevention, fencing along common boundaries. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the woodland
		Oakenshaw Fenny Rough	LPX06 (~110 m) LPX07 (~115 m)	No direct impacts although limited disturbance impacts may arise during construction
		Abbey Forge and Mill Pond	LPX05 (~180 m)	No direct impacts although a watercourse provides a hydrological link to the SWS. Pollution prevention measures required during construction and operation
		Arrow Valley Park Lake	EL16 (~135 m)	No direct impacts although a watercourse provides a hydrological link to the River Arrow SWS and may also connect to the lake. Pollution prevention measure required during construction and operation
		Ravensbank Drive Bridle Track	EL24 (~20 m) EL15 (~180 m) EL33 (~300 m) 2 & 11 (immediately adjacent)	No direct impacts although limited disturbance impacts may arise during construction. Measures required to prevent encroachment, fencing along common boundaries

Ecological Designation	Number Within Redditch Borough	Site Name	Nearest Development Site	Comments / Recommendations
		Brockhill Wood	2010/13 (~50 m)	This SWS is within Bromsgrove District, on the border with Redditch Borough. No direct impacts although disturbance impacts may arise during construction
LNR	6	Proctor's Barn Wood	None	No impacts
		Foxlydiat Woods	2010/14 (immediately adjacent) RB03 (~65 m)	See SWS above
		Pitcheroak Woods		
		Oakenshaw Woods	None	No impacts
		Southcrest Woods	LP13 (~20 m)	See SWS above
		Walkwood Coppice	None	No impacts
Ancient Woodland	30 components	Foxlydiat Wood	2010/14 (immediately adjacent)	No direct impacts although disturbance impacts may arise during construction. Measures required to prevent encroachment, pollution prevention, fencing along common boundaries
		Brockhill Wood	2010/13 (~50 m)	This is also a SWS and is within Bromsgrove District, on the border with Redditch Borough. No direct impacts although disturbance impacts may arise during construction
		Rough Hill & Wirehill Woods	2010/09 (<100 m)	No impacts although limited disturbance impacts may arise during construction
		Pitcheroak Woods	RB03 (<100 m)	No direct impacts although disturbance impacts may arise during construction
		Remaining Ancient Woodlands	-	No impacts
LGS	0	-	-	-

8.4 Baseline Environment and Impact Assessment – Bromsgrove District

8.4.1 Bromsgrove District contains no Ramsar Sites, SAC, SPA or NNR.

8.4.2 Two NNR are located immediately adjacent to the District boundary at Chaddesley Woods, to the west, and Fosters Green Meadows, to the south. Neither is within close proximity to development sites.

8.4.3 There are 14 SSSI within, or partially within Bromsgrove District (Figure 8-2):

- SP092776: Berry Mound Pastures;
- SP020753: Bittell Reservoirs;
- SO971716: Burcot Lane Cutting;
- SO921732: Feckenham Forest (partially);

- SP010689: Hewell Park Lake;
- SP031762: Hopwood Dingle;
- SO929758: Hurst Farm Pasture;
- SO934742: Little Royal Farm Pastures;
- SO958769: Madeley Heath Pit;
- SO940732: Oakland Pasture;
- SO942812: Penorchard & Spring Farm Pastures;
- SO959790: Romsley Hill;
- SO966789: Romsley Manor Farm; and
- SO945782: Sling Gravel Pits.

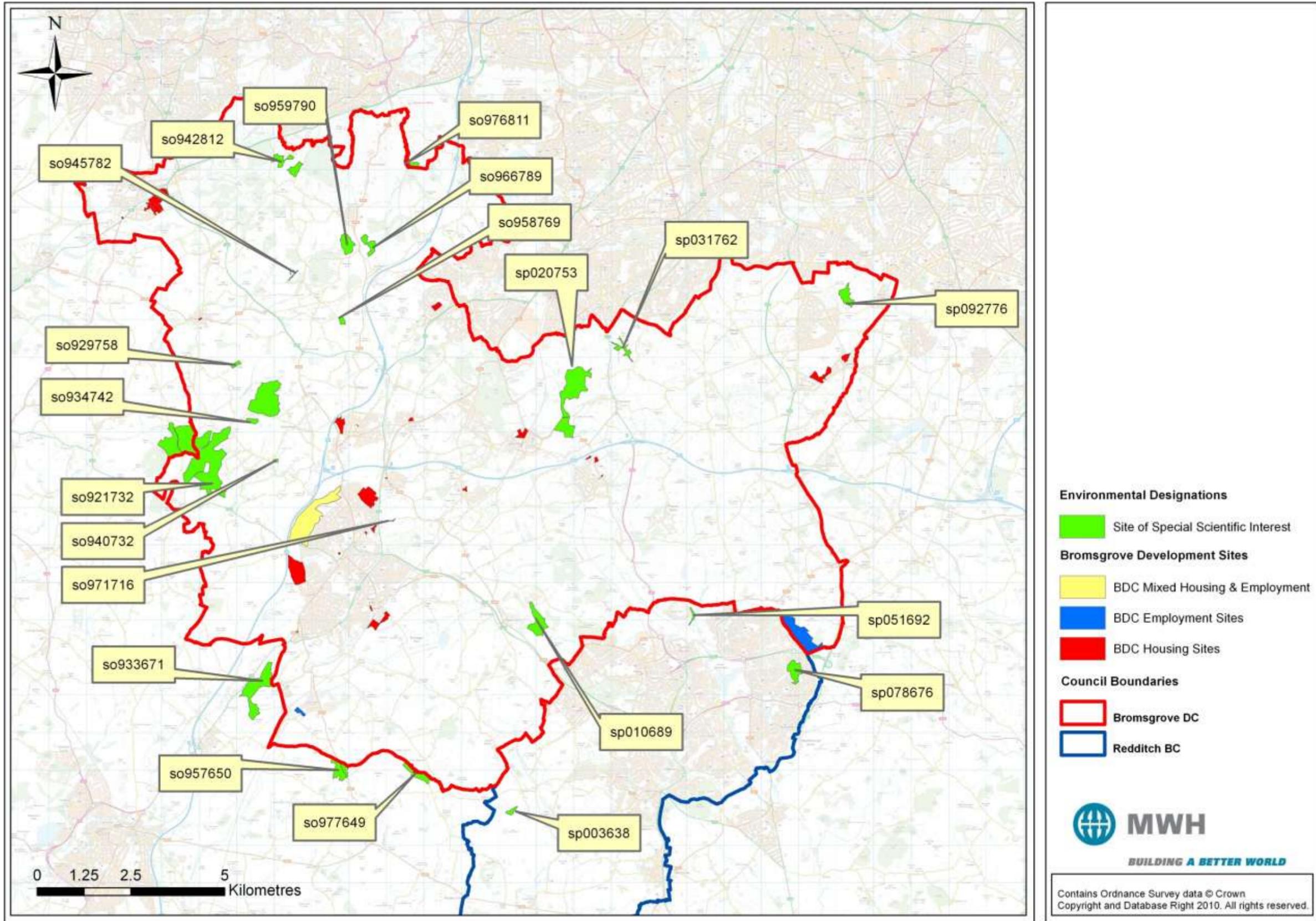
8.4.4 The following SSSI are located outside Bromsgrove District, but are immediately adjacent to the border:

- SO976811: Illey Pastures (Dudley);
- SO957650: Pipershill Common (Wychavon);
- SO933671: Upton Warren Pools (Wychavon); and
- SO977649: Foster's Green Meadows (Wychavon).

8.4.5 The following SSSI are located outside Bromsgrove District, but are in close proximity:

- SP051692: Dagnell End Meadow (Redditch);
- SP078676: Ipsley Alders Marsh (Redditch);
- SP093724: Windmill Naps Wood (Stratford-on-Avon); and
- SP102740: Clowes Wood & New Fallings Coppice (Stratford-on-Avon).

Figure 8-2 Bromsgrove District Sites of Special Scientific Interest



- 8.4.6 None of the aforementioned SSSI within Bromsgrove District are in close proximity to development sites, the closest being Development Site BDC92, which is located approximately 700 m to the west of Bittell Reservoirs SSSI and separated by housing development, roads and a railway line. Although this SSSI is unlikely to be affected by the development of BDC92, drainage to the east of the railway line does connect into the SSSI, and it is possible that a hydrological link is present from the development site, passing beneath the railway line and connecting to the SSSI. If developed, this potential hydrological link should be investigated further and pollution prevention measures put in place, during both the construction phase and post-completion, to prevent harmful substances from entering the drainage system and, ultimately the SSSI.
- 8.4.7 The closest SSSI to a development site is Ipsley Alders Marsh, which is located in Redditch Borough and which was discussed in more detail in Section 8.3.5.
- 8.4.8 Bromsgrove District contains 83 SWS. The locations of these SWSs are shown in Appendix 26. One SWS is proposed to be extended: SP06/01 Callow Farm Meadow.
- 8.4.9 The majority of the SWSs are located within the urban area of Bromsgrove District, but are considered likely to be unaffected by the development sites due to distance and intervening existing development. However, seven SWS are located in closer proximity or immediately adjacent to development sites and are assessed in more detail:
- SO97/33: Lickey Hills;
 - SP06/12: Brockhill Wood;
 - SO97/27: Whetty Coppice;
 - SP06/30: Ravensbank Drive Bridle Track;
 - SO95/09: Bow, Shell, Swan and Seeley Brooks;
 - SO96/12: Land near Stoke Works;
 - SO 96/19: Worcester & Birmingham Canal;
 - SO97/34: Battlefield Brook Water Vole Colony; and
 - SO97/35: Spadesbourne Brook Water Vole Colony.
- 8.4.10 Lickey Hills SWS comprises 110 ha of ancient semi-natural woodland, unimproved lowland grassland, more recent woodland, areas of conifer plantation, acid grassland, heathland, wooded valleys and associated wet flushes and ornamental ponds. Rare and uncommon species have been recorded within the SWS.
- 8.4.11 Development Site BDC92 is located approximately 160 m to the east of the most southerly point of the SWS, where a bridleway enters the SWS from Cherry Hill Road. Whilst the SWS will not be directly affected by the development of BDC92, some disturbance impacts may arise during the construction phase, particularly from construction vehicles which may use the south westerly approach of Cherry Hill Road to access / exit the site, although it is more likely that construction vehicles will access the site from the north east. Regardless of this, measures should be put in place to protect the SWS from disturbance issues during construction, ensuring the continued ecological viability of the site.
- 8.4.12 Brockhill Wood SWS is a 28.3 ha woodland. Although shown on the Inventory of Ancient Woodland much of the woodland comprises replaced commercial such as aspen, sycamore,

birch, sweet chestnut and grey alder, with only the original canopy trees retained around the boundaries. The SWS is extensive, with varied terrain, springs, ditches, damp grassland rides and different broadleaved woodland habitats.

- 8.4.13 Brockhill Wood SWS is located on the border with Redditch Borough and is in close proximity to Development Site 2010/13, which is situated approximately 50 m to the east and separated only by Brockhills Lane. Whilst the SWS will not be directly affected by the development of 2010/13, some disturbance impacts may arise during the construction phase, particularly from construction vehicles which are likely to use Brockhills Lane to access the site. Measures should be put in place to protect the SWS from disturbance issues during construction, ensuring the continued ecological viability of the site. A watercourse is present through the development site, but this watercourse flows in a south easterly direction away from the SWS and does not provide a hydrological link.
- 8.4.14 Whetty Coppice SWS is a 1.45 ha ancient semi-natural woodland, predominantly of old hazel coppice with oak standards. The woodland has a species-rich field layer where the canopy opens up. The wood slopes gradually to the north and seasonal wet flushes occur on the low-lying ground.
- 8.4.15 Development Site BDC65 is located approximately 260 m to north west of the SWS, separated by housing development, residential streets and the A38 dual carriage way. The SWS will not be affected by the development site.
- 8.4.16 Ravensbank Drive Bridle Track SWS is a 2.1 km double hedged trackway that has become overgrown providing an important wildlife corridor around the north-eastern edge of Redditch Borough, bordering with Bromsgrove District. The site comprises a double hedge with associated scrub, small areas of more mature woodland, a small watercourse with wet flushes and seasonally inundated marginal ditches, more permanent water features and remnant patches of grassland. Although the habitats are not rare, the linear nature of the track enhances its value, particularly as a foraging and commuting corridor for a range of species through an otherwise urban environment.
- 8.4.17 Development Sites 2 and 11 (Ravensbank) are immediately adjacent to the SWS to the North West because Sites 2 and 11 although physically located in Bromsgrove District are put under development sites of Redditch as they are allocated to meet the needs of RBC. Whilst the SWS will not be directly affected by the development of these sites, some disturbance impacts are likely to arise during the construction phase as a result of construction activities and vehicles. Measures should be put in place to protect the SWS from encroachment during construction, ensuring the continued ecological viability of the site. Boundary fencing should also be provided to separate the SWS from the development sites along the common border, to ensure that access by the general public into the bridleway within the SWS is made only via authorised access points. No new accesses and paths into the SWS from the development sites should be provided unless proposals can demonstrate no significant impacts. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the habitats of the adjacent double hedge trackway.
- 8.4.18 Redditch Development Sites EL24, EL15 and EL33 are also in close proximity to the SWS. These were described in more detail in Section 8.3.33.
- 8.4.19 The small watercourses comprising Bow Brooks SWS flow south and west before draining via the Bow Brook into the River Avon at Defford, some distance to the south. The streams are small, narrow and varied in structure. Although the brooks vary in quality along their lengths, they are rich in aquatic and emergent vegetation, with Bow Brook particularly known for its aquatic and emergent flora.

- 8.4.20 Development Site 2010/12 is approximately 700 m to the east of the northernmost extremity of this SWS, which lies in Bromsgrove District. The topography of this area generally slopes towards these stream valleys and measures should be put in place, during both construction and post-completion phases, to prevent drainage, which may contain silts and other potentially harmful substances from entering these streams.
- 8.4.21 Land near Stoke Works SWS is a 1.91 ha area of derelict land and grassed road verges, now part of a business park and industrial estate complex. Wasp orchid have been recorded on the site in the past, and may still be present.
- 8.4.22 Employment Site 7 is located immediately adjacent to the SWS, surrounding it on three sides. Whilst the SWS will not be directly affected by the development of Site 7, some disturbance impacts are likely to occur during the construction phase and measures should be put in place to protect the SWS from encroachment during construction, ensuring the continued ecological viability of the site. These measures should include pollution prevention measures to any ditches which provide a hydrological link from the Site to the SWS. Boundary fencing should also be considered to protect the SWS along common borders, to ensure that access by the general public into the SWS is made only via authorised access points. No new accesses and paths into the SWS from the site should be provided unless proposals can demonstrate no significant impact. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the habitats of the adjacent derelict site and grassland verges.
- 8.4.23 Worcester & Birmingham Canal SWS is a 37.5 km linear feature completed in 1851 as a commercial transport link between the River Severn and the industrial heartlands in Birmingham and the Black Country. Today it provides a recreational resource and valuable wildlife corridor, with marginal vegetation supporting a rich diversity of flora and fauna, including reed warblers, otters and kingfishers.
- 8.4.24 The canal flows through the centre of Employment Site 7. The development of Site 7 may result in some disturbance impacts during the construction phase although its existing use for recreational purposes will mean that a certain level of disturbance is already tolerated with little or no consequences. However, it is important that pollution prevention measures are put in place, both during construction and after completion of the development, to prevent potentially harmful substances from entering the canal. In addition, an authorized canal footpath for use by the general public to allow their continued access along it will be required within the development site. Dedicated accesses to this path should be provided to prevent unauthorized encroachment into the SWS. Development Site ALV6 is also in close proximity to this SWS, located at the end of a spur off the canal. Although ALV6 is only a small development site, some disturbance impacts may result during the construction and operational phases, and measures should be implemented, where possible, to minimize these impacts. Equally, it is important that pollution prevention measures are put in place, during construction and post-completion, to prevent potentially harmful substances from entering the canal. Access to the SWS should also be restricted to authorized access / exit points and dedicated footpaths, to minimize encroachment. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the marginal vegetation of the canal.
- 8.4.25 Battlefield Brook Walter Vole Colony SWS contains one of two water vole populations in Bromsgrove. It comprises a 6.4 km stretch of Battlefield Brook, starting at the M5 motorway north of the Catshill area. From here, the Brook heads south, flowing under the M5 / M42 junction before crossing beneath the M5 motorway and running parallel to it. The brook crosses back under the M5 north of Timberhonger Lane, and flows in an easterly direction into Sanders Park. Three tributaries join with Battlefield Brook, with sections included in the SWS. The southerly extent of the SWS is at the confluence with the Spadebourne Brook, at the east of Sander's Park.

- 8.4.26 Housing Development Sites BDC20 and BDC80 are in close proximity to the SWS, with Battlefield Brook forming the northern boundary of BDC20. To the west, the SWS is separated from BDC20 by the M5 motorway. Towards the south, the SWS is separated from BDC80 by only Timberhonger Lane.
- 8.4.27 Where the SWS forms the northern boundary of BDC20, a buffer zone should be established prior to construction and established within the development proposals to prevent loss of important water vole riparian habitat, and to minimize disturbance impacts that are likely to occur during the construction phase, and potentially after completion of the development. Although water voles occupy only a narrow strip of land, this buffer zone should be at least 6 m wide on both sides of the brook. The buffer strip should be fenced off to allow the riparian vegetation to grow tall, although scrub encroachment should be prevented, through habitat management, by occasionally cutting this vegetation back to around 10-15 cm during the autumn or winter months. Cutting should only take place on one bank only in alternate years. Fencing of the buffer zone would also prevent access and encroachment to the watercourse by new residents of BDC20. Other good site practices should also be implemented during construction to minimize disturbance impacts.
- 8.4.28 It is also important that pollution prevention measures are put in place, both during construction and after completion of the both sites, to prevent potentially harmful substances from entering the watercourse and harming both the animals and the supporting habitats.
- 8.4.29 Spadesbourne Brook Water Vole Colony SWS is the second of the two water vole populations in Bromsgrove. It comprises a 4.9 km stretch of Spadesbourne Brook, starting at Alcester Road in the north, and running southerly and south westerly direction through Bromsgrove, before turning in a south easterly direction to run parallel with Charford Road. The southerly extent of the SWS is the intersection of Charford Road with Stoke Road. One small tributary meets the Spadesbourne Brook between Slideslow Drive and School Drive, and a section of this tributary is included in the proposed SWS.
- 8.4.30 Housing Development Site BDC81 is located less than 20 m from the SWS at its closest points, separated only by Birmingham Road. In general, the SWS is separated by intervening development, including residential properties fronting onto Beechcroft Drive and buildings along Birmingham Road. The development of BDC81 may result in some disturbance impacts during the construction phase and measures should be put in place along Birmingham Road to protect the SWS from encroachment during construction, ensuring the continued ecological viability of the site. These measures should include pollution prevention measures in the event that hydrological linkages are present from the development site to the SWS.
- 8.4.31 Five other, very small development sites are located immediately adjacent to the Spadesbourne Brook, or in close proximity. Where the small development site is immediately adjacent to the brook, a buffer zone should be established and fence off prior to construction, as described for Battlefield Brook (see Section 8.4.27), and pollution prevention measures implemented to prevent potentially harmful substances from entering the watercourse and harming both the animals and the supporting habitats.
- 8.4.32 There is only one LNR within Bromsgrove District: Waseley Hills Country Park. This and other LNR's surrounding the District can be seen in Appendix 27.
- 8.4.33 Due to distance and intervening structures, this LNR will not be affected by any development sites. The nearest development site is BDC65, located approximately 500 m to the east and separated by existing housing development, schools and farmland. A watercourse is present to the north east for the development site. However, this watercourse arises within the Waseley Hills Country Park, flowing away from it. It therefore does not provide a hydrological link to the LNR.

- 8.4.34 There are approximately 111 discrete areas of ancient and semi-natural and ancient replanted woodland within Bromsgrove District, many of which are component parts of larger woodlands or have ecological designations (SWS). Ancient woodlands include: Balaam’s Wood (LNR), Bills Wood (LNR), Broomwich Wood (LNR), Beacon Wood (SWS), Great Farley and Dales Woods (SWS), Roundhill Wood (SWS) and Wassellgrove Dingle (SWS).
- 8.4.35 In the vast majority of cases, the proposed development sites are sufficient distance from areas of ancient and semi-natural and ancient replanted woodland that it is considered likely that no impacts will arise. The closest is Development Site BDC92, which is located approximately 160 m, at its closest point, to the east of Pinfields Wood, which is part of the Lickey Hills SWS (see Section 8.4.10).
- 8.4.36 Areas of woodland within Bromsgrove District listed on the Inventory of Ancient Woodland are shown in Appendix 28.
- 8.4.37 There are five LGS within Bromsgrove District (Appendix 29). These are:
- Hagley Hall Quarry;
 - Kendal End Farm;
 - Lickey Hill Quarry 01;
 - Madeley Heath; and
 - Shepley Sand Pit and Knoll.
- 8.4.38 None will be affected by the development sites. Development Site BDC92 is the closest, to Kendal End Farm LGS, at approximately 635 m. Development Site BDC112 is located around 750 m from Shepley Sand Pit and Knoll LGS. All other development sites are sufficient distance, >1.2 km, to result in no impacts to the LGSs.
- 8.4.39 Table 8-2 presents a summary of the geological and ecological designations with Bromsgrove District. This demonstrates that for the minority of designated areas identified to be potentially at risk from construction and other activities at the proposed development sites, relatively simple and straightforward mitigation measures can be put in place to minimize the potentially minor local impact.

Table 8-2 Summary of Geological and Ecological Designations Within Bromsgrove District

Ecological Designation	Number Within Bromsgrove District	Site Name	Nearest Development Site	Comments / Recommendations
Ramsar	0	-	-	-
SAC	0	-	-	-
SPA	0	-	-	-
NNR	0	-	-	-
SSSI	18	Bittell Reservoirs	BDC92 (~700 m)	Although unlikely to be impacted due to distance and intervening development, road and rail and infrastructure, a possible hydrological link is present. Pollution prevention measures required during construction and operation

Ecological Designation	Number Within Bromsgrove District	Site Name	Nearest Development Site	Comments / Recommendations
		Remaining 17 SSSI	-	No impacts
SWS	83	Lickey Hills	BDC92 (~160 m)	No direct impacts although disturbance impacts may arise during construction
		Brockhill Wood	2010/13 (~50 m)	No direct impacts although disturbance impacts may arise during construction
		Whetty Coppice	BDC65 (~260 m)	No impacts due to distance and intervening development
		Ravensbank Drive Bridle Track	2 & 11 (immediately adjacent) EL24 (~20 m) EL15 (~180 m) EL33 (~300 m)	This SWS is within Redditch Borough, on the border with Bromsgrove District. No direct impacts although disturbance impacts may arise during construction. Measures required to prevent encroachment, fencing along common boundaries. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the habitats of the double hedge trackway
		Bow Brooks	2010/12 (~700 m)	Due to topography, pollution prevention measures are required
		Land near Stoke Works	Site 7 (immediately adjacent)	No direct impacts although disturbance impacts may arise during construction. Measures required to prevent encroachment. On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the habitats of the adjacent derelict site and grassland verges
		Battlefield Brook Water Vole Colony	BDC20 (immediately adjacent) BDC80 (<20 m)	Buffer zone to be established along the southern bank of the watercourse prior to construction and incorporated into the design proposals of at least 6 m width. Buffer zone to be fenced to allow vegetation to grow tall and prevent access by the general public. Vegetation to be managed by cutting back every alternate year. Pollution prevention measures to be implemented for both construction and operational phases
		Spadesbourne Brook Water Vole Colony	BDC81 (<20 m) A number of small unreferenced development sites (immediately adjacent and close by)	Measures to be put in place along Birmingham Road to protect the SWS from encroachment and disturbance during construction, including pollution prevention measures Fenced buffer zone to be established prior to construction and incorporated into the design proposals where the small development sites are immediately adjacent to the watercourse, and pollution prevention included

Ecological Designation	Number Within Bromsgrove District	Site Name	Nearest Development Site	Comments / Recommendations
		Worcester & Birmingham Canal	Site 7 (immediately adjacent – canal flows through the Site) ALV6 (immediately adjacent)	Pollution prevention measures required during construction and post completion Authorized accesses to be provided On-site planting and landscaping proposals should be appropriate to the site and aim to enhance the marginal vegetation of the canal
		Remaining SWSs	-	No impacts
LNR	1	Waseley Hills Country Park	BDC65 (~500 m)	No impacts
Ancient Woodland	111 components	Pinfields Wood (part of Lickey Hill woodlands)	BDC92 (~160 m)	No direct impacts although disturbance impacts may arise during construction
		Remaining Ancient Woodlands	-	No impacts
LGS	5	Hagley Hall Quarry	BDC35B (~1.23 km)	No impacts
		Kendal End Farm	BDC92 (~635 m)	No impacts due to distance
		Lickey Quarry 1	BDC92 (~1.5 km) BDC65 (~2.3 km) BDC112 (~2.3 km)	No impacts due to distance
		Madeley Heath	BDC65 (~2.36 km)	No impacts
		Shepley Sand Pit and Knoll	BDC112 (~750m)	No impacts due to distance

8.5 Planning Policy on Ecological and Geological Conservation

8.5.1 Current planning policy on ecological and geological conservation within the UK and locally, within Redditch Borough and Bromsgrove District is summarized below. Full details of all policies can be found in Appendix 30.

8.5.2 Planning Policy Statement 9 (PPS9): Biodiversity and Geological Conservation (August 2005) sets out planning policies on protection of biodiversity and geological conservation through the planning system. Emphasis is on the conservation, enhancement and restoration of ecological and geological diversity.

8.5.3 Borough of Redditch Local Plan No. 3 (adopted May 2006) - relevant saved policies within the Local Plan are:

- Policy B (NE) 1 Overarching Policy of Intent;
- Policy B (NE) 1a Trees, Woodland and Hedgerows;
- Policy B (NE) 3 Wildlife Corridors;
- Policy B (NE) 10a Sites of National Wildlife Importance; and
- Policy B (NE) 10b Sites of Regional or Local Wildlife Importance.

8.5.4 Redditch Revised Preferred Draft Core Strategy Document - the Core Strategy for the Borough of Redditch is currently in preparation. The Revised Preferred Draft Core Strategy

Development Plan Document (consultation 21st January - 31st March 2011) includes 3 relevant strategic objectives including:

- to maintain and provide a high quality natural, rural and historic environment with a Green Infrastructure network which maximises opportunities for biodiversity value, wildlife and ecological connectivity;
- to protect, promote and where possible enhance the quality of the Boroughs landscape and Redditch Borough's other distinctive features; and
- to protect and enhance water, air and soil and minimise flood risk.

8.5.5 Relevant policies include:

- Policy 2 Natural Environment;
- Policy 3 Flood Risk and Water Management; and
- Policy 5 Green Infrastructure.

8.5.6 Bromsgrove District Local Plan (adopted January 2004) - relevant saved policies within the Local Plan are:

- Policy DS9 Protection of Designated Environmental Areas;
- Policy C9 Development Affecting SSSIs and NNRs;
- Policy C10 Development Affecting SWSs and LNRs;
- Policy C10A Development Affecting Other Wildlife Sites;
- Policy C12 Wildlife Corridors;
- Policy C17 Retention of Existing Trees; and
- Policy C18 Retention of Existing Woodland.

8.5.7 Bromsgrove Core Strategy 2 - the Core Strategy document for Bromsgrove District is currently in preparation. The Draft Core Strategy Document (January 2011) contains one strategic objective and two core policies of relevance:

- SO8 - protect and enhance the unique character, quality and appearance of the historic and natural environment throughout the District;
- CP17 Natural Environment; and
- CP20 Water Management.

8.6 Policy Recommendations

8.6.1 A key aim of the above policies is the conservation, enhancement and restoration of biodiversity and geological diversity as an integral part of sustainable development, with any impacts to identified sites or habitats of ecological or geological importance kept to a minimum. This also applies to habitats and species identified within the Local Biodiversity

Action Plans¹⁰⁴, such as ancient and species-rich hedgerows, woodland, semi-natural grasslands, canals, pond and lakes, rivers and streams, and roadside verges.

8.6.2 Impacts of development can be minimised through the careful identification of sites which are suitable and appropriate for development and through the implementation of best practice techniques during both the construction and operational phases.

8.6.3 Where possible development sites should seek to avoid being located immediately adjacent or in close proximity to sites of ecological importance, as the risk of direct and indirect impacts of disturbance, encroachment and habitat loss / damage will be reduced with increasing distance. Hydrological links should also be taken into account when identifying suitable development sites, as pollution incidents upstream can impact on sites of ecological importance downstream, particularly if the site of ecological importance is noted for its aquatic / wetland features.

8.6.4 It is recognised that avoidance is not always possible. In these instances, policy should ensure that best practice techniques are implemented during both the construction and operational phases, and opportunities for appropriate enhancement identified and put in place, where possible. Appropriate enhancements where the development sites border or are in close proximity to habitats of some local ecological value, whether designated or not, should complement the adjacent habitat resulting in an increased area of that habitat type or connecting / extending wildlife corridors. For example, where a development site is adjacent with an area of woodland, appropriate enhancements would include the on-site planting of native trees species and woodland edge species contiguous with the woodland. The identification of opportunities for off-site planting should also be encouraged, to strengthen the adjacent habitats, although it is recognised that this would be dependent on the permission of the adjacent landowner. Appropriate enhancements would have to be considered on a site-by-site basis. During construction, the implementation and maintenance of good environmental site practices in the form of a Construction Environmental Management Plan (CEMP), or equivalent, is recommended. Mitigation measures include, but are not limited to:

- undertaking noise activities outside sensitive periods, such as the bird breeding season and hibernation periods and keeping noisy activities to a minimum duration;
- siting noisy activities away from sensitive locations;
- establishing designated haulage routes for heavy construction vehicles, and preventing engine idling;
- providing temporary fencing to prevent encroachment by construction plant, machinery and storage areas; and
- imposing pollution prevention measures, such as those suggested by the Environment Agency within their Pollution Prevention Guidance Notes.¹⁰⁵

8.6.5 CEMPs are recommended for all development sites regardless of their proximity to a site of geological or ecological importance, as the measures and controls they contain will aim to minimize all construction impacts that may affect the surrounding environment, such as the nuisance effects of noise, dust and construction traffic to residential properties. Indeed, it is likely that the developers and their contractors will implement some form of construction

¹⁰⁴ Worcestershire Local Biodiversity Action Plans (<http://www.worcestershire.gov.uk/cms/environment-and-planning/biodiversity/action-plans.aspx>)

¹⁰⁵ www.environment-agency.gov.uk/business/topics/pollution/39083.aspx

management plan in accordance with their quality, Health and Safety and environmental management systems. Although there are no set distances, where development sites are within 1 km of a nationally or internationally designated site, within 0.5 km of locally designated site, or where the development site is located upstream of a designated site, it is increasingly important that the CEMP includes measures and controls that adequately mitigate for potential impacts on biodiversity. However, each site should be considered on an individual basis, extending the distance threshold where necessary.

- 8.6.6 During operation, impacts to sites of ecological importance are more likely to arise through their use by members of the general public for recreational and leisure pursuits. In these instances, policy should ensure that access / exit points and footpaths are provided and maintained to discourage people from deviating from designated routes. Fencing should be considered along common boundaries to prevent unauthorised access. Where hydrological and hydrogeological links are present, policy should ensure that pollution prevention measures are included within development proposals that prevent potentially harmful substances from entering watercourses and ditches, affecting the ecological integrity of the designated site downstream. Policy should also ensure that biodiversity-focused SUDs are considered, to manage water quality and quantity from development sites. From a biodiversity perspective, SUDs that incorporate swales, filter strips, ponds and basins are more likely to provide useful wildlife habitats and corridors, as well as improving the aesthetics of the urban environment.
- 8.6.7 Other improvement and enhancement measures for inclusion in development proposals include the erection of bird and bat boxes, incorporation of nesting sites into buildings, the creation of green / brown roofs, verge and hedgerow management and other, often simple, measures such as those recommended within Biodiversity By Design¹⁰⁶ and for Biodiversity Enhancement Areas within the West Midlands Region¹⁰⁷. On-site planting and landscaping proposals should complement and connect to habitats present on adjacent sites wherever possible, resulting in increased areas of that habitat type or connecting / extending wildlife corridors and the green infrastructure network. Planting and landscaping proposals should be appropriate to the site and its surroundings, and considered on a site-by-site basis.
- 8.6.8 The location of development sites should also seek to avoid severing and fragmenting existing wildlife corridors and links to existing habitats, such as hedgerows, tree lines and green wedges. Whilst these links may not be covered by ecological designations, they are of ecological importance to species which will use these links to move between areas, as flight lines, for foraging and cover, and potentially for nesting and hibernation. They are also important components parts of the green infrastructure network within the areas. Green infrastructure is defined as the network of green spaces and natural elements that intersperse and connect cities, towns and villages, and includes open spaces, waterways, gardens, woodlands, green corridors, wildlife habitats, street trees, natural heritage and open countryside. Where it is not possible to avoid impacting on these links, policy should ensure that the corridors and links are maintained within the development proposals and landscape plans, identifying and implementing opportunities for enhancement wherever possible that are appropriate to the site and the impacted corridors and links.
- 8.6.9 Although there are no set distances, for development sites within 5 km of a SSSI, including geological SSSIs, consultation should be undertaken with Natural England. Where the SSSI is managed by a Wildlife Trust, the Wildlife Trust should also be consulted. For sites of local geological and ecological importance, there is no requirement to consult with Natural

¹⁰⁶ Biodiversity By Design: A guide for sustainable communities, Town & Country Planning Association (http://www.tcpa.org.uk/data/files/bd_biodiversity.pdf)

¹⁰⁷ West Midlands Biodiversity Partnership: Biodiversity Enhancement Areas (http://www.wmbp.org/landscapes_for_living/biodiversity_enhancement_areas)

England although their general advice can be sought. Consultation should be undertaken with the local authority's Biodiversity Officer / Ecologist and, where relevant, the managing organization. Again, there are no set distances which trigger the need for consultation, although consultation is recommended for development sites within 1 km of locally designated sites. However, each site should be considered on an individual basis, extending the distance threshold where necessary.

- 8.6.10 The Environment Agency should be consulted for all development sites prior to the submission of any formal application, in line with its standing advice on flood risk, but consultation is increasingly important where the development site affects, or is in close proximity to controlled waters. The Environment Agency should be consulted, as a matter of course, where the controlled waters themselves are covered by an ecological designation, either immediately adjacent to the development site or downstream. Each site should be considered on an individual basis.

9 Summary and Conclusions

9.1 Introduction

9.1.1 This Outline WCS has been undertaken for BDC and RBC in accordance with Environment Agency Guidance. The study aim is to assess the water cycle capacity constraints to the development of 32 (+1 mixed) housing sites and 1 employment land site in BDC and 33 (+4 mixed) housing sites and 17 employment land sites in RBC. Where appropriate, infrastructure requirements and mitigation measures are proposed.

9.1.2 The study objectives were as follows:

- To summarise the results and outcomes of the L2 SFRA – i.e. *can development be accommodated without increased flood risk?*
- To determine whether there is sufficient water supply and water infrastructure capacity to meet the proposed growth and development under average and peak demand conditions and to propose demand management measures for the growth and development sites – i.e. *is there enough water?*
- To assess the wastewater collection and treatment capacity constraints to meet the proposed growth and development, to identify sustainable solutions, and to develop broad policy direction for the Core Strategy documents – i.e. *what constraints are there on increasing capacity?*
- To assess the capacity of the water environment to absorb additional effluent discharge, and the implications for wastewater treatment capacity and process upgrades to achieve water quality standards – i.e. *will there be a water quality impact?*
- To assess the impact of planned development on SSSI, SWS and LGS and to identify mitigation measures and policies to protect and enhance these sites - i.e. *are there other location specific environmental risks?*
- To summarise the study outcomes – i.e. what opportunities are there for changing the proposed development locations and are there outstanding concerns about infrastructure provision that need to be addressed in a Detailed WCS?

9.1.3 This study has taken into consideration findings from the Scoping Level WCS and has, where appropriate, incorporated guidance from PPSs (PPS3, PPS9, PPS23 and PPS25). The study has also been informed by other national policies, regulations and guidance such as the CSH, Building Regulations, BREEAM, Future Water, Water for People and the Environment, Groundwater Protection: Policy and Practice, the Pitt Review and subsequent guidance and the Flood and Water Management Bill.

9.2 Water Cycle Infrastructure and Water Environment

9.2.1 With an exception of a small area north of Bromsgrove District, which was excluded from the study, potable water is supplied to BDC and RBC by STWL through a network of water mains. Water supply is mainly from borehole sources associated with the Triassic Sherwood Sandstone Aquifer. Supply is also sourced from STWL's strategic water grid which increases security of supply to the District and Borough.

9.2.2 Wastewater collection and treatment within the District and Borough is managed by STWL. There are known current issues associated with capacity exceedence of piped sewerage systems as a result of the historic practice of discharging storm water into foul sewers. This problem is exacerbated by hard standing and paving. Six STWs serve Bromsgrove District,

four of which are located outside District. Three STWs serve Redditch Borough, one of which is outside the Borough.

- 9.2.3 Three main watercourses within Bromsgrove District are potentially impacted by the proposed development: the River Salwarpe and its tributaries, Hoo Brook and Gallow Brook. Five smaller water courses and the Worcester and Birmingham canal are also potentially impacted by the proposed development in the District. Two main water courses (the River Arrow and Bow Brook and associated tributaries) are potentially impacted by the proposed development in Redditch Borough. Two watercourses, the River Stour and the River Tame are outside the District and Borough, but are potentially impacted by the proposed development.
- 9.2.4 While there are no Ramsar Sites, SAC, SPA or NNR within the District and Borough, there are a number of SSSI, SWS and NNR within the District and Borough that may be potentially impacted by the proposed development.

9.3 Growth and Development

- 9.3.1 The growth and development scenarios assessed in this Outline WCS were agreed with the PSG on 2 September 2010. For BDC, two scenarios were considered: Scenario 1 – 6,000 new dwellings by 2026; 4,000 of these dwellings and 28 ha of employment land to be provided by 2021 and Scenario 2 – 7,000 new dwellings by 2026; 4,000 of these dwellings and 28 ha of employment land to be provided by 2021. For RBC, two scenarios were considered: Scenario 1 – 3,000 new dwellings and 27 ha of employment land to be delivered by 2026 and Scenario 2 – 7,000 new dwellings and 68 ha of employment land to be provided by 2026.
- 9.3.2 Based on the growth and development scenarios presented in Paragraph 9.3.1 and the dwellings and employment land committed and / or completed for the period 2006 to 2010 (1,101 and 1,009 dwellings and 27.36 and 12.56 ha of employment land for BDC and RBC respectively), annual housing and employment land requirements were computed for the District and Borough for Scenario 1 and Scenario 2.
- 9.3.3 The sites available for development (and hence for assessment) were agreed with BDC and RBC. These sites were identified from the two Councils' SHLAA reports, the District's Employment Land Availability Study and the Council's Revised Development Strategy. Bromsgrove District currently has 163.8 ha of residential land and 6.8 ha of employment land available for development. Redditch Borough currently has 192.2 ha of residential land and 28.37 ha of employment land available for development.
- 9.3.4 Summation of the capacity values for residential land presented in the BDC SHLAA report which takes into account site constraints, indicates there is capacity for 3,855 dwellings in Bromsgrove District. Similarly, based on the capacity values in the RBC SHLAA report, Redditch Borough has a capacity for 2,979 dwellings. However, an additional 170 'Windfall Allowance' dwellings are expected to become available, giving a total of 3,149 dwellings for Redditch Borough.
- 9.3.5 It is evident from the information presented Paragraphs 9.3.1 and 9.3.4 that there is insufficient residential land in Bromsgrove District for the proposed number of dwellings agreed for Scenarios 1 and 2 by 2026. There is no employment land shortfall. Similarly, it is evident that there is insufficient residential land in Redditch Borough for the proposed number of dwellings for Scenario 2 by 2026. There is also a shortfall in employment land in Redditch Borough for Scenario 2 by 2026. These shortfalls cannot be fully met by the 8.8 ha of Strategic Sites classified as Mixed Use Strategic Sites.

- 9.3.6 The consequence of this is that the wastewater collection and treatment assessment component of this Outline WCS has only assumed the proposed development of 3,855 dwellings and 6.8 ha of employment land in Bromsgrove District and 2,979 dwellings and 28.37 ha of employment land in Redditch Borough.

9.4 Flood Risk Management

- 9.4.1 A L2 SFRA has been undertaken in accordance with the requirements of PPS25 and NPPF, the aim of which is to direct development away from areas at highest risk of flooding. Where this is not possible, policies and guidance have been recommended to allow development in these areas when it has been proven that they will be safe for the lifetime of the development and they will not increase flood risk elsewhere.
- 9.4.2 In agreement with BDC and RBC, 18 key proposed development sites were assessed as part of the L2 SFRA. Hydraulic modelling, which included the impacts of climate change, was undertaken to determine fluvial flood risk at these sites.
- 9.4.3 The L2 SFRA demonstrated that provided the proposed development type is suitable for a flood zone, development at the 18 key proposed development sites can be accommodated without increased flood risk. However, surface water should be appropriately controlled and development should be directed towards areas of lowest flood risk within each site.
- 9.4.4 Runoff should be managed, wherever possible, through the use of SuDs and a management train approach should be adopted to deal with surface water. It is recommended that opportunities be sought wherever possible to provide multiple benefits when managing flood risk, for example, restoring floodplains, deculverting watercourses and providing blue / green corridors. Opportunities should be sought to incorporate flood risk management measures into the design and layout of the proposed development wherever possible.
- 9.4.5 The assessed proposed development sites are complainant with PPS25 as long as development in high risk flood zones is avoided. However, it is strongly recommended that a SWMP is developed and that site specific FRAs are undertaken where appropriate. Site specific FRAs will need to consider sewer and groundwater flooding.

9.5 Water Resources and Water Supply

- 9.5.1 Bromsgrove District and Redditch Borough are located within STWL's Severn and Birmingham WRZs. STWL's final WRMP suggests that although these two WRZs have projected baseline negative balances of supply through to the 2035 planning horizon, a planned programme of measures will restore a positive balance of supply under average and peak demand conditions for the period 2010 to 2035.
- 9.5.2 It should be noted, however, that the Environment Agency's RSA programme has identified seven STWL sources within the Severn and Birmingham WRZs that may have a negative impact on a number of water bodies and may therefore require a review of consent. Were this to result in any reductions to the licensed abstractions, this forecast situation may need to be re-considered.
- 9.5.3 Relevant CAMS and RBMP reports note the stressed nature of water resources within the Borough and District. This is reflected in the planned measures included within the current STWL WRMP which focus on both demand management measures and the use of aquifer storage and recovery projects, with a major infrastructure enhancement and abstraction licence variation to increase deployable output rather than the development of new water supply sources.

- 9.5.4 The adoption of demand management measures by STWL and the Environment Agency should be supported and encouraged by both BDC and RBC. An alternative to this would be the supply of water from elsewhere within the STWL supply area using the Strategic Treated Water Grid, with the risk of local environment impacts being transferred to other sources, as well as other negative impacts such as increased carbon costs.
- 9.5.5 It is recommended that a micro-component demand model is developed to assess the impact of demand management measures within the Borough and District. This will allow for the setting of cost-effective local demand targets and measures which could have the benefit of reducing water consumption and runoff, with attendant savings in cost and infrastructure provision.
- 9.5.6 Until area specific demand modelling is completed and local demand targets identified, it is recommended that general targets are set for new developments to meet the highest level of water efficiency measures. For residential buildings this would require a minimum water conservation target of CSH Level 3/4 (≤ 105 l/p/d) for all new developments and a CSH water category Level 5 (≤ 80 l/p/d) after 2016 for developments in water stressed areas. New office developments should demonstrate the highest achievable BREEAM certification with respect to water demand and all other developments should provide evidence of achieving a minimum of 25% water savings.
- 9.5.7 STWL has stated that while the strategic supply infrastructure will support the proposed development sites, it is likely that the local distribution network will require reinforcement. The extent of reinforcements will need to be determined by detailed modelling of the network on a site by site basis together with consideration given to the cumulative effect of other development in the locality. It is recommended that this work is undertaken as part of a Detailed Water Cycle Study.

9.6 Wastewater Collection

- 9.6.1 Effective drainage is key to the sustainable management of wastewater in the Borough and District. The Borough and District have been divided into eight DAP areas by STWL; three in Redditch Borough and five in Bromsgrove District. A GIS was used to determine the projected increase in the number of dwellings and employment land within each of the eight DAP areas based on the proposed and growth development sites and scenarios presented in Chapter 3.
- 9.6.2 Existing STWL hydraulic models were then used to assess the impact of the proposed growth and development on the wastewater collection systems within each of the eight DAP areas against a baseline (current) condition. The models were set up to account for the sequencing of growth and development and extant infrastructure as listed in the District's and Borough's SHLAA reports, the District's Land Availability Studies and the Borough's Land Availability Assessment. STWL were also consulted on the potential impact of the increased flows on the wastewater collection system. It should be noted, however, that there are existing wastewater collection issues in the District and Borough. This assessment therefore focused only on the potential constraints to growth and development as a result of the proposed growth and development described in Chapter 3.
- 9.6.3 The assessment determined that five proposed development sites within Redditch Borough would be constrained by the existing wastewater collection infrastructure:
- 2010/11 Brockhill ADR (Spernal DAP Drainage Area);
 - 2010/13 Brockhill Green Belt (Spernal DAP Drainage Area);
 - 2010/14 Foxlydiate Green Belt (Spernal DAP Drainage Area);

- EL63 (IN67) North of Red Ditch (Spernal DAP Drainage Area); and
- 2012/12 Webheath ADR (Redditch RAMPS Drainage Area).

9.6.4 Similarly, nine proposed development sites within Bromsgrove District will be constrained by the existing wastewater collection infrastructure:

- BDC20 Perryfields Road (Bromsgrove DAP Drainage Area);
- BDC80 Whitford Road (Bromsgrove DAP Drainage Area);
- BDC81 Norton Farm (Bromsgrove DAP Drainage Area);
- BDC85 Land adjacent to Wagon Works, St Godwald's Road (Bromsgrove DAP Drainage Area);
- BDC35b Kidderminster and Stourbridge Roads (Hagley DAP Drainage Area);
- BDC49 Gallows Brook Pig Farm (Hagley DAP Drainage Area);
- BDC189 233 Worcester Road (Hagley DAP Drainage Area);
- BDC51 Land at Algoa House (Hagley DAP Drainage Area); and
- BDC188 Rose Cottage, Thicknall Cottage and Land at rear of Western Road (Hagley RAMPS Drainage Area).

9.6.5 Although there are no constraints of strategic concern, the development sites are mainly constrained by small diameter local collection sewers and limited / no SPS capacity. Further, for Redditch Borough, the proposed development sites are on the opposite side of Redditch town to Spernal WTW and will therefore have an impact on the existing wastewater collection system from the point of connection to the point of discharge at the works.

9.6.6 Potential solutions to the capacity constraints identified at the aforementioned sites will need to be locally relevant and fit-for-purpose. Possible solutions could include:

- local upsizing of sewers to provide additional capacity;
- new / upgraded SPSs;
- new gravity sewers to enable new developments to discharge to a point on the existing system that has adequate spare capacity;
- on line balancing tanks on existing sewers to provide storage during times of heavy rain;
- off line balancing tanks on existing sewers to provide storage during times of heavy rain;
- connecting downstream of known flooding areas;
- reducing stormwater drainage through SuDs, stormwater separation at large sites and separate stormwater networks for the upper parts of combined sewer networks; and
- reducing foul sewer flow through low flow toilet systems for all new developments, retrofitting to existing properties and through implementing water efficiency measures.

- 9.6.7 Guidance has been provided as to where the District and Borough should target their investigations to identify additional sites for development to make up the shortfall in land availability described earlier. From a wastewater collection perspective, further sites should be sought in larger catchments where development flows will make up a small proportion of the current flows, where there is adequate spare capacity in the existing network, where there is sufficient elevation to allow for sewer self-cleansing and where there is spare treatment capacity.
- 9.6.8 It is recommended that the wastewater collection system for all future development should ensure that only foul flows enter the existing sewerage network. Key to this recommendation is ensuring that surface water is properly managed to eliminate the temptation of connecting inadequate or poorly maintained surface water drainage systems to the local foul sewers. The promotion of SuDs is strongly recommended, where appropriate.
- 9.6.9 A Detailed WCS is recommended to develop and cost sustainable notional solutions to allow for the additional wastewater flows to be accommodated within the existing wastewater collection system and to prioritize interventions to ensure the required capacity is available prior to development. This will require the development of type III DAP hydraulic models which will also help quantify the risk of flooding as well as the risk of pollution associated with flooding. It is also recommended that a full CBA is undertaken that includes consideration of agreed sustainability criteria / indices, incorporates agreement on a methodology for quantifying risk and incorporates the potential benefits that demand management measures could deliver.

9.7 Wastewater Treatment

- 9.7.1 Information on the nine STWs serving the District and Borough was collected to determine existing treatment capacity, discharge consents and performance in meeting WFD objectives and standards. No persistent significant failures of WFD objectives and standards have been identified that can be clearly attributed to STW discharges. To identify the remaining flow headroom, an assessment was carried out to appraise whether the current operational DWF was equal to / greater than the CDWF. Further, using the growth and development projections presented in Chapter 3 and an average household occupancy level (2.4 per dwelling), an assessment was made as to the likely increase in development feasible in each STW catchment without breaching the current / AMP5 consent.
- 9.7.2 A GIS was used to determine the projected increase in the number of dwellings and employment land within each of the nine STW catchments based on the proposed development sites and scenarios presented in Chapter 3. Redditch (Spernal) STW and Bromsgrove (Fringe Green) STW will need to accommodate the majority of the new flows from the proposed development sites. Redditch (Spernal) STW will need to accommodate 2,332 new dwellings (78.2% of the flows from the new residential development within RBC) and 28.37 ha of employment land (100% of the flows from the new employment land development within RBC). Bromsgrove (Fringe Green) STW will need to accommodate 2,821 new dwellings (73.2% of the flows from the new residential development within BDC) and 6.8 ha of employment land (73.5% of the flows from the new employment land development within BDC).
- 9.7.3 An assessment was undertaken to determine whether all nine aforementioned STWs have the hydraulic and treatment capacity to accommodate the increased flows and loads without breaching the consented limits thereby risking RQO standards in the affected water bodies. This assessment was undertaken using information provided by STWL and the Environment Agency.
- 9.7.4 The results indicate that for all STWs except Bromsgrove (Fringe Green), the spare hydraulic capacity exceeds the required capacity needed for the proposed development sites.

Accordingly, provided the STWs are able to treat the increased flows to the quality standards (see Paragraph 9.7.6 below) required by the Environment Agency's Environmental Permit (discharge consent) conditions, no changes to the effluent quality standards are likely to be required. It should be noted, however, that limits in existing permits will not have been set to meet WFD objectives and standards. Therefore it cannot be assumed that WFD objectives and standards will be met if flows stay within the permitted DWF. Changes to existing permits may be required to contribute to meeting WFD 'good status' and this need will be assessed by the Environment Agency as part of River Basin Management Planning, rather than being driven by growth

- 9.7.5 At Bromsgrove (Fringe Green) STW flow from the proposed development is assessed as exceeding the consented flow for the works by 7.3%. It is possible that a revised discharge permit may be required from the Environment Agency to allow the proposed development to take place. This would include an assessment as to whether tighter limits would be required on concentrations in order to maintain compliance with the WFD 'no deterioration objective' (current water body class) as well as the Agency's 'no deterioration policy' on discharge consents. However, as the quality conditions on the discharge for this STW are within the 10% no deterioration limit, it is possible that no changes to the consent would be required. This will need to be investigated further in a Detailed WCS.
- 9.7.6 STWL has advised on the likely limitations in treatment capacity and the physical constraints to removing these limits. STWs where there is substantial spare treatment capacity include Minworth STW and Roundhill STW. Treatment works with reasonable spare treatment capacity include Astwood Bank STW, Alvechurch STW, Bromsgrove (Fringe Green) STW and Stoke Prior STW. Treatment works where there is minimal spare treatment capacity include Redditch (Spernal) STW, Priest Bridge STW and Belbroughton STW. For all STWs where there is minimal or reasonable spare treatment capacity, STWL report no land or other constraints to preventing treatment capacity extension.
- 9.7.7 The assessment of wastewater treatment capacity has not pointed to any strong implications for the phasing of development. At Bromsgrove (Fringe Green) STW, hydraulic capacity exists for approximately 50% of the increase in flow predicted from the proposed development which is planned for completion by 2020. Much of this proposed development is scheduled within the next 5 years. Accordingly, the hydraulic capacity at Bromsgrove (Fringe Green) STW will need to be increased by about 2015.
- 9.7.8 With the exception of Bromsgrove (Fringe Green) STW, the capacity to treat additional loads will be exceeded before the consented flow limit is reached. Where STWL has identified minimal spare treatment capacity, the conservative assumption is that no further load can be treated until the STWs have been upgraded. Where STWL has judged reasonable spare treatment capacity, the urgency for upgrading is less, but there is insufficient detail at present to estimate when upgrading would be required.
- 9.7.9 It is recommended that a Detailed WCS is required to better understand the availability of spare treatment capacity on the phasing of development. A Detailed WCS would also need to consider the shortfall in the present development allocation and / or where any further growth might best be located. The Detailed WCS would also need to take into consideration the interaction between the wastewater collection network and treatment. The wastewater collection assessment has identified constraints in the collection network (see Paragraph 9.6.3 and 9.6.4) that may modify the conclusions as to where the shortfall in development would be best allocated based on STW capacity alone. Whatever solutions are chosen, they will depend on the relative magnitudes of whole life costs, the sustainability of upgrading the wastewater collection networks and STWs and the associated environmental costs and benefits.

9.8 Ecological and Geological Sites of Importance

9.8.1 National, regional and local sites of ecological and geological importance that may be impacted by the proposed development sites within Redditch Borough and Bromsgrove District have been assessed. There are no Ramsar, SAC, SPA, LGS or NNR sites within Redditch Borough. There are 6 SSSI, 24 SWS, 6 LNR and 30 components of Ancient Woodland within the Borough. There are no Ramsar, SAC, SPA or NNR sites within Bromsgrove District. There are 14 SSSI, 81 (plus 2 proposed) SWS, 1 LNR, 111 components of Ancient Woodland and 5 LGS within the District.

9.8.2 For the minority of designated sites within the Borough and District that have been identified as being at risk from the proposed development, simple and straight forward mitigation measures can be put in place to minimize the potentially minor local impacts. A summary of the policy recommendations put forward in this regard is presented below:

- implementation of best practice techniques during both the construction and operational phases;
- avoid development immediately adjacent to or in close proximity to sites of ecological and geological importance;
- where hydrological links are identified, consideration should be given to pollution pathways, particularly if the site is noted for its aquatic / wetland features;
- implement and maintain a CEMP during construction;
- biodiversity-focused SUDs should be considered to manage water quality and quantity from proposed development sites. SUDs that incorporate swales, filter strips and basins are more likely to provide useful wildlife habitats and corridors;
- simple improvement and enhancement measures such as those recommended with 'Biodiversity by Design' and 'Biodiversity Enhancement Areas within the West Midlands Region' should be considered, wherever possible;
- development should seek to avoid severing and fragmenting existing wildlife corridors and links to existing habitats;
- developers should consult and seek advice from Natural England, the local Wildlife Trust and the local Biodiversity Officer / Ecologist; and
- the Environment Agency should be consulted for all development sites prior to the issue of any formal application for development.

9.9 Impact Summary

9.9.1 Appendix 31 presents an impact summary using a simple traffic light system of all of the proposed developments sites for Redditch Borough and Bromsgrove District.

9.9.2 It is clear that there are numerous proposed development sites where there are constraints to development, although none of these are strategic constraints. These are mainly associated with wastewater treatment and collection infrastructure limits. There is a clear need for a Detailed WCS to further assess these constraints and to identify and cost appropriate sustainable solutions. There is also a clear need to identify additional development sites up to the full complement of dwellings required under Scenarios 1 and 2 for both RBC and BDC. It may then be possible to identify opportunities for changing the proposed development locations.

APPENDIX 1 DEVELOPMENT POSITION AS AT APRIL 2010

The Bromsgrove District Council 'SHLAA'¹⁰⁸, 'Land Availability: Housing'¹⁰⁹ and 'Land Availability: Employment'¹¹⁰ reports provide information on available land in the District to April 2010. These reports include information on housing and employment land completions, under construction and outstanding (planning permission granted) as at April 2010. The tables below summarise this information for housing and employment land respectively.

Housing Completions, Under Construction and Outstanding for Bromsgrove District

Year	Completions (number)	Under Construction (number)	Outstanding (Planning Permission Granted) (number)
2006 – 07	276	-	-
2007 – 08	135	-	-
2008 – 09	159	-	-
2009 – 10	72	41	418
TOTAL	642	41	418
TOTAL DWELLINGS COMPLETED / COMMITTED (2006 – 2010)			1,101

Employment Land Completions, Under Construction and Outstanding for Bromsgrove District

Year	Completions (ha)	Under Construction (ha) ¹¹¹	Outstanding (Planning Permission Granted) (ha) ¹¹²
2006 – 07	2.58	-	-
2007 – 08	2.64	-	-
2008 – 09	1.68	-	-
2009 – 10	1.38	2.37	16.71
TOTAL	8.28	2.37	16.71
TOTAL LAND DEVELOPED / COMMITTED (2006 – 2010) (ha)			27.36

Redditch Borough Council's 'SHLAA',¹¹³ 'Revised Development Strategy',¹¹⁴ 'Housing Completions 2010',¹¹⁵ 'Housing Commitments 2010',¹¹⁶ 'Employment Commitments in Redditch Borough'¹¹⁷ and 'Employment Land Review Update 2010'¹¹⁸ provide detail on the Borough's development position as at April 2010. The tables below summarise this information for housing and employment land respectively.

¹⁰⁸ <http://www.bromsgrove.gov.uk/cms/pdf/SHLAA.pdf>

¹⁰⁹ Bromsgrove District Council: Planning and Regeneration – Land Availability: Housing. April 2010

¹¹⁰ Bromsgrove District Council: Planning and Regeneration – Land Availability: Employment. April 2010

¹¹¹ Under construction in: 2006-07 = 5.05 ha, 2007-08 = 13.53 ha and 2008-09 = 5.02 ha

¹¹² Outstanding development with planning permission in: 2006-07 = 20.31 ha, 2007-08 = 16.27 ha and 2008-09 = 21.96 ha

¹¹³ Strategic Housing Land Availability Assessment for Redditch Borough. Refreshed April 2010 (Unpublished)

¹¹⁴ <http://redditch.whub.org.uk/cms/pdf/PDCScore%20strat.pdf>

¹¹⁵ Redditch Borough Council – Housing Completions 2010.doc

¹¹⁶ Redditch Borough Council – Housing Commitments 2010.doc

¹¹⁷ <http://redditch.whub.org.uk/cms/pdf/Final%202010.pdf>

¹¹⁸ <http://redditch.whub.org.uk/cms/pdf/ELR%202010%20ownership%20removed.pdf>

Housing Completions, Under Construction and Outstanding for Redditch Borough

Year	Completions (number)	Small Site Commitments (<5 dwellings) (number)
2006 – 07	454	-
2007 – 08	236	-
2008 – 09	100	-
2009 – 10	171	48
TOTAL	961	48
TOTAL DWELLINGS COMPLETED / COMMITTED (2006 – 2010)		1,009

Employment Land Completions, Under Construction and Outstanding for Redditch Borough

Year	Completions (ha)	Commitments (ha)
2006 – 07		
2007 – 08		
2008 – 09		
2009 – 10		
TOTAL	8.59	3.97
TOTAL LAND DEVELOPED / COMMITTED (2006 – 2010) (ha)		12.56

APPENDIX 2 INDIVIDUAL DEVELOPMENT SITES IN BROMSGROVE DISTRICT

Development Site Description	Unique ID	Total Area (ha) ¹¹⁹	Density from SHLAA	Capacity from SHLAA
Land at Algoa House, Western Road, Hagley	BDC51	1.44	40	49
45 - 47 Woodrow Lane, Catshill	BDC9	0.202	30	6
Birmingham Road, Alvechurch	BDC170	1.067	40	36
Rose Cottage, Thicknall Cottage and Land at rear of Western Road, Hagley	BDC188	1.20	40	40
7 & 9 Worcester Road, Hagley	BDC102	0.239	50	12
(part of) Land adj to Crown Meadow, Alvechurch	ALV6	0.595	40	25
4, 4a, 6, 8, & 10 St Catherine's Road, Blackwell	BDC122	0.95	8.4	8
Kidderminster & Stourbridge Road, Hagley	BDC35B	9.80	40	255
88 Birmingham Road, Bromsgrove	BDC166	0.29	50	15
33 - 41 Western Road, Hagley	BDC50	0.43	13.95	6
Land adj to Wagon Works, St Godwald's Road, Bromsgrove	BDC85	7.80	30	212
30 Alcester Road, Bromsgrove	BDC152	0.105	50	5
Perryfields Road, Bromsgrove	BDC20	69.74	40	1,500
Bleakhouse Farm, Station Road, Wythall	BDC66	6.30	40	163
3 - 15 Marlbrook Lane & 203 - 215 Old Birmingham Road, Marlbrook	BDC112	1.00	30	26
2 - 4 Hartle Lane, Belbroughton	BDC37	0.25	48.4	12
233 Worcester Road, Bromsgrove	BDC149	0.13	69.2	9
Finstall Training Centre, Stoke Road, Bromsgrove	BDC163	0.48	40	16
RMC House, Church Lane, Bromsgrove	BDC45	0.26	50	13
Church Road (land off), Catshill	BDC93	6.10	16.4	100
Selsdon Close, Wythall	BDC86	3.10	40	76
50, 52 & 54 Red Lion Street (rear of), Alvechurch	BDC95	0.25	40	10
Norton Farm, Birmingham Road, Bromsgrove	BDC81	12.00	40	350
Strathearn, Western Road, Hagley	BDC189	3.05	40	79
Gallows Brook Pig Farm, Kidderminster Road, Hagley	BDC49	1.710	40	58
Meadows First School, Stourbridge Road, Bromsgrove	BDC148	0.80	11.3	9

¹¹⁹ Site area taken from the Bromsgrove SHLAA 2009

Development Site Description	Unique ID	Total Area (ha) ¹²⁰	Density from SHLAA	Capacity from SHLAA
Hagley Former Middle school, Park Road, Hagley	BDC160	0.60	30	15
Whitford Road, Bromsgrove	BDC80	24.00	32	500
The Avenue, Rubery	BDC65	3.50	40	91
Kendal End Road (land at), Barnt Green	BDC92	5.00	30	98
The Council House, Burcot Lane, Bromsgrove	BDC168 (A&B)	1.213	50	51
Burcot Lane, Bromsgrove ^{121 122}	BDC192	0.28	35	10
TOTAL		163.84 ha	-	3,855 dwellings

Development Site Description	Unique ID	Total Area (ha)	Vacant Area (ha)
Saxon & Harris Business Park	Site 7	1.8	1.8
Perryfields Road, Bromsgrove	BDC20	5.0	5.0
Total Area (ha)		6.8	6.8

¹²⁰ Site area taken from the Bromsgrove SHLAA 2009

¹²¹ Site BDC192 not included in SHLAA 2009

¹²² Density and Capacity derived using the methodology in the SHLAA, assumed density of 35 dwellings per hectare

APPENDIX 3 INDIVIDUAL DEVELOPMENT SITES IN REDDITCH BOROUGH

Development Site Description	Unique ID	Total Area (ha)	Capacity from SHLAA
Brush Factory, Evesham Road, Crabbs Cross (LP124)	LP02	0.09	4
Rear of 144 - 162 Easemore Road (LP135)	LP03	0.43	24
Windsor Road Gas Works (LP147)	LP05	5.68	140
Mayfield Works	LP06	0.19	18
Land off Torrs close	LP13	0.09	6
Land at Tidbury Close (07/214)	LP16	0.12	6
Adjacent Castleditch Lane / Pheasant Lane	LPX02	0.52	16
Former Claybrook School, Matchborough	LPX04	0.74	36
Land at Millfields, Fire Station and rear of Fire Station	LPX05	1.36	35
Former Ipsley School playing field	LPX06	0.93	31
South of Scout Hut, Oakenshaw Road	LPX07	1.02	32
Church Hill District Centre	CS01	2.25	57
Matchborough District Centre	CS03	0.92	17
Peterbrook Close (08/303ol)	WYG02	0.16	5
Tanhouse Lane	WYG03	0.57	14
Marfield Farm School	WYG04	1.41	53
High Trees, Dark Lane (09/259)	WYG06	0.70	5
Widney House, Bromsgrove Road	RB03	2.24	58
Land off Wirehill Drive (08/305)	L4L02	0.47	15
Land adjacent Saltways Cheshire Home (08/073)	UCS 2.14	0.40	5
Rear of Sandygate Close	UCS 2.16	0.20	8
Dingleside Middle School & playing field and land rear of 1-11 Auxerre Avenue	UCS 8.38	3.95	120
Loxley Close	2010/03	0.31	10
Upper Norgrove House ¹²³	2010/04	1.22	27
Clifton Close	2010/05	0.15	6
Prospect Hill	2010/07	1.43	61
Rear of Alexandria Hospital	2010/09	7.74	145
A435 ADR	2010/10	33.43	360
Brockhill ADR	2010/11	25.5	425
Webheath ADR	2010/12	47.71	600
Brockhill Green Belt	2010/13	27.73	400
Foxlydiate Green Belt	2010/14	22.16	230
Sandycroft, West Avenue	2010/27	0.35	10

¹²³ Is part of Webheath ADR (2010/12)

Development Site Description	Unique ID	Total Area (ha)	Capacity from SHLAA
Total		192.2 ha	2,979 dwellings

Development Site Description	Unique ID	Total Area (ha)
Nash Road, Redditch	EL01	6.6
Park Farm Industrial Estate, Redditch	EL02	0.4
Land East of Brockhill	EL03	1.1
Green Lane, Wirehill	EL04	3.5
A435 Segment 2	EL05	0.5
Old Forge Drive, Redditch	EL06	10.44
Studley Road, Redditch	EL07	1.32
Enfield Industrial Estate, Redditch	EL08	0.38
Merse Road, Moons Moat, Redditch	EL09	0.90
Bartlett Road, Redditch	EL10	0.65
Palmers Road, Redditch	EL11	0.62
UCS 7.5	EL12	0.29
UCS 9.19	EL13	0.19
UCS 9.58	EL14	0.19
Washford Industrial Estate, Redditch	EL15	0.6
Edward Street	EL16	0.22
Nash Road, Redditch	EL17	0.47
TOTAL AREA (ha)		28.37

Development Site Description	Unique ID	Total Area (ha)
Winyates, Redditch	St2	2.5
Woodrow, Redditch	St4	1.7
Edward Street	St8	0.5
Town Centre, Northwest Quadrant	St10	4.6
TOTAL AREA (ha)		9.3

APPENDIX 4 PLANNING AND DEVELOPMENT SCENARIO AVERAGE HOUSEHOLD SIZES AND POPULATION PROJECTIONS

Population Projections for Scenario 1

YEAR	Bromsgrove (6,000 dwellings by 2026)	Redditch (3,000 dwellings by 2026)
2001	87,800	78,800
2002	89,000	78,700
2003	90,000	78,700
2004	90,600	78,500
2005	91,100	78,500
2006	91,700	78,600
2007	92,400	78,600
2008	93,000	78,800
2009	93,400	78,700
2010	93,500	78,700
2011	93,700	78,600
2012	94,000	78,600
2013	94,300	78,600
2014	94,600	78,600
2015	94,800	78,600
2016	95,000	78,600
2017	95,200	78,600
2018	95,500	78,600
2019	95,800	78,600
2020	96,000	78,700
2021	96,300	78,700
2022	96,800	78,700
2023	97,400	78,800
2024	98,000	78,900
2025	98,500	78,800
2026	99,000	78,900

Population Projections for Scenario 2

YEAR	Bromsgrove (7,000 dwellings by 2026)	Redditch (7,000 dwellings by 2026)
2001	87,800	78,800
2002	89,000	78,700
2003	90,000	78,700
2004	90,600	78,500
2005	91,100	78,500
2006	91,700	78,600
2007	92,400	78,600
2008	93,000	78,800
2009	93,400	78,700
2010	93,500	79,200
2011	93,700	79,600
2012	94,000	80,100
2013	94,300	80,600
2014	94,600	81,100
2015	94,800	81,600
2016	95,000	82,000
2017	95,200	82,500
2018	95,500	83,000
2019	95,800	83,500
2020	96,000	84,000
2021	96,300	84,500
2022	97,300	85,000
2023	98,400	85,600
2024	99,500	86,100
2025	100,500	86,600
2026	101,500	87,100

Notes - based on mid-year estimates up to 2009, then population projections for 2010-26

Average Household size

YEAR	Bromsgrove	Redditch
2001	2.44	2.47
2006	2.39	2.38
2011	2.34	2.32
2016	2.28	2.27
2021	2.23	2.22
2026	2.18	2.18

Average Household size

YEAR	Bromsgrove	Redditch
2001	2.44	2.47
2006	2.39	2.38
2011	2.34	2.33
2016	2.28	2.28
2021	2.23	2.24
2026	2.19	2.20

APPENDIX 5 OVERVIEW OF LEGISLATION, REGULATION AND POLICY ON DEMAND MANAGEMENT MEASURES IN THE UK

Legislation, Regulation and Policy on Water Demand Management

Planning Policy Statements: LPAs must ensure that PPS are considered in all planning documents. The 2007 supplement 'Planning Policy Statement on Climate Change'¹²⁴ states that LPA can introduce higher levels of building sustainability in advance of nationally set standards where, for example, there are clear opportunities for significant use of decentralised and renewable or low carbon energy.

Code for Sustainable Homes: The CSH¹²⁵ was introduced in 2007 to improve the overall sustainability of new homes by setting a single national standard to design and construct homes to higher environmental standards.

The water efficiency of new homes plays a key part of the assessment. The CSH levels set out the following performance levels dependent on internal domestic water use:

- Level 1 / 2 – 120 l/person/d;
- Level 3 / 4 – 105 l/person/d; and
- Level 5 / 6 – 80 l/person/day.

All new homes receiving Government funding are to be built to Level 3 (105 l/person/d without water re-use or rainwater harvesting).

Building Regulations: Changes to Part G of the Building Regulations¹²⁶ issued in May 2009 by the DCLG means that there is now a requirement for water consumption in new dwellings not to exceed 125 l/person/d (regulation 17K), and to ensure installation of water efficient fittings. This also applies when a building is changed to residential use or where flats are added to new premises. Potential consumption must be calculated using the methodology described in 'The Water Efficiency Calculator for New Dwellings'.¹²⁷

BREEAM: The Building Research Establishment Environment Assessment Methodology (BREEAM)¹²⁸ is a set of tools for measuring the sustainability of buildings, including water conservation measures. The assessment is based on a set of criteria resulting in an overall BREEAM rating. In addition to new properties it also allows the assessment of existing homes and non-domestic developments using different sets of criteria.

Defra: In their 'Future Water'¹²⁹ report the Department for Food and Rural Affairs (Defra) lays out its vision for a water consumption target for all dwellings of 130 l/person/d to 120 l/person/d by 2030. To achieve this vision Defra actively encourages demand management and higher water efficiency standards while working together with water companies, government (e.g. Water Savings Group, Consumer Council for Water) and other organisations, such as Waterwise.

Environment Agency: The Environment Agency's report 'Water for People and the Environment'¹³⁰ sets out a water resources management strategy for England and Wales to 2050 and beyond. The

¹²⁴ <http://www.communities.gov.uk/documents/planningandbuilding/pdf/ppsclimatechange.pdf>

¹²⁵ http://www.planningportal.gov.uk/uploads/code_for_sust_homes.pdf

¹²⁶ <http://www.stgbc.org.uk/Downloads/PartG2010.pdf>

¹²⁷ http://www.planningportal.gov.uk/uploads/br/water_efficiency_calculator.pdf

¹²⁸ <http://www.breeam.org/>

¹²⁹ <http://www.defra.gov.uk/environment/quality/water/strategy/pdf/future-water.pdf>

¹³⁰ <http://publications.environment-agency.gov.uk/pdf/GEHO0309BPKX-E-E.pdf>

strategy supports Defra's water consumption target of 130 l/p/d by 2030. To achieve this, new dwellings would need to meet the CSH Level 3 target and near universal meter penetration would be required in all water stressed areas by 2020.

The 'Regional Action Plan for Midlands Region'¹³¹, identifies water efficiency and household metering as two of six key priorities for the region. The strategy emphasises that WCSs should be completed at the early planning stages for all significant new housing developments in accordance with the Agency guidelines.

Together with the South East England Development Agency (SEEDA), the Agency initiated a recent scoping study 'Ensuring Water for All'¹³² for South East England. The study provides an overall summary of the current UK and international water efficiency knowledge and gives guidance to regional stakeholders on how to implement water efficiency as part of a wider stakeholder strategy.

Ofwat: In the preparation for the AMP5 (2010 to 2015) submissions¹³³, Ofwat published their proposals for water efficiency targets which provide a framework for assessing water companies' performances. Water efficiency targets¹³⁴ have been set in two parts:

- Base Service Water Efficiency (BSWE) – the minimum level of activity expected to be achieved by all water companies with an annual water savings target of 1 l/property/d achieved through water efficiency measures, leakage reduction and metering. This target also addresses the requirement to provide information to customers about sustainable water use and to encourage water companies to take an active part in the development of the evidence base for water efficiency; and
- Sustainable Level of Water Efficiency (SELWE) – requiring water companies to consider additional water efficiency activities, above the base level.

Targets have been set for 2010 to 2011 and 2014 to 2015. Monitoring of progress against the BSWE targets will be undertaken annually.

Redditch Borough Council: The RBC 'Revised Preferred Draft Core Strategy Document'¹³⁵ includes the requirement for all future developments in the Borough to be carbon neutral. The following water efficiency measures have also been proposed:

- all new homes to meet or exceed water efficiency targets of CSH Level 4 with a water usage no more than 105 l/p/d;
- office developments meet the BREEAM office scale; and
- all other developments achieve a minimum of 25% efficiency savings.

To achieve these efficiency targets, RBC aims to implement sustainable water demand management techniques, with the integration of greywater recycling and rainwater harvesting in new developments wherever practicable. These targets and measures will need to be updated as the core strategy develops.

As part of the strategy, RBC requires that all development proposals shall be in accordance with Policy 3 Flood Risk and Water Management' in its Core Strategy Document and should take account of the Strategic Flood Risk Assessment and the Water Cycle Strategy process.

¹³¹ <http://publications.environment-agency.gov.uk/pdf/GEHO1209BRKX-e-e.pdf>

¹³² http://www.waterwise.org.uk/images/site/Research/dg01_ensuring%20water%20for%20all_final%20report_issue.pdf

¹³³ http://www.ofwat.gov.uk/pricereview/pr09phase2/ltr_pr0915_watefftgts

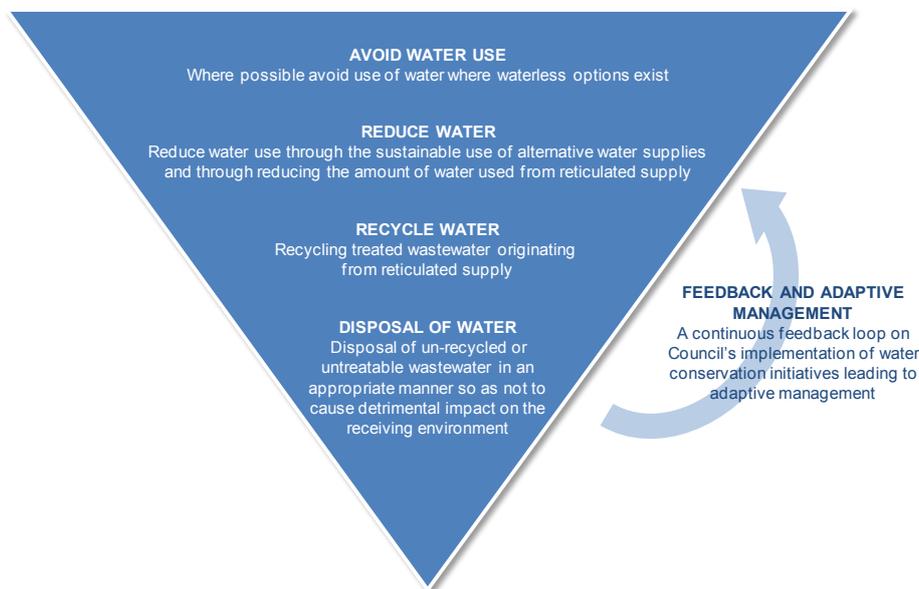
¹³⁴ http://www.ofwat.gov.uk/pricereview/pap_pos_pr09supdempolapp1.pdf

¹³⁵ <http://redditch.whub.org.uk/cms/pdf/PDCScore%20strat.pdf>

Bromsgrove District Council: currently BDC’s demand management objectives and water efficiency targets are based on the regional planning paper “*Planning for Water in Worcestershire*”¹³⁶. This encourages all new developments to achieve a minimum CSH Level 4 and CSH water category Level 5 after 2016, and achievement of water neutrality in “seriously water stressed areas” by:

- installing water efficient fixtures and white good appliances;
- greywater and rainwater harvesting systems;
- creating landscapes that do not require irrigation (Xeriscaping);
- encouragement of retrofitting existing buildings; and
- targeted promotion of water metering.

Bromsgrove water management policy will require further development to follow the water conservation hierarchy of avoid, reduce, recycle and disposal, as presented below:



In their report ‘Water Efficiency and the Water Companies’,¹³⁷ Waterwise highlighted the different water efficiency activities and projects water companies have undertaken across the UK. Water companies focus on the promotion of water efficiency to their customers using a range of approaches, including:

- online activities on water company websites;
- customer communication by the means of leaflets, water bills, the media and audits;
- improving non-domestic customer water use through self-audit packs, water audits and efficiency surveys and leakage protection;
- promotion of free household water efficiency products via company magazines, inserts in bills and partnership websites;

¹³⁶ http://www.bromsgrove.gov.uk/cms/pdf/planning_for_water_in_worcestershire.pdf

¹³⁷ www.waterwise.org.uk/images/site/Research/water_efficiency_review%20website%20version.pdf

- promotion of outdoor water efficiency products by providing advice on water efficient gardening techniques and plants and promotion of water butts;
- communications with schools via audits, school education packs, education centres and online activities; and
- retrofit and auditing programmes in the public sector including schools, hospitals and local councils.

In their report, Waterwise also highlighted that partnership between water companies, central and local government and independent organisations plays a vital part in delivering success in this field. Examples of organisations that have acted as facilitators between the water industry, policy makers and the public to promote local and national efficiency programmes, foster collaboration and to create knowledge networks include:

- Waterwise – www.waterwise.org.uk;
- Tap into Savings – www.tapintosavings.org;
- Water Saving Group;
- National Water Conservation Group;¹³⁸ and
- the WATERSAVE Network.

An important example of a large scale efficiency project is the Thames Gateway Neutrality Project.¹³⁹ The 2007 feasibility study was led by the Agency in partnership with Defra and the DCLG. It focused on the Thames Gateway development project, a major growth area under serious water stress. The study explored ways to achieve ‘water neutrality’, that is, where total water use after a development does not exceed the total water use before development.¹⁴⁰ The feasibility study concluded that water neutrality in this area could be achieved by implementing a set of measures, including:

- increasing level of metering;
- introduction of variable tariffs;
- high level of water efficiency in new developments;
- retrofit programmes for existing homes; and
- reduction in demand from non-domestic users.

In the report ‘Water neutrality: an economic assessment for the Thames Gateway development’,¹⁴¹ the Agency demonstrated the overall positive cost benefits which water neutrality can have on the economy, environment and society. The aim of the partnership is now to undertake pilot studies in trial areas to confirm the research findings and to provide large-scale best practice water efficiency examples to the UK water industry.

¹³⁸ www.waterwise.org.uk/reducing_water_wastage_in_the_uk/policy/nwgc.html

¹³⁹ <http://www.environment-agency.gov.uk/research/library/publications/41049.aspx>

¹⁴⁰ <http://www.environment-agency.gov.uk/research/library/publications/40737.aspx>

¹⁴¹ <http://publications.environment-agency.gov.uk/pdf/SCHO1009BQZV-e-e.pdf>

Indirect Demand Management Measures – Source Substitution Options

Although a less popular proposed measure by UK water companies, alternative water sources like rainwater harvesting and greywater re-use have raised more interest with developers and private customers in recent years.

The Environment Agency¹⁴² highlights ways of re-using and harvesting water for domestic use. However the Agency states that simple systems, like rainwater butts and low-cost greywater diversions systems, for watering the garden for example, should be adopted in preference to larger systems that substitute water for indoor use. This is mainly due to the carbon emissions associated with larger systems, which is discussed later below.

The application of systems for internal domestic use may be appropriate where¹⁴³:

- all feasible water efficiency measures are already in place;
- the planned system is cost effective (including ongoing maintenance costs);
- the planned system will be competently maintained and monitored;
- energy use and carbon emissions are minimised;
- the planned system will not have unacceptable impacts on a sensitive water body; and
- they offer a more sustainable solution to manage surface water run-off than could be provided by other SuDS approaches.

Further advice is available from the Environment Agency and the UK Rainwater Harvesting Association¹⁴⁴, as well as the following documents:

- harvesting Rainwater for domestic use: an information guide, Environment Agency, January 2008;145
- greywater: an information guide, Environment Agency, April 2008;146
- conserving water in buildings, Chapter 7: using greywater and harvesting rainwater, Environment Agency;147
- BSI British Standards: BS8515 – Rainwater Harvesting Systems, Code of practice, January 2009; 148 and
- BSI British Standards: BS8525 - Greywater Systems, Code of practice, June 2010.149

¹⁴² <http://www.environment-agency.gov.uk/homeandleisure/beinggreen/118948.aspx>

¹⁴³ Personal Communication, Jonathan Dennis, Water Demand Management Advisor, Strategic Supply and Demand, Environment Agency, 1st October 2010

¹⁴⁴ <http://www.ukrha.org/>

¹⁴⁵ <http://publications.environment-agency.gov.uk/pdf/GEHO0108BNPN-E-E.pdf>

¹⁴⁶ <http://publications.environment-agency.gov.uk/pdf/GEHO0408BNWQ-E-E.pdf>

¹⁴⁷ http://www.environment-agency.gov.uk/static/documents/Leisure/cwb_ch7_grey_rain_889316.pdf

¹⁴⁸ <http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030171876>

¹⁴⁹ <http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030184123>

Evidence Base to Support the Analysis and Adoption of Demand Management Measures

Water companies are implementing a small number of large-scale water efficiency programmes. Even with these programmes, it has been acknowledged by Government and the water industry that there remains a weak evidence base to support the roll-out of large scale efficiency programmes. While leakage control and metering have been recognised as passing economic tests, the cost benefit outcomes of installing water efficiency products or implementing customer education programmes remain uncertain.

Waterwise was commissioned by the UK Environment Minister's Water Saving Group to review and analyse the existing evidence base and to determine possible water savings of current water efficiency measures. In October 2008 Waterwise published the first phase of the 'Evidence Base for Large-Scale Water Efficiency in Homes',¹⁵⁰ including results from 20 water efficiency trials. The report has become widely acknowledged within the industry and was updated with the 'Phase II Evidence Base for Large-Scale Water Efficiency in Homes' in February 2010.¹⁵¹

The updated report assisted water companies to improve their decisions about efficiency programmes for potential inclusion in their WRMPs programmes for AMP5, and will provide supporting information for AMP6. The report provides evidence that retrofit programmes can be a cost-effective way to achieve water savings.

UK Water Industry Research (UKWIR) has recently launched a water savings database¹⁵² which collates and compares results from many, mainly small scale pilot and field projects. It is a "live" database where users can view existing projects, identify gaps and add or update their own data for ongoing or new projects, and can join discussion forums. Access to the database is freely available. The aim of this database is therefore to support the exchange of information regarding water savings across the UK water industry.

The Market Transformation Programme¹⁵³ (MTP), managed by Defra through a consortium of contractors, supports UK government policies in improving the resource efficiency of products, systems and services to achieve the UK's commitment to climate change, water efficiency and waste reduction. Part of the programme is to provide evidence and guidance on the improvement of energy efficient standards of energy-using products. The recently published report 'Behavioural economics & energy using products: scoping research on discounting behaviour and consumer reference points',¹⁵⁴ provides further evidence about changes in customer behaviour to price signals and incentives.

Demand Management and Greenhouse Gas Emissions

There an accepted view that implementation of demand management measures will result in reduced carbon emissions. This only applies to measures that reduce the overall water use, i.e. water efficiency measures, especially those using hot water in homes. Alternative source substitution options, e.g. rainwater harvesting and greywater re-use have recently been reported by the Agency to be less carbon neutral than previously assumed.

¹⁵⁰ http://www.waterwise.org.uk/images/site/Policy/evidence_base/evidence%20base%20for%20large-scale%20water%20efficiency%20in%20homes%2C%20waterwise%2C%20october%202008.pdf

¹⁵¹ http://www.waterwise.org.uk/images/site/Policy/evidence_base/evidence%20base%20for%20large-scale%20water%20efficiency%20in%20homes%20-%20phase%20ii%20interim%20report.pdf

¹⁵² <http://www.water-saving.org/site/WR25c/wr25c-home>

¹⁵³ <http://efficient-products.defra.gov.uk/cms/market-transformation-programme/>

¹⁵⁴ http://randd.defra.gov.uk/Document.aspx?Document=EV0701_9169_FRP.pdf

The Environment Agency report ‘Energy and Carbon Implications of rainwater harvesting and greywater recycling’¹⁵⁵ indicates that although alternative source substitution options reduce water use they can also significantly increase carbon emissions. The report states that potential emissions of a typical rainwater harvesting system can be 40% higher than those from mains water due to embodied carbon and increased electricity demand for pumping. However, the report did not fully consider all the wider sustainable advantages alternative source substitution can deliver. In their recommendations the authors suggest that policy makers should ‘introduce effective checks on the (alternative source substitution) system applicability in a given situation to ensure that they have wider environmental and social benefits that bridge the gap resulting from the net additional carbon emissions’.

¹⁵⁵ <http://publications.environment-agency.gov.uk/pdf/SCHO0610BSMQ-e-e.pdf>

SEVERN TRENT WATER LIMITED WATER DEMAND MANAGEMENT DETAILS

Water Efficiency

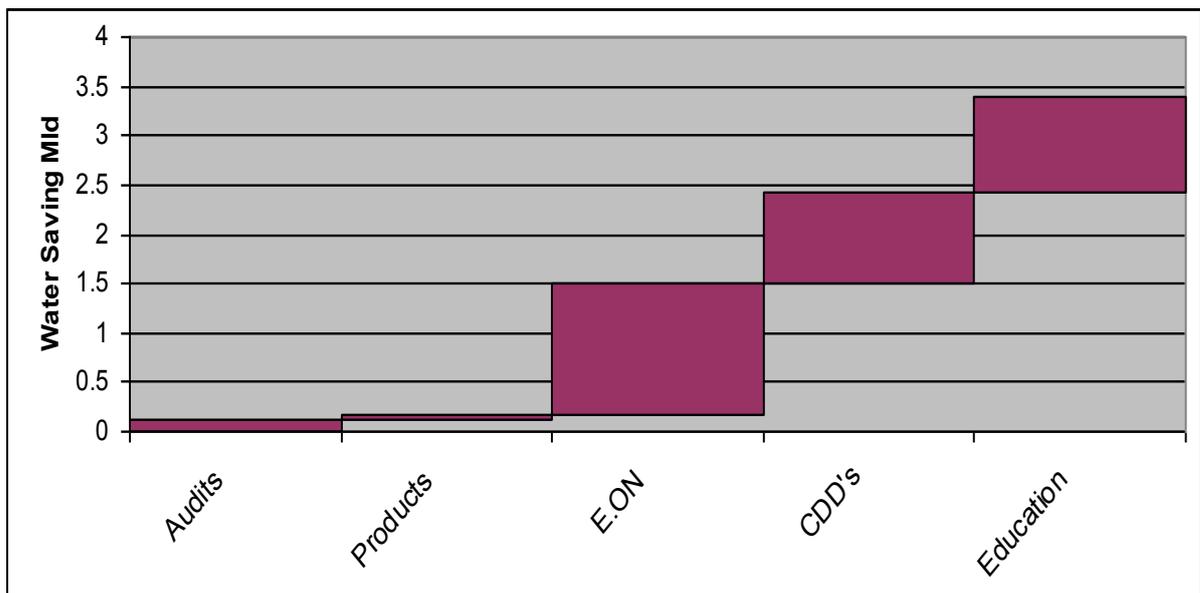
In November 2008 Ofwat set STWL a new water efficiency target for AMP5 which requires the reduction of customer consumption by on average 1 litre / property / day over the next five years, equating to 3.27 MI/d annually or 16.35 MI/d by 2015. As a result, STWL’s baseline projections of demand for water include the additional activities that will be required to deliver target savings.

Work completed since the draft WRMP significantly improved STWL’s understanding of the relative effectiveness of the available water efficiency options. This work included the completion of two large scale pilot programmes investigating efficiency opportunities in both domestic and institutional properties. STWL also made use of the Ofwat Water Efficiency Initiatives – Good Practice Register and the interim Waterwise Evidence Base for Large-Scale Water Efficiency when developing options.

STWL’s draft WRMP focused on domestic water audits and limited household measures as the method to deliver water efficiency savings, and projected savings of around 2 MI/d by 2014-15. Revised proposals will deliver minimum water savings of 16.35 MI/d over the same time period.

Anticipated water savings in each year of AMP5 as a result of the water efficiency program are shown in the figure below:

STWL Planned Water Efficiency Savings for 2010-15



STWL’s planned activities to achieve the 16.35 MI/d target include:

1. Provision of Cistern Displacement Devices (CDD) - This is the distribution on request to customers of cistern displacement devices (more commonly called Hippo’s or save-a-flush bags that “displace” water in the cistern saving 1 litre each flush). STWL believe there is sufficient capacity to improve on their current penetration into 1 in 6 homes through active promotion to enable STWL to continue to deliver 1 MI/d per year usage reduction through AMP5.
2. Partner Activity - This is the tie in to existing activities with both internal and external partners to deliver improved water efficiency whilst conducting other tasks – e.g. using STWL meter readers and quality inspectors to promote and distribute products during routine visits, linking

up with external organisations such as social housing providers to deliver devices and behaviours during routine tenant engagement.

3. Self Audit - These are both STWL's one line self audit and the hard copy booklet to give customers advice on water efficiency measures and help them assess their own water use and understand how they can save.
4. STWL sites - Where STWL are constructing or refurbishing existing offices such as their new Severn Trent Centre, STWL will demonstrate 'best in class' water usage equipment and behaviour. This includes water efficient fixtures, fittings and an educated workforce as well as rainwater harvesting and grey water reuse. STWL will also reduce the use of potable water on existing wastewater sites and office facilities.
5. Institutional and commercial audit and retrofit - STWL has already started a programme that will deliver water efficient devices into 600 schools by the end of 2009 / 2010. This programme will be extended into AMP5 to deliver water efficiency savings in institutional and commercial premises, through the provision of advice, audits and where practicable water efficient devices.
6. Household Audit and retrofit - As stated, this is the installation of retrofit water efficiency devices in the social housing sector such as Dual flush toilet retrofit (converting single flush to dual flush), shower heads, tap flow regulators and shower timers.
7. Product subsidies – these are the free and / or subsidised products that STWL promote via the company website (including water butts, showerheads, shower timers, hose pipe trigger guns, tap flow regulators, shower flow regulators etc.).

The table below shows the annual saving each of the above final WRMP planned activities will contribute towards the 16.35 MI/d over AMP5:

Projected STWL Supply Area Water Savings During AMP5

Activity	Target	Water saving (MI/d)	Area Targeted	Household / Non-household	Type of Expenditure
Cistern Displacement Devices	137,800	1.06	Toilet use	Household & non-household (split to be established – estimate 50/50)	Products / materials
Product Sales	5,115	0.019	Predominantly shower	Household	Products / materials
Product Subsidies	14,230	0.086	Predominantly Shower	Household	Products / materials
Self Audits	687,720	0.246	Behaviour	Household	Literature / website

Activity	Target	Water saving (MI/d)	Area Targeted	Household / Non-household	Type of Expenditure
Household Audit & Retrofit	44,000	0.494	Toilet	Household	50% products / materials
					50% contractor / third party costs
Institutional Audit & Retrofit	1,100	0.894	Toilet / hand basin & shower	Non-household	Contractor / 3rd party costs (includes products / materials provided by the 3rd party)
Partnering STWL Activity	22,000	0.128	97% Toilet & 3% Shower	Household	Products / materials
STWL Site Use	50% reduction	0.346	Switch from potable to non potable source	Non-household	Materials / equipment (including installation costs)

2010-11 Water Efficiency Program Progress

The water efficiency programme is an evolving picture as the scope and range of activity in STWL's programme has already shifted somewhat from the original Water Resources Plan submission. An indicative split can be provided, however as STWL optimise their programme and develop options this will change.

In 2010-11 the split will be:

- 0.93 MI/d CDD's;
- 1.34 MI/d other products (shower flow regulators, shower heads, timers, tap flow regulators etc.);
- 0.28 MI/d customer self audits; and
- 0.70 MI/d education / behavioural initiatives (school and community group outreach programme to promote good water efficient behaviour – up to 30% of the target water saving will be delivered via this route).

In addition to these baseline targets STWL are developing social housing retrofit options (with the aim to retrofit 2,000 properties in 2010/11 ready to scale up in 2011/12).

For 2011 / 12 there is likely to be a lower focus on distributed products and a greater focus on social housing initiatives. STWL are also hoping to undertake more commercial audit work; however STWL are still developing the programme. This has evolved significantly from the final water resources plan, therefore using these figures would not now be appropriate.

Metering

STWL's operational area is divided into six WRZ: Severn, East Midlands, Staffs & East Shropshire, Oswestry, Forest and Stroud and Birmingham. BDC and RBC are within the Severn WRZ. As part of STWL's AMP5 least cost investment plan, STWL has proposed a change of occupier metering trial in AMP5 in the East Midlands zone.

The metering strategy will focus on continuing optional metering and additional metering via selective metering of change of occupier properties, and for both policies STWL has assumed a 10% post metering consumption reduction. This assumption is based on evidence from a number of companies studied in the 2003 UKWIR report '*The impact of household metering on consumption*'.

Leakage

The economic level of leakage reduction is determined on a WRZ basis. The leakage strategy for AMP5 in the Severn WRZ is based on increased investment in active leakage control, further mains replacement and increased pressure management. Each of these areas is discussed in more detail below:

Increased Investment in Active Leakage Control

To ensure STWL has sufficient capability to deliver lower leakage targets in AMP5 and beyond, STWL will need to recruit and train an optimal number of detection and repair staff.

STWL will continue to optimise the selection of proactive (achieving "exit" or target District Metered Area leakage levels) or reactive (response to "burst" alarms) leakage targeting strategies, using improved understanding of the underlying causes of leakage increases. STWL are undertaking a number of trials to improve the effectiveness of leakage detection. These novel techniques include: the use of generic algorithm based modelling tools to pick out burst hot spots and; predictive tools to understand which parts of the network are most susceptible to leakage increases during extreme cold and dry periods. Full implementation of Accountability Zones and NETBASE will help move towards targeting leakage reductions based upon the cost of water, environmental sensitivity of sources and water scarcity status.

More Mains Replacement

STWL was one of the first companies to deliver a leakage-driven mains renewals programme. This programme has helped to develop a better understanding of which areas are likely to yield significant leakage savings and processes to identify and resolve installation and quality-control issues.

STWL has proved that although one-off (initial) leakage savings are not as great as previously anticipated, burst rates have reduced significantly in renewed DMAs. Asset replacement is an essential step towards proactively addressing a future leakage problem. Disruption of the network during asset replacement means an inevitable increase in leakage on non-replaced assets, including the private supply pipe. The supply pipe problem is difficult to address with the constraints of current legislation concerning ownership of the supply pipe.

Focus will remain on improving installation standards and post-project surveying to find and repair outstanding private leaks. STWL is looking into the cost-effectiveness of the opportunity to undertake more supply pipe replacements, alongside renewal of company assets, which will require greater customer support and engagement by replacing communications pipes and pipe ancillaries at the same time as mains, significant leakage savings could be achieved and could reduce the costs of active leakage control required to achieve targets.

Increased Pressure Management

The majority of large-area pressure management opportunities have now been implemented. By 2009 / 10 the majority of DMA-level pressure reductions schemes were in place and optimised. STWL are currently working to identify smaller, cost-effective schemes at a sub-DMA level. STWL has delivered over 4,000 continuously logged pressure points in recent years, enabling a step-change in understanding of pressures / variations within their systems. This will enable further pressure reduction opportunities to be identified and implemented more quickly, as well as identifying equipment or valving problems.

The resulting profile for the Severn WRZ covering the Bromsgrove and Redditch area is shown in the figure below:

Projected Leakage Profile for Severn WRZ



Education and Pilot Studies

STWL has an extensive education programme with the key focus being an outreach programme. This programme involves education coordinators going out to schools and community groups to deliver half day education sessions on water efficiency. STWL also offer site visits to two education centres (in Derby and Cheltenham).

In addition to direct engagement STWL also has an interactive education microsite that allows pupils to calculate their own water use and that of their school as well as providing hints and tips on what they can do to be more efficient. STWL also has more general information on the main STWL website as well as hard copy literature and leaflets to help customers become more efficient. In 2010, STWL has also started to be more targeted in activities to tailor messages and communications to specific audiences and customers to help communicate their messages more effectively.

STWL has undertaken a number of pilot programmes both with domestic and institutional customers. The key activities have been a large scale school retrofit programme targeting 600 schools across the Severn Trent Region. This programme delivered significant water savings for the schools reducing their consumption by c. 25% on average. STWL has also undertaken a number of domestic property retrofit programmes that delivered c. 10% reduction in demand. Greater detail on these projects is available from STWL.

APPENDIX 6 REDDITCH BOROUGH DEVELOPMENT SITES AND DRAINAGE AREA PLANNING AREAS

DAP Area	Development Site Description	Unique ID	Total Area (ha)	Capacity from SHLAA
Priest Bridge	Brush Factory, Evesham Road, Crabbs Cross (LP124)	LP02	0.09	4
	Land at Tidbury Close (07/214)	LP16	0.12	6
	High Trees, Dark Lane (09/259)	WYG06	0.70	5
Redditch RAMPS	Upper Norgrove House ¹⁵⁶	2010/04	1.22	27
	Webheath ADR	2010/12	47.71	600
Spernal	Rear of 144 - 162 Easemore Road (LP135)	LP03	0.43	24
	Windsor Road Gas Works (LP147)	LP05	5.68	140
	Mayfield Works	LP06	0.19	18
	Land off Torrs close	LP13	0.09	6
	Adjacent Castleditch Lane / Pheasant Lane	LPX02	0.52	16
	Former Claybrook School, Matchborough	LPX04	0.74	36
	Land at Millfields, Fire Station and rear of Fire Station	LPX05	1.36	35
	Former Ipsley School playing field	LPX06	0.93	31
	South of Scout Hut, Oakenshaw Road	LPX07	1.02	32
	Church Hill District Centre	CS01	2.25	57
	Matchborough District Centre	CS03	0.92	17
	Peterbrook Close (08/303ol)	WYG02	0.16	5
	Tanhouse Lane	WYG03	0.57	14
	Marfield Farm School	WYG04	1.41	53
	Widney House, Bromsgrove Road	RB03	2.24	58
	Land off Wirehill Drive (08/305)	L4L02	0.47	15
	Land adjacent Saltways Cheshire Home (08/073)	UCS 2.14	0.40	5
	Rear of Sandygate Close	UCS 2.16	0.20	8
	Dingleside Middle School & playing field and land rear of 1-11 Auxerre Avenue	UCS 8.38	3.95	120
	Loxley Close	2010/03	0.31	10

¹⁵⁶ Is part of Webheath ADR (2010/12)

DAP Area	Development Site Description	Unique ID	Total Area (ha)	Capacity from SHLAA
	Clifton Close	2010/05	0.15	6
	Prospect Hill	2010/07	1.43	61
	Rear of Alexandria Hospital	2010/09	7.74	145
	A435 ADR	2010/10	33.43	360
	Brockhill ADR	2010/11	25.5	425
	Brockhill Green Belt	2010/13	27.73	400
	Foxlydiat Green Belt	2010/14	22.16	230
	Sandycroft, West Avenue	2010/27	0.35	10

DAP Area	Development Site Description	Unique ID	Total Area (ha)
Spernal	North of Red Ditch, Enfield	EL01	6.6
	Nash Road, Redditch	EL02	0.4
	Park Farm Industrial Estate, Redditch	EL03	1.1
	Land East of Brockhill	EL04	3.5
	Green Lane, Wirehill	EL05	0.5
	A435 Segment 2	EL06	10.44
	Old Forge Drive, Redditch	EL07	1.32
	Studley Road, Redditch	EL08	0.38
	Enfield Industrial Estate, Redditch	EL09	0.9
	Merse Road, Moons Moat, Redditch	EL10	0.65
	Bartlett Road, Redditch	EL11	0.62
	Palmers Road, Redditch	EL12	0.29
	UCS 7.5	EL13	0.19
	UCS 9.19	EL14	0.19
	UCS 9.58	EL15	0.6
	Washford Industrial Estate, Redditch	EL16	0.22
	Edward Street	EL17	0.47

APPENDIX 7 BROMSGROVE DISTRICT DEVELOPMENT SITES AND DRAINAGE AREA PLANNING AREAS

DAP Area	Development Site Description	Unique ID	Total Area (ha) ¹⁵⁷	Density from SHLAA	Capacity from SHLAA
Bromsgrove	30 Alcester Road, Bromsgrove	BDC152	0.105	50	5
	45 - 47 Woodrow Lane, Catshill	BDC9	0.202	30	6
	4, 4a, 6, 8, & 10 St Catherine's Road, Blackwell	BDC122	0.95	8.4	8
	Meadows First School, Stourbridge Road, Bromsgrove	BDC148	0.80	11.3	9
	Burcot Lane, Bromsgrove ^{158 159}	BDC192	0.28	35	10
	RMC House, Church Lane, Bromsgrove	BDC45	0.26	50	13
	88 Birmingham Road, Bromsgrove	BDC166	0.29	50	15
	Finstall Training Centre, Stoke Road, Bromsgrove	BDC163	0.48	40	16
	3 - 15 Marlbrook Lane & 203 - 215 Old Birmingham Road, Marlbrook	BDC112	1.00	30	26
	The Council House, Burcot Lane, Bromsgrove	BDC168 (A&B)	1.213	50	51
	Church Road (land off), Catshill	BDC93	6.10	16.4	100
	Land adj to Wagon Works, St Godwald's Road, Bromsgrove	BDC85	7.80	30	212
	Norton Farm, Birmingham Road, Bromsgrove	BDC81	12.00	40	350
	Whitford Road, Bromsgrove	BDC80	24.00	32	500
Perryfields Road, Bromsgrove	BDC20	69.74	40	1,500	

¹⁵⁷ Site area taken from the Bromsgrove SHLAA 2009

¹⁵⁸ Site BDC192 not included in SHLAA 2009

¹⁵⁹ Density and Capacity derived using the methodology in the SHLAA, assumed density of 35 dwellings per hectare

DAP Area	Development Site Description	Unique ID	Total Area (ha) ¹⁶⁰	Density from SHLAA	Capacity from SHLAA
Bromsgrove RAMPS	233 Worcester Road, Bromsgrove	BDC149	0.13	69.2	9
	50, 52 & 54 Red Lion Street (rear of), Alvechurch	BDC95	0.25	40	10
	2 - 4 Hartle Lane, Belbroughton	BDC37	0.25	48.4	12
	(Part of) Land adjacent to Crown Meadow, Alvechurch	ALV6	0.595	40	25
	Birmingham Road, Alvechurch	BDC170	1.067	40	36
	Kendal End Road (land at), Barnt Green	BDC92	5.00	30	98
Hagley	33 - 41 Western Road, Hagley	BDC50	0.43	13.95	6
	7 & 9 Worcester Road, Hagley	BDC102	0.239	50	12
	Hagley Former Middle School, Park Road, Hagley	BDC160	0.60	30	15
	Rose Cottage, Thicknall Cottage and Land at rear of Western Road, Hagley	BDC188	1.20	40	40
	Land at Algoa House, Western Road, Hagley	BDC51	1.44	40	49
	Gallows Brook Pig Farm, Kidderminster Road, Hagley	BDC49	1.710	40	58
	Strathearn, Western Road, Hagley	BDC189	3.05	40	79
	Kidderminster & Stourbridge Road, Hagley	BDC35B	9.80	40	255
Rubery	The Avenue, Rubery	BDC65	3.50	40	91

¹⁶⁰ Site area taken from the Bromsgrove SHLAA 2009

DAP Area	Development Site Description	Unique ID	Total Area (ha) ¹⁶¹	Density from SHLAA	Capacity from SHLAA
Wythall	Selsdon Close, Wythall	BDC86	3.10	40	76
	Bleakhouse Farm, Station Road, Wythall	BDC66	6.30	40	163

DAP Area	Development Site Description	Unique ID	Total Area (ha)	Vacant Area (ha)
Bromsgrove RAMPS	Saxon & Harris Business Park	Site 7	1.8	1.8
Bromsgrove	Perryfields Road, Bromsgrove	BDC20	5.0	5.0

¹⁶¹ Site area taken from the Bromsgrove SHLAA 2009

APPENDIX 8 STWL DESKTOP ASSESSMENT OF DEVELOPMENT SITE IMPACTS ON WASTEWATER COLLECTION IN BROMSGROVE DISTRICT AND REDDITCH BOROUGH

Site Ref	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Residential							
Alvechurch							
BDC170	Birmingham Road, Alvechurch	36	Unknown	Alvechurch STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
ALV6	(part of) Land adj to Crown Meadow, Alvechurch	25	11 - 18 yrs	Alvechurch STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC95	50,52 & 54 Red Lion Street (rear of), Alvechurch	10	< 5 yrs	Alvechurch STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
Bromsgrove							
BDC20	Perryfields Road, Bromsgrove	1500	6 - 10 yrs	Bromsgrove STW	<p>This is a significant development located on the opposite site of the sewerage catchment in relation to Bromsgrove sewage treatment works. Due to the layout of the site foul flows are expected to impact different parts of the existing sewerage system.</p> <p>The north east part of the site (east of Fockbury Mill Lane/north of Perryfields Road) is likely to connect upstream of known internal sewer flooding problems. As part of our sewer flooding alleviation programme a project is currently assessing potential solutions to address this capacity problem and so upstream development should not commence until these improvements have been completed.</p> <p>The area to the south of Fockbury Mill Lane is likely to drain to existing sewers in Crabtree Lane, Grayshot Close and potentially Kidderminster Road. All these existing sewers are only small diameter (225mm dia) and only designed to accommodate existing local flows and so connection of 800-1000 new dwellings to these sewers is expected to require localised capacity improvements. Further downstream there are several known external flooding problems which may also require capacity enhancements. Further detailed hydraulic modelling will be required to confirm the extent of capacity improvements but it is envisaged that capacity improvements will be required due to the size of the development. It is expected that surface water would be managed sustainably and not connected to the foul/combined sewerage system</p>	Medium/High - The potential size and location of this site in relation the existing sewerage system.	SHLAA_(2010).shp

Site Ref	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Residential							
Bromsgrove							
BDC80	Whitford Road, Bromsgrove	500	6 - 10 yrs	Bromsgrove STW	Ground topography indicates that this site would drain towards an existing 225/300mm dia sewer in Deanway which runs east across Sanders Park. There are no known sewer flooding problems downstream of this development but due to its size and location in relation to existing sewerage system it is envisaged that some localised capacity improvements may be required. Whilst further hydraulic modelling will be required to confirm the extent of any capacity enhancements it is not envisaged to be significant provided surface water is managed sustainably and is not connected to the foul/combined sewers.	Low/Medium - Localised capacity issues may be required	SHLAA_(2010).shp
BDC81	Norton Farm, Birmingham Road, Bromsgrove	350	6 - 10 yrs	Bromsgrove STW	Ground topography indicates that this site is likely to drain south east towards existing 375mm diameter foul sewers running south along Birmingham Road. Whilst dry weather flows pass through the town centre there is a bifurcation just downstream of the development which diverts excess storm flows to a separate sewerage system to the east of the town centre. There are no known sewer flooding problems in the vicinity of the development but there are some known problems in the High Street area in Bromsgrove town centre. A solution to alleviate internal flooding problems is currently deferred due to high solution cost but this property is protected using anti flood measures. Further hydraulic analysis would be required to assess the hydraulic impact of this development but provided surface water is not connected to the foul sewer any capacity improvements are not envisaged to be significant.	Low/Medium - Localised capacity issues may be required	SHLAA_(2010).shp
BDC85	Land adj to Wagon Works, St Godwald's Road, Bromsgrove	212	Unknown	Bromsgrove STW	This site is adjacent to an existing residential development which drains to a sewage pumping station off Scaife Road which then pumps via a 100mm diameter rising main across the railway to discharge to 225mm diameter gravity sewers in Stoke Road. This development is likely to double the current foul flows draining to the pumping station and so subject to further hydraulic pumping capacity checks this pumping station may need to be upsized/replaced. Due to the topography of the site an additional pumping station may be required and so this could be incorporated as part of the existing pumping station relocation depending on site drainage layout.	Low/Medium - Likely pumping station replacement	SHLAA_(2010).shp

Site Ref	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Residential							
Bromsgrove							
BDC168 (A & B)	The Council House, Burcot Lane, Bromsgrove	51	6 - 10 yrs	Bromsgrove STW	As this is a redevelopment of an existing site, the additional foul flows generated from 51 replacement residential units is not envisaged to have any capacity constraints provided subject to ensuring no surface water from the site is connected to the foul/combined sewers	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC163	Finstall Training Centre, Stoke Road, Bromsgrove	16	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC166	88 Birmingham Road, Bromsgrove	15	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC45	RMC House, Church Lane, Bromsgrove	13	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC192	Burcot Lane	10	-	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC148	Meadows First School, Stourbridge Road, Bromsgrove	9	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC149	233 Worcester Road, Bromsgrove	9	< 5 yrs	Stoke Prior STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp

Site Ref	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Residential							
Lickey End							
BDC152	30 Alcester Road, Bromsgrove	5	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
Hagley							
BDC35B	Kidderminster & Stourbridge Road, Hagley	255	11 - 18 yrs	Roundhill STW	Ground topography indicates that sites 'BDC35B' and 'BDC49' would drain to an existing sewers in Kidderminster Road (225mm dia) or Western Road (150mm dia) which eventually drain south west along Worcester Road (only 225mm dia). There is a known internal sewer flooding problem affecting a single property on Worcester Road where flood alleviation works are currently deferred due to the unduly high c£600,000 solution cost (this property is currently protected from flooding by anti flood devices). Connection of 255 + 58 new dwellings to an existing 225mm dia sewer with known capacity problems will require further detailed hydraulic modelling to evaluate how to accommodate additional flows from this development.	Medium - Known sewer flooding problems and small diameter sewers	SHLAA_(2010).shp
BDC49	Gallows Brook Pig Farm, Kidderminster Road, Hagley	58	11 - 18 yrs	Roundhill STW			SHLAA_(2010).shp
BDC189	Strathearn, Western Road, Hagley	79	11 - 18 yrs	Roundhill STW	This comment refers to sites 'BDC189', 'BDC51' and 'BDC188'. Whilst there is an existing 225mm dia sewer to the south east of these sites running along Western Road the ground topography suggests part of the site would need to be pumped or alternatively drain to the 150mm dia sewer in Western Road (to the south west of the sites). Connection to the 225mm dia sewer will bypass a known flooding problem affecting a single property on Worcester Road but there are still envisaged to be capacity issues in this area. Connection of a total of 168 new dwellings to an existing 225mm dia sewer with known capacity problems will require further detailed hydraulic modelling to evaluate how to accommodate additional flows from this development.	Medium - Known sewer flooding problems and small diameter sewers	SHLAA_(2010).shp
BDC51	Land at Algoa House, Western Road, Hagley	49	11 - 18 yrs	Roundhill STW			SHLAA_(2010).shp
BDC188	Rose Cottage, Thicknall Cottage and Land at rear of Western Road, Hagley	40	11 - 18 yrs	Roundhill STW			SHLAA_(2010).shp
BDC160	Hagley Former Middle school, Park Road, Hagley	15	< 5 yrs	Roundhill STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp

Site Ref	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Residential							
Lickey End							
BDC102	7 & 9 Worcester Road, Hagley	12	< 5 yrs	Roundhill STW	There is a known infrequent external highway flooding immediately outside this site. However provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from 12 new dwellings is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC50	33 - 41 Western Road, Hagley	6	< 5 yrs	Roundhill STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
Marlbrook							
BDC112	3 - 15 Marlbrook Lane & 203 - 215 Old Birmingham Road, Marlbrook	26	< 5 yrs	Bromsgrove STW	This site is located near to a localised sewer capacity constraint which has resulted in a known (infrequent) internal flooding problem. Further detailed modelling will be required to assess the potential impact of this development but provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any significant capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
Blackwell							
BDC122	4,4a,6,8, & 10 St Catherine's Road, Blackwell	8	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
Belbroughton							
BDC37	2 - 4 Hartle Lane, Belbroughton	12	6 - 10 yrs	Belbroughton STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp

Site Ref	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Residential							
Belbroughton							
BDC65	The Avenue, Rubery	91	< 5 yrs	Minworth STW	This appears to be a redevelopment of existing industrial units and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul/combined sewer is dis-connected. The site is upstream on known flooding problems which are currently being appraised as part of our sewer flooding investment programme for anticipated completion in 2011. On completion the size of this redevelopment site is not expected to cause any capacity issues provided storm water is not connected to the foul system. NOTE: There is an existing 225mm dia foul water sewer crossing this site.	Low - Known hydraulic problems due to be resolved in 2011	SHLAA_(2010).shp
Catshill							
BDC93	Church Road (land off), Catshill	100	11 - 18 yrs	Bromsgrove STW	There are no known sewer flooding problems downstream of this site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC9	45 - 47 Woodrow Lane, Catshill	6	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
Barnt Green							
BDC92	Kendal End Road (land at), Barnt Green	98	11 - 18 yrs	Alvechurch STW	There are no known sewer flooding problems downstream of this site although there is a combined sewer overflow immediately downstream. Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	SHLAA_(2010).shp

Site Ref	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Residential							
Wythall							
BDC66	Bleakhouse Farm, Station Road, Wythall	163	11 - 18 yrs	Minworth STW	Ground topography indicates this site is likely to connect to an existing 450mm dia sewer running to the north west of the site across open farmland. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	SHLAA_(2010).shp
BDC86	Selsdon Close, Wythall	76	11 - 18 yrs	Minworth STW	Ground topography indicates this site is likely to connect to an existing 225mm dia sewer running along the northern boundary of the site before crossing the railway and then across open farmland. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	SHLAA_(2010).shp

Site Ref	Site Name	Site Area (ha)		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Bromsgrove District Council							
Employment							
7	Saxon & Harris Business Park (Hanbury Road, Stoke Prior, B60)	50	TBC	Stoke Prior STW	As this appears to be a redevelopment of existing industrial units and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul/combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	BDC_FINAL_Employment_Sites.shp
2	Ravensbank Business Park (Ravensbank Drive, Nr Redditch, B98)	30	TBC	Redditch (Spernal) STW	As this appears to be a redevelopment of existing industrial units and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul/combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	BDC_FINAL_Employment_Sites.shp
11	Ravensbank ADR (BE3) (Hedera Road, Redditch, B98)	10.3	TBC	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	BDC_FINAL_Employment_Sites.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
'Strategic' Sites							
St10	Town Centre, Northwest Quadrant	4.6	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul/combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Startegic_Sites_2010.shp
St2	Winyates, Redditch	2.5	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul/combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Startegic_Sites_2010.shp
St4	Woodrow, Redditch	1.7	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul/combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Startegic_Sites_2010.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
'Strategic' Sites							
St8	Edward Street	0.5	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul/combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_Strategic_Sites_2010.shp
Redditch							
2010/12	Webheath ADR	600	6-10 yrs / 10+yrs	Priest Bridge STW OR Redditch (Spernal) STW	This site is located on the edge of the Priest Bridge and Redditch (Spernal) sewage treatment works catchments and so could potentially drain to either catchment depending on the sewer connection point. The ground contours indicate that most of the site will not be able to connect to the existing sewerage system without needing to be pumped and so this gives some flexibility over potential point of connection but either way the sewers in the immediate vicinity are only small diameter (150/225mm dia) and so are likely to require upsizing to provided additional capacity to accommodate pumped flows from 600 dwellings. Further hydraulic modelling will be required to assess the extent of any capacity improvements.	Medium - Large development upstream of small dia sewerage system(s)	RBC_FINAL_SHLAA_sites_2010.shp
2010/11	Brockhill ADR	425	1 - 5 yrs / 6 - 10 yrs	Redditch (Spernal) STW	These two sites ('2010/11' & '2010/13') are located upstream of small diameter sewerage systems and whilst there are no known sewer flooding problems downstream there is unlikely to be spare capacity to accommodate the additional foul flows from up to 825 new dwellings. Further hydraulic modelling will be required to confirm the extent of any capacity improvements once potential connection points have been identified.	Medium - Large development(s) upstream of small dia sewerage system(s)	RBC_FINAL_SHLAA_sites_2010.shp
2010/13	Brockhill Green Belt	400	1 - 5 yrs				RBC_FINAL_SHLAA_sites_2010.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
Redditch							
2010/10	A435 ADR	360	10+ yrs	Redditch (Spernal) STW	This site is shown as a thin 2.8km strip of development land along the south east of the Redditch sewerage system and so it has not been possible to assess where the 360 new dwellings would be located. There are numerous sewers which could serve this site depending whether the housing allocation is concentrated in a single area or in several smaller development pockets. There are no known sewer flooding problems in this part of Redditch and so depending of the concentration of housing/location, significant capacity issues are not envisaged (subject to detailed hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
2010/14	Foxydiate Green Belt	230	10+ yrs	Redditch (Spernal) STW	This site is located upstream of small diameter sewerage systems and whilst there are no known sewer flooding problems downstream it is envisaged that some localised capacity enhancements may be required to accommodate the additional foul flows from 230 new dwellings. Further hydraulic modelling will be required to confirm the extent of any capacity improvements once potential connection points have been identified.	Low/Medium (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
2010/09	RO Alexandria Hospital	145	6 - 10 yrs	Redditch (Spernal) STW	There is a known isolated highway flooding problem to the south off the site affecting Green Lane. However the site is crossed by a 300mm dia foul water sewer which does not have any known flooding problems. Subject to hydraulic modelling accommodation of the additional foul flows from 145 new dwellings is not envisaged to require and significant capacity improvements.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LP05	Windsor Road Gas Works (LP147)	140	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
Redditch							
UCS 8.38	Dingleside Middle School & playing field and land rear of 1-11 Auxerre Avenue	120	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
2010/07	Prospect Hill	61	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
RB03	Widney House, Bromsgrove Road	58	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
CS01	Church Hill District Centre	57	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
WYG04	Marfield Farm School	53	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
Redditch							
LPX04	Former Claybrook School, Matchborough	36	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LPX05	Land at Millfields, Fire Station and RO Fire Station	35	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LPX07	South of Scout Hut, Oakenshaw Road	32	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LPX06	Former Ipsley School playing field	31	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
2010/04	Upper Norgrove House	27	1 - 5 yrs	Priest Bridge STW	Also see comment for site '2010/12'. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
Redditch							
LP03	Rear of 144 - 162 Easemore Road (LP135)	24	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LP06	Mayfield Works	18	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
CS03	Matchborough District Centre	17	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LPX02	Adjacent Castleditch Lane / Pheasant Lane	16	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
L4L02	Land off Wirehill Drive (08/305)	15	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
WYG03	Tanhouse Lane	14	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
2010/27	Sandycroft, West Avenue	10	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
2010/03	Loxley Close	10	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
UCS 2.16	Rear of Sandygate Close	8	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
Redditch							
LP16	Land at Tidbury Close (07/214)	6	1 - 5 yrs	Priest Bridge STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LP13	Land off Torrs close	6	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
2010/05	Clifton Close	6	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
WYG02	Peterbrook Close (08/303ol)	5	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
UCS 2.14	Land adjacent Saltways Cheshire Home (08/073)	5	1 - 5 yrs	Priest Bridge STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp
LP02	Brush Factory, Evesham Road, Crabbs Cross (LP124)	4	1 - 5 yrs	Priest Bridge STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp

Site Ref	Site Name	Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Residential							
Astwood Bank							
WYG06	High Trees, Dark Lane (09/259)	5	1 - 5 yrs	Astwood Bank STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_FINAL_SHLAA_sites_2010.shp

Site Ref	Site Name	Site Area		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Employment							
EL63 (IN67)	North of Red Ditch, Enfield	10.974	Not stated	Redditch (Spernal) STW	This site is located adjacent to residential development sites '2010/11' & '2010/13' and is located upstream of small diameter sewerage systems. Whilst there are no known sewer flooding problems downstream the potential impact on the foul sewerage system will be dictated by the employment type/water consumption. Further hydraulic modelling will be required to confirm the extent of any capacity improvements once employment types and connection points have been identified.	Low/Medium depending on water usage (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL44	Nash Road, Redditch	6.27	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL22	Old Forge Drive, Redditch	5.74	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL51	Target Park Industrial Estate	2.11	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp

Site Ref	Site Name	Site Area		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Employment							
EL61	Green Lane, Wirehill	2.002	Not stated	Redditch (Spernal) STW	Also see residential site '2010/09'. There is a known isolated highway flooding problem to the south off the site affecting Green Lane. However the site is crossed by a 300mm dia foul water sewer which does not have any known flooding problems. Subject to hydraulic modelling accommodation of the additional foul flows from a small employment development is not envisaged to require and significant capacity improvements.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL58	Fishing Line Road, Redditch	1.56	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL38	Trescott Road, Smallwood, Redditch	1.41	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL23	Old Forge Drive, Redditch	1.322	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL17	Park Farm Industrial Estate, Redditch	1.079	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp

Site Ref	Site Name	Site Area		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Employment							
EL16	Shawbank Road, Redditch	1.032	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL56	Enfield Industrial Estate, Redditch	0.914	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment units consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL15	Moons Moat Drive, Redditch	0.895	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment units consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL52	Heming Road, Washford Ind Estate, Redditch	0.66	Not stated	Redditch (Spernal) STW	As this site appears to involve redevelopment units consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp

Site Ref	Site Name	Site Area		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Employment							
EL33	Merse Road, Moons Moat, Redditch	0.653	Not stated	Redditch (Spernal) STW	As this site appears to involve part redevelopment units consideration should be given to ensuring any surface water currently draining to the foul/combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL30	Bartlett Road, Redditch	0.623	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL27	Studley Road, Redditch	0.476	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL13	B4497	0.46	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL12	Upper Crossgate Road, Redditch	0.403	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL25	Studley Road, Redditch	0.378	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL11	Crossgate Road, Redditch	0.33	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL14	Coldfield Drive / Clews Road	0.31	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp

Site Ref	Site Name	Site Area		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Employment							
EL21	Moon Moats Drive	0.31	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL53	Palmers Road, Redditch	0.292	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues. NOTE: There are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL34	Padgets Lane, Redditch	0.26	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL36	Washford Industrial Estate, Redditch	0.216	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL69	Trescott Road, Smallwood, Redditch	0.19	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL64	Barn Close Farm, Love Lyne, Hunt End	0.187	Not stated	Priest Bridge STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL20	Arthur Street, Redditch	0.12	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL32	Arthur Street, Redditch	0.12	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp

Site Ref	Site Name	Site Area		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Employment							
EL24	Fringe Meadow Road, Moons Moat, Redditch	0.108	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL19	Enfield Road, Redditch	0.07	Not stated	Priest Bridge STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL28	Lodge Road, Redditch	0.05	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL31	Headless Cross Drive, Redditch	0.05	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL18	Dunstall Court	0.04	Not stated	Priest Bridge STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL29	Evesham Road, Crabbs Cross	0.04	Not stated	Priest Bridge STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL1	Church Road, Redditch	0.04	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL26	Washford Drive, Redditch	0.04	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL35	The Station, Windsor Street	0.03	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp

Site Ref	Site Name	Site Area		Sewage Treatment Works Catchment	Sewerage Comment	Potential Impact on Sewerage Infrastructure	Shapefile Source
Redditch Borough Council							
Employment							
EL54	Birchfield Road, Redditch	0.03	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL67	Headless Cross Drive, Redditch	0.03	Not stated	Redditch (Spernal) STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp
EL55	Birchfield Road, Redditch	0	Not stated	Redditch (Spernal) STW	Same site as EL54	Low (subject to hydraulic modelling)	RBC_Employment_Land_2010.shp

APPENDIX 9 PARAMETER VALUES AND DESIGN EVENT SIMULATIONS APPLIED IN REDDITCH BOROUGH INFOWORKS MODEL SIMULATIONS

DAP Area	InfoWorks Model Reference	InfoWorks Network Reference	Growth Scenario ¹⁶²	No. of New Dwellings	New Employment Land Area	Impermeable Area Creep for Housing <15 Years Old ¹⁶³ (% of Total Area)	Measured and Unmeasured Per Capita Consumption ¹⁶⁴ (l/h/d)	Occupancy Rate ¹⁶⁵ (Head per Property)	Impermeable Runoff Area ¹⁶⁶ (% of Total Area)
Spernal – L-874-01	Needs model.iwt	Spernal Scenario 1 Short Term (2015)	1	597	0	1	145 (un-metered) 124 (metered)	2.8	0.5
		Spernal Scenario 2 Short Term (2015)	2	1,797	12.4	1	145 124	2.8	0.5
Priest Bridge – L-874-02	L-874-02m08 Priestbridge DAP and L-874-02m08 Redditch RAMPS Existing.iwc	Priest Bridge and Redditch RAMPS WCS Known Short Term 2015 S1_FINAL	1	25	0	1	145 124	2.8	0.5
		Priest Bridge and Redditch RAMPS WCS Known Short Term 2015 S2_FINAL	2	75	0.33	1	145 124	2.8	0.5

¹⁶² Where projected growth within a drainage area differed between the growth scenarios identified in Chapter 3 both scenarios were modelled

¹⁶³ Area assigned with an even split between roof area and paved area, creep is considered predominant during the first 10 to 20 years of a development. No impermeable area has been assigned to the foul / combined network from employment land

¹⁶⁴ Values taken from WRMP

¹⁶⁵ Assumed value

¹⁶⁶ Value as per STWL guidance

DAP Area	InfoWorks Model Reference	InfoWorks Network Reference	Growth Scenario ¹⁶⁷	No. of New Dwellings	New Employment Land Area	Impermeable Area Creep for Housing <15 Years Old ¹⁶⁸ (% of Total Area)	Measured and Unmeasured Per Capita Consumption ¹⁶⁹ (l/h/d)	Occupancy Rate ¹⁷⁰ (Head per Property)	Impermeable Runoff Area ¹⁷¹ (% of Total Area)
Spernal – L-874-01	Needs model.iwt	Spernal Scenario 1 Predicted Long Term (2026)	1	966	0	1	144 129	2.8	0.5
		Spernal Scenario 2 Predicted Long Term (2026)	2	684	37.3	1	144 129	2.8	0.5
Priest Bridge – L-874-02	L-874-02m08 Priestbridge DAP and L-874-02m08 Redditch RAMPS Existing.iwc	Priest Bridge and Redditch RAMPS WCS Predicted Long Term 2026 S1 FINAL	1	407	0	1	144 129	2.8	0.5
		Priest Bridge and Redditch RAMPS WCS Predicted Long Term 2026 S2_FINAL	2	572	0.11	1	144 129	2.8	0.5

¹⁶⁷ Where projected growth within a drainage area differed between the growth scenarios identified in Chapter 3 both scenarios were modelled

¹⁶⁸ Area assigned with an even split between roof area and paved area, creep is considered predominant during the first 10 to 20 years of a development. No impermeable area has been assigned to the foul / combined network from employment land

¹⁶⁹ Values taken from WRMP

¹⁷⁰ Assumed value

¹⁷¹ Value as per STWL guidance

APPENDIX 10 PARAMETER VALUES AND DESIGN EVENT SIMULATIONS APPLIED IN BROMSGROVE DISTRICT INFOWORKS MODEL SIMULATIONS

DAP Area	InfoWorks Model Reference	InfoWorks Network Reference	Growth Scenario ¹⁷²	No. of New Dwellings	New Employment Land Area	Impermeable Area Creep for Housing <15 Years Old ¹⁷³ (% of Total Area)	Measured and Unmeasured Per Capita Consumption ¹⁷⁴ (l/h/d)	Occu-pancy Rate ¹⁷⁵ (Head per Property)	Impermeable Runoff Area ¹⁷⁶ (% of Total Area)	Trade Element for Employment Land ¹⁷⁷ (ℓ/s/ha)	Domestic Element for Employment Land ¹⁷⁸ (ℓ/s/ha)
Bromsgrove – L-872-01	Bromsgrove#75_Needs_1.iwc	Bromsgrove Known Short Term Scenarios 1 and 2	1 & 2	2,149	5	1	145 (un-metered) 124 (metered)	2.8	0.5	1	0.5
Rubery – L-872-02	Rubery.iwc	WCS Scenario 1 and 2 Short Term	1 & 2	91	0	1	145 124	2.8	0.5	1	0.5
Hagley – L-972-04	Hagley.iwt	Hagley WCS short term	1 & 2	33	0	1	145 124	2.8	0.5	1	0.5
Bromsgrove RAMPS – L-872-05 – Alvechurch sub area	Bromsgrove Rural.iwm	Bromsgrove RAMPS WCS Short Term	1 & 2	10	0	1	145 124	2.8	0.5	1	0.5

¹⁷² Where projected growth within a drainage area differed between the growth scenarios identified in Chapter 3 both scenarios were modelled

¹⁷³ Area assigned with an even split between roof area and paved area, creep is considered predominant during the first 10 to 20 years of a development. No impermeable area has been assigned to the foul / combined network from employment land

¹⁷⁴ Values taken from WRMP

¹⁷⁵ Assumed value

¹⁷⁶ Value as per STWL Guidance

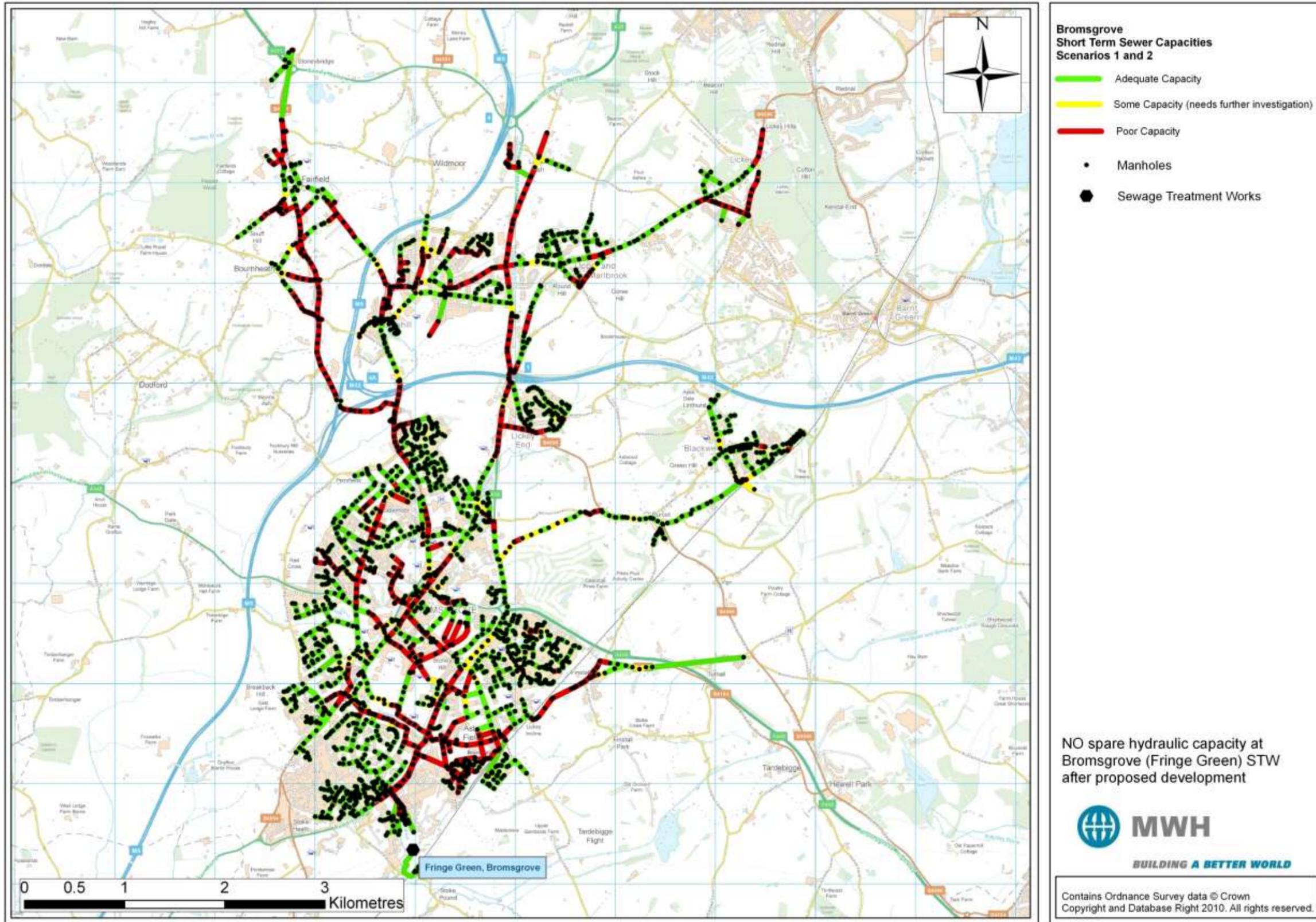
¹⁷⁷ Value as per STWL Guidance

¹⁷⁸ Value as per STWL Guidance

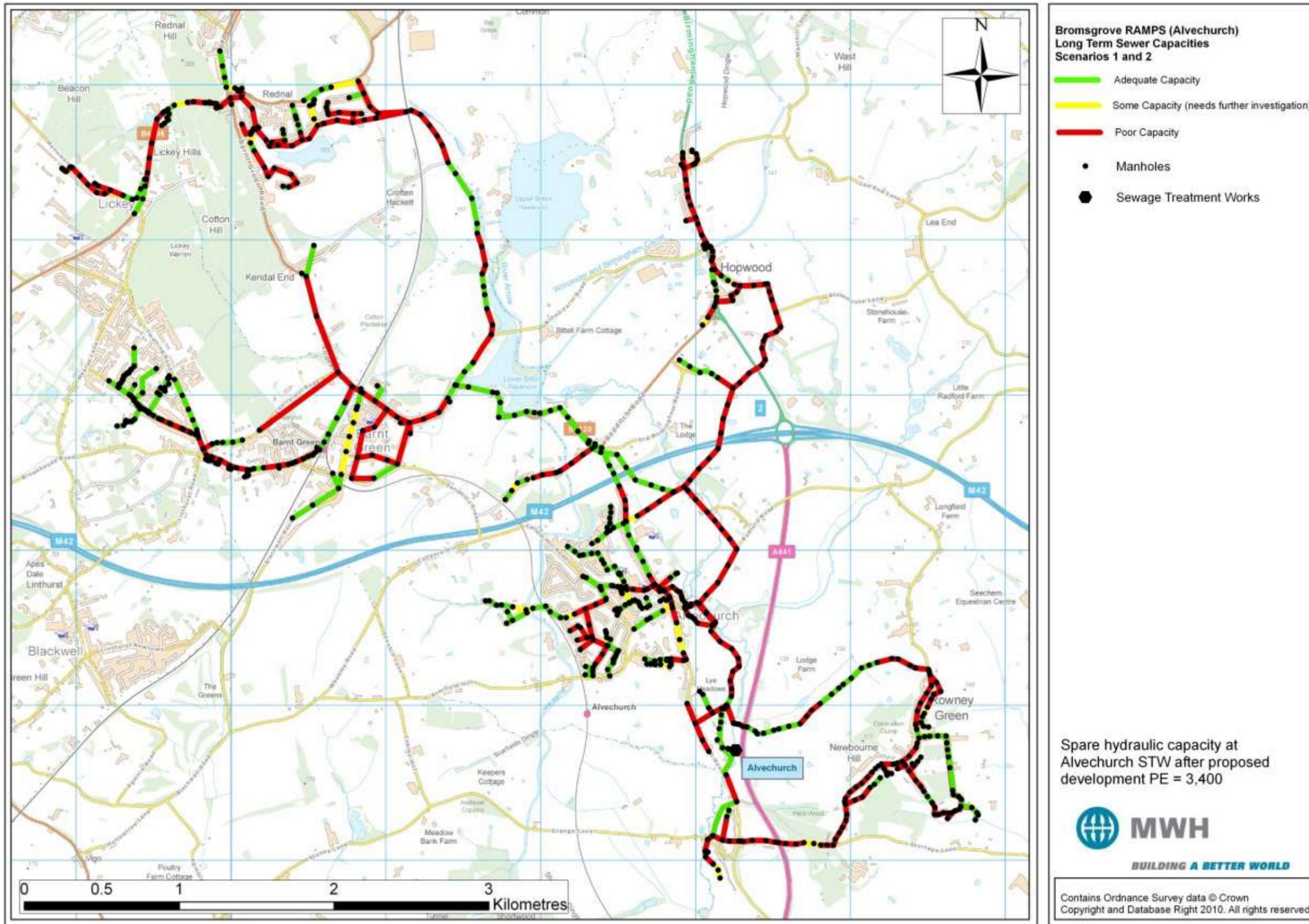


DAP Area	InfoWorks Model Reference	InfoWorks Network Reference	Growth Scenario ¹⁷²	No. of New Dwellings	New Employment Land Area	Impermeable Area Creep for Housing <15 Years Old ¹⁷³ (% of Total Area)	Measured and Unmeasured Per Capita Consumption ¹⁷⁴ (l/h/d)	Occupancy Rate ¹⁷⁵ (Head per Property)	Impermeable Runoff Area ¹⁷⁶ (% of Total Area)	Trade Element for Employment Land ¹⁷⁷ (l/s/ha)	Domestic Element for Employment Land ¹⁷⁸ (l/s/ha)
Bromsgrove RAMPS – L-872-05 – Stoke Works sub area	L872_05-Stoke Prior_v8.5.iwc	Stoke Prior WCS short term	1 & 2	9	1.8	1	145 124	2.8	0.5	1	0.5
Bromsgrove – L-872-01	Bromsgrove#75_Needs_1.iwc	Bromsgrove Predicted Long Term Scenarios 1 and 2#1	1 & 2	672	0	1	144 129	2.8	0.5	1	0.5
Wythall – L-872.03	F-925-06m08 Shirley West - Tidbury Green Needs.iwc	Wythall for WCS long	1 & 2	239	0	1	144 129	2.8	0.5	1	0.5
Hagley – L-972-04	Hagley.iwt	hagleyWCS long term #1	1 & 2	481	0	1	144 129	2.8	0.5	1	0.5
Bromsgrove RAMPS – L-872-05 – Stoke Works sub area	L872_05-Stoke Prior_v8.5.iwc	Stoke Prior_WCS_long term	1 & 2	171	0	1	145 124	2.8	0.5	1	0.5

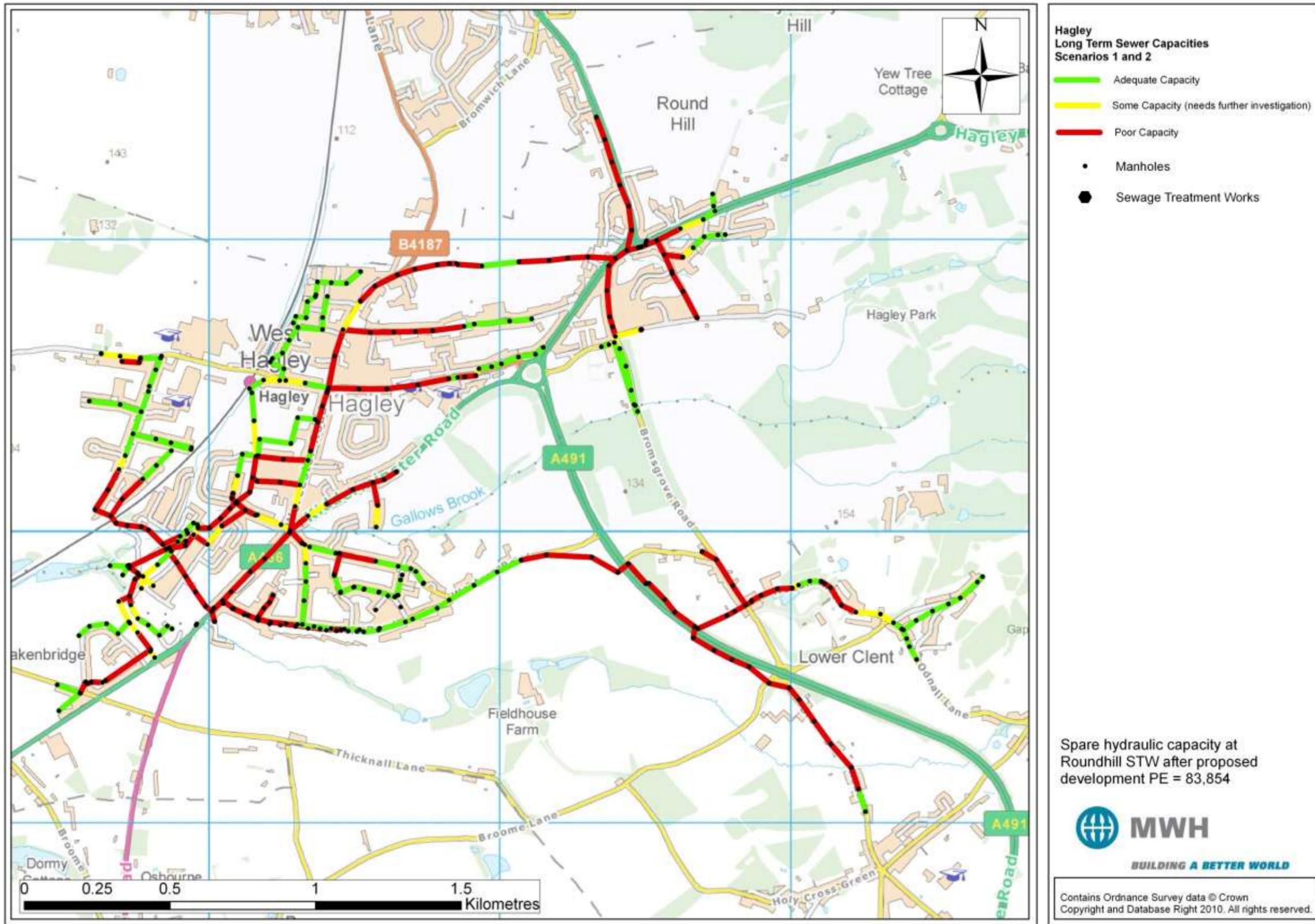
APPENDIX 11 PREDICTED SEWER CAPACITIES – BROMSGROVE TOWN DAP SCENARIOS 1 AND 2



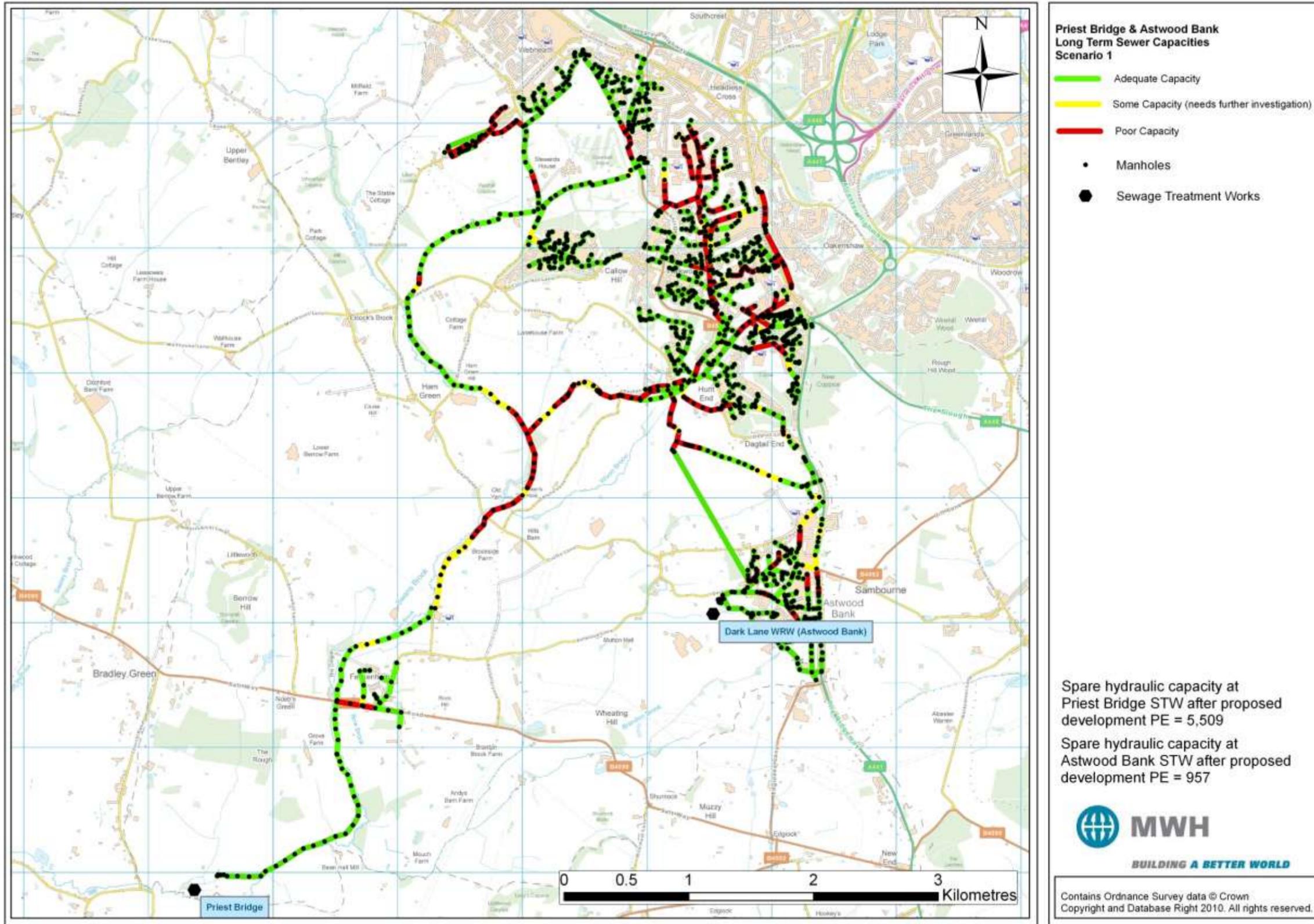
APPENDIX 12 PREDICTED SEWER CAPACITIES – BROMSGROVE RAMPS DAP SCENARIOS 1 AND 2



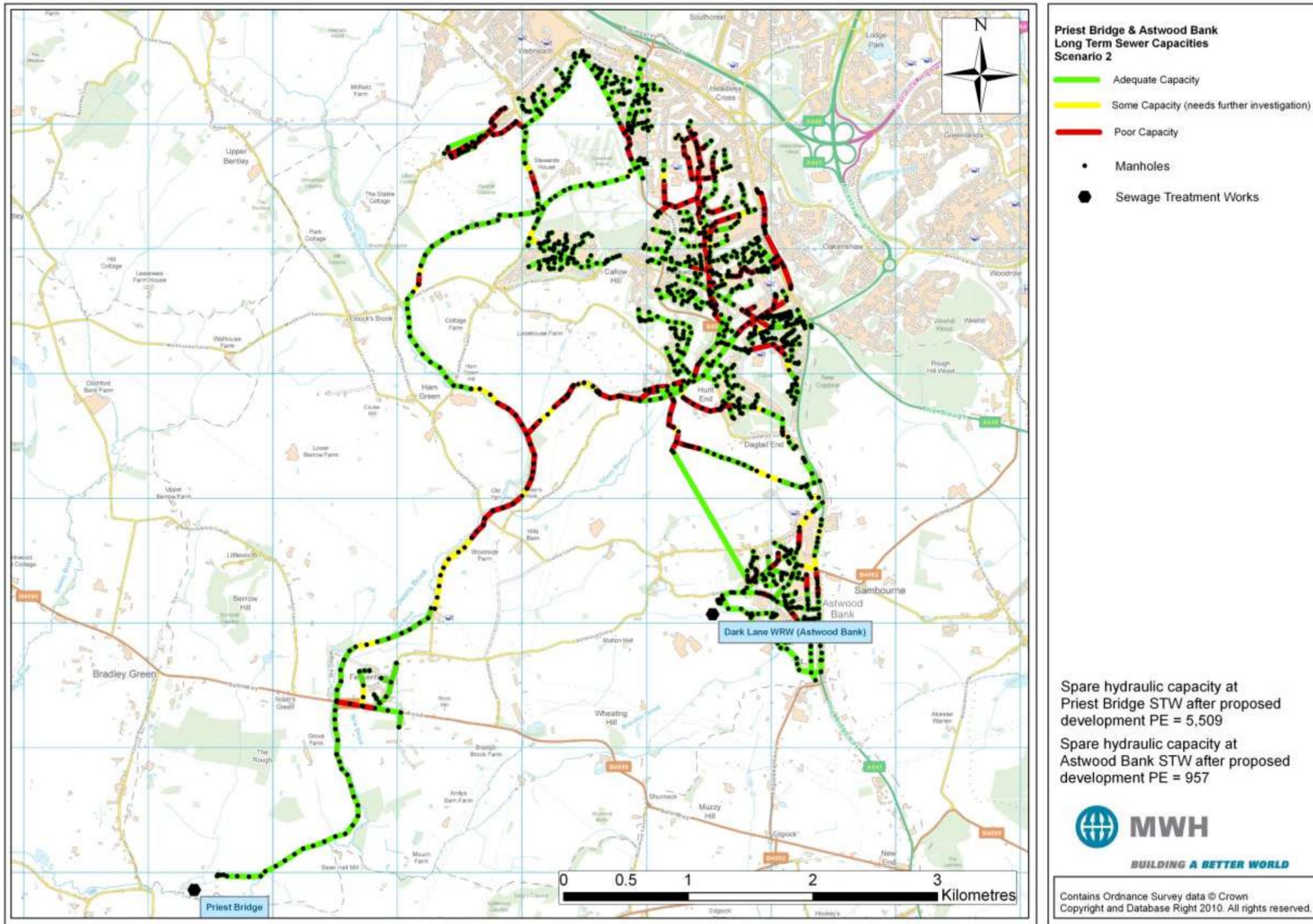
APPENDIX 13 PREDICTED SEWER CAPACITIES – HAGLEY DAP SCENARIOS 1 AND 2



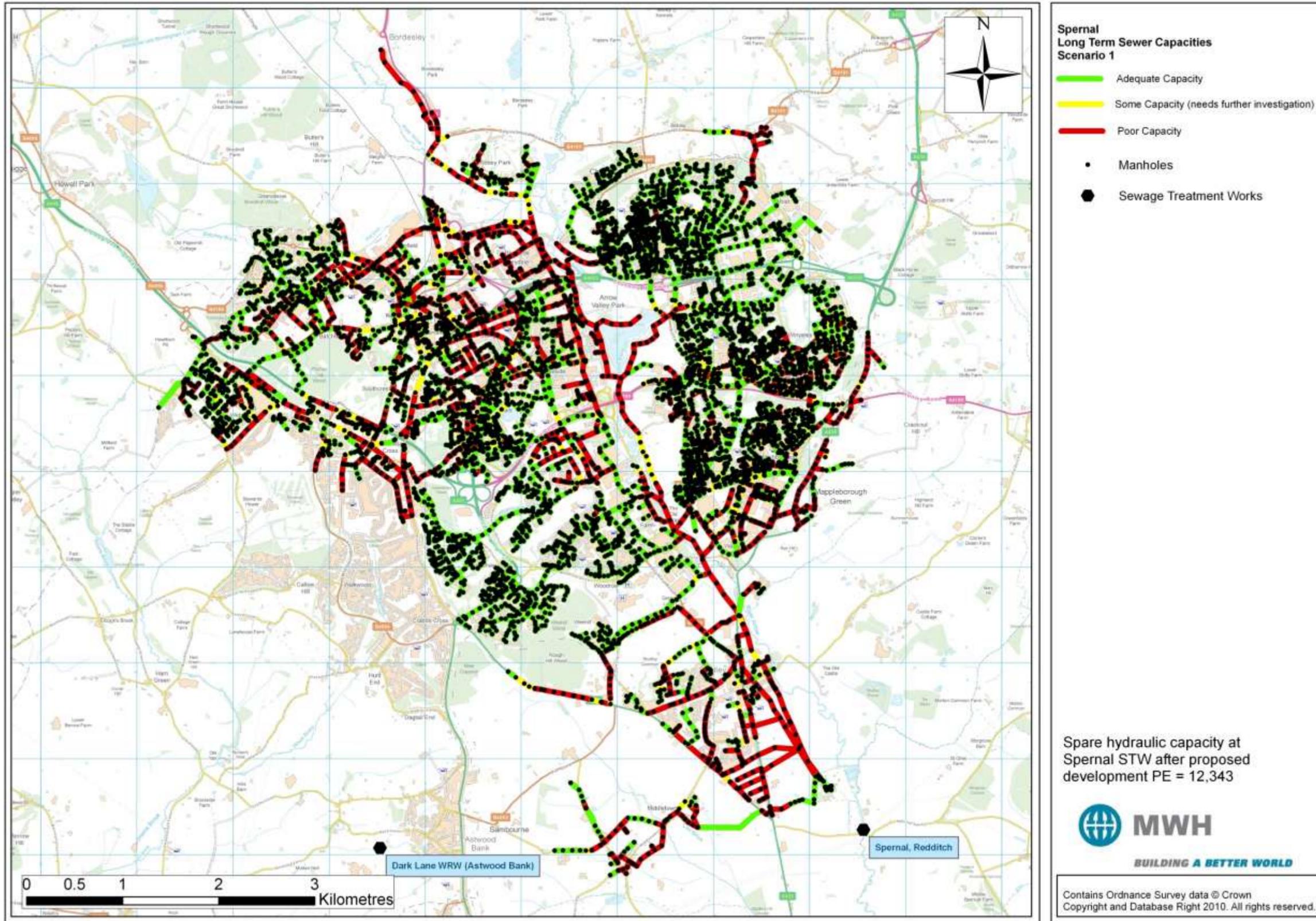
APPENDIX 14 PREDICTED SEWER CAPACITIES – PRIEST BRIDGE AND ASTWOOD BANK DAPS SCENARIO 1



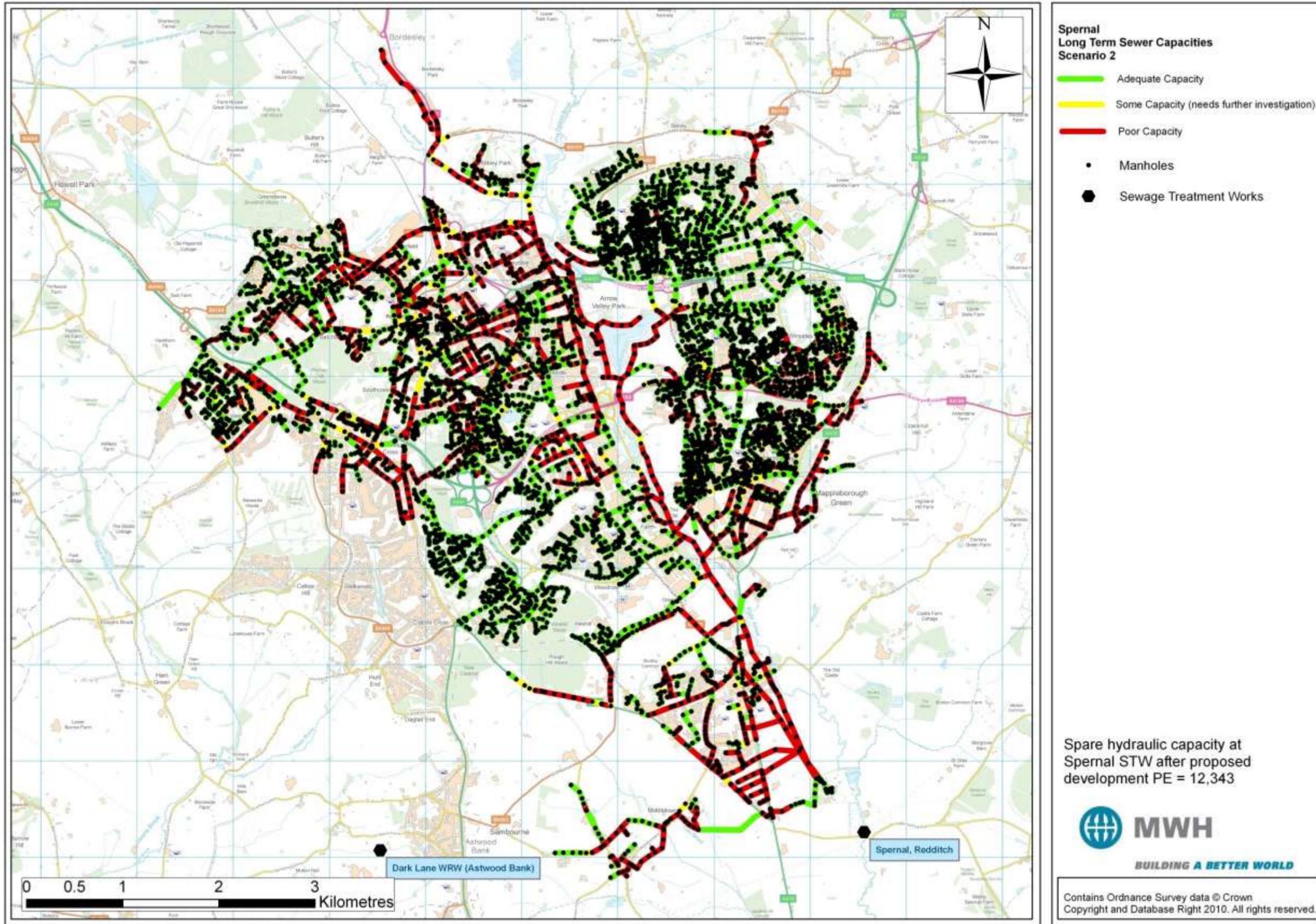
APPENDIX 15 PREDICTED SEWER CAPACITIES – PRIEST BRIDGE AND ASTWOOD BANK DAPS SCENARIO 2



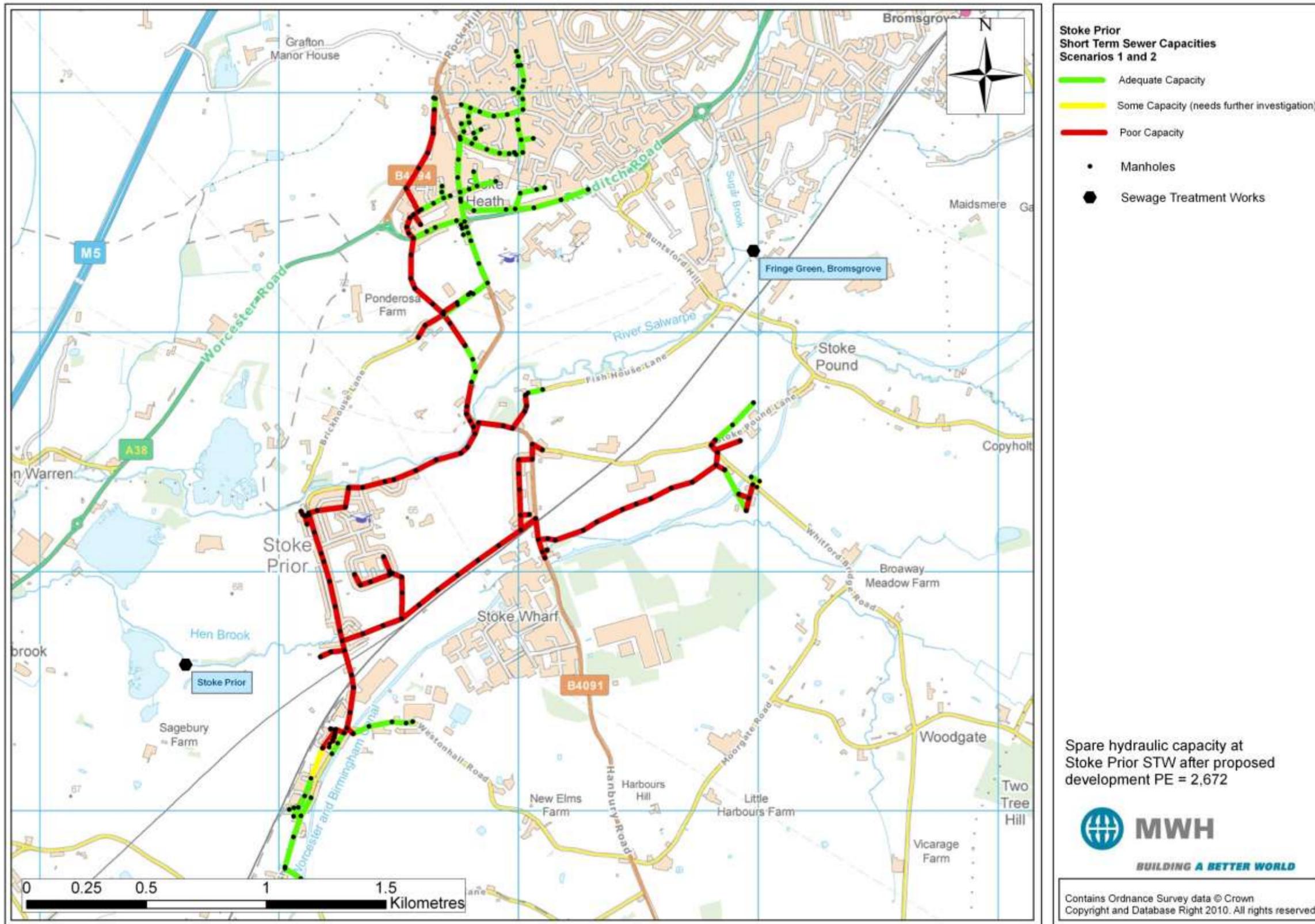
APPENDIX 16 PREDICTED SEWER CAPACITIES – SPERNAL DAP SCENARIO 1



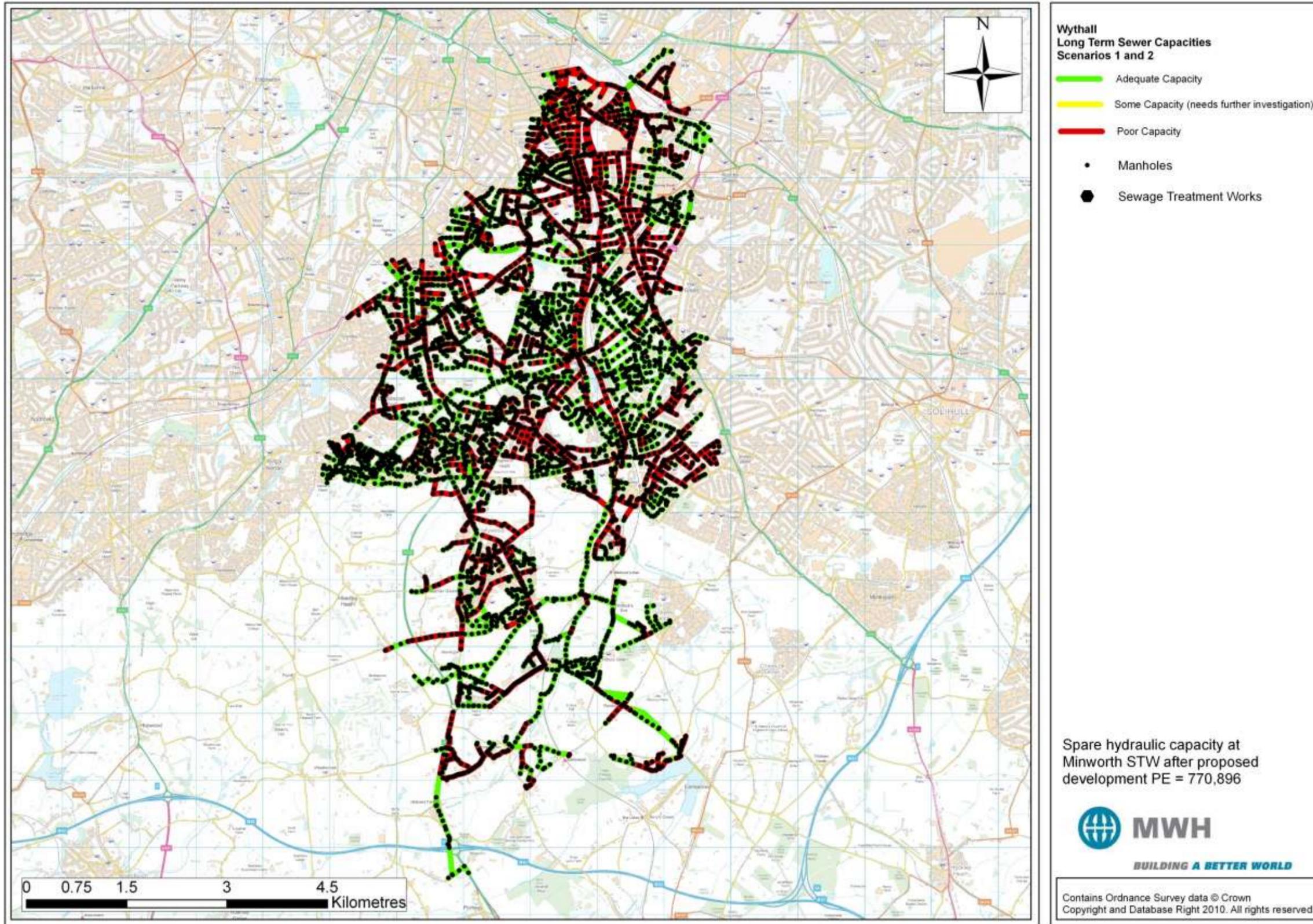
APPENDIX 17 PREDICTED SEWER CAPACITIES – SPERNAL DAP SCENARIO 2



APPENDIX 18 PREDICTED SEWER CAPACITIES – STOKE PRIOR DAP SCENARIOS 1 AND 2



APPENDIX 19 PREDICTED SEWER CAPACITIES – WYTHALL DAP SCENARIOS 1 AND 2



APPENDIX 20 STWL HIGH-LEVEL ASSESSMENT OF DEVELOPMENT SITE IMPACTS ON WASTEWATER TREATMENT IN BROMSGROVE DISTRICT AND REDDITCH BOROUGH

Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Alvechurch						
BDC170	Birmingham Road, Alvechurch	36	Unknown	Alvechurch STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
ALV6	(Part of) Land adjacent to Crown Meadow, Alvechurch	25	11 - 18 yrs	Alvechurch STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC95	50,52 & 54 Red Lion Street (rear of), Alvechurch	10	< 5 yrs	Alvechurch STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Bromsgrove						
BDC20	Perryfields Road, Bromsgrove	1,500	6 - 10 yrs	Bromsgrove STW	<p>This is a significant development located on the opposite site of the sewerage catchment in relation to Bromsgrove sewage treatment works. Due to the layout of the site foul flows are expected to impact different parts of the existing sewerage system.</p> <p>The north east part of the site (east of Fockbury Mill Lane / north of Perryfields Road) is likely to connect upstream of known internal sewer flooding problems. As part of our sewer flooding alleviation programme a project is currently assessing potential solutions to address this capacity problem and so upstream development should not commence until these improvements have been completed.</p> <p>The area to the south of Fockbury Mill Lane is likely to drain to existing sewers in Crabtree Lane, Grayshot Close and potentially Kidderminster Road. All these existing sewers are only small diameter (225 mm dia.) and only designed to accommodate existing local flows and so connection of 800-1,000 new dwellings to these sewers is expected to require localised capacity improvements. Further downstream there are several known external flooding problems which may also require capacity enhancements. Further detailed hydraulic modelling will be required to confirm the extent of capacity improvements but it is envisaged that capacity improvements will be required due to the size of the development. It is expected that surface water would be managed sustainably and not connected to the foul / combined sewerage system.</p>	Medium / High - the potential size and location of this site in relation the existing sewerage system.



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Bromsgrove						
BDC80	Whitford Road, Bromsgrove	500	6 - 10 yrs	Bromsgrove STW	Ground topography indicates that this site would drain towards an existing 225 / 300 mm dia. sewer in Deanway which runs east across Sanders Park. There are no known sewer flooding problems downstream of this development but due to its size and location in relation to existing sewerage system it is envisaged that some localised capacity improvements may be required. Whilst further hydraulic modelling will be required to confirm the extent of any capacity enhancements it is not envisaged to be significant provided surface water is managed sustainably and is not connected to the foul / combined sewers.	Low / Medium - localised capacity issues may be required
BDC81	Norton Farm, Birmingham Road, Bromsgrove	350	6 - 10 yrs	Bromsgrove STW	Ground topography indicates that this site is likely to drain south east towards existing 375 mm dia. foul sewers running south along Birmingham Road. Whilst dry weather flows pass through the town centre there is a bifurcation just downstream of the development which diverts excess storm flows to a separate sewerage system to the east of the town centre. There are no known sewer flooding problems in the vicinity of the development but there are some known problems in the High Street area in Bromsgrove town centre. A solution to alleviate internal flooding problems is currently deferred due to high solution cost but this property is protected using anti flood measures. Further hydraulic analysis would be required to assess the hydraulic impact of this development but provided surface water is not connected to the foul sewer any capacity improvements are not envisaged to be significant.	Low / Medium - localised capacity issues may be required



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Bromsgrove						
BDC85	Land adjacent to Wagon Works, St Godwald's Road, Bromsgrove	212	Unknown	Bromsgrove STW	This site is adjacent to an existing residential development which drains to a sewage pumping station off Scaife Road which then pumps via a 100 mm diameter rising main across the railway to discharge to 225 mm dia. gravity sewers in Stoke Road. This development is likely to double the current foul flows draining to the pumping station and so subject to further hydraulic pumping capacity checks this pumping station may need to be upsized / replaced. Due to the topography of the site an additional pumping station may be required and so this could be incorporated as part of the existing pumping station relocation depending on site drainage layout.	Low / Medium - likely pumping station replacement
BDC168 (A & B)	The Council House, Burcot Lane, Bromsgrove	51	6 - 10 yrs	Bromsgrove STW	As this is a redevelopment of an existing site, the additional foul flows generated from 51 replacement residential units is not envisaged to have any capacity constraints provided subject to ensuring no surface water from the site is connected to the foul / combined sewers	Low (subject to hydraulic modelling)
BDC163	Finstall Training Centre, Stoke Road, Bromsgrove	16	< 5 yrs	Bromsgrove STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC166	88 Birmingham Road, Bromsgrove	15	< 5 yrs	Bromsgrove STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Bromsgrove						
BDC45	RMC House, Church Lane, Bromsgrove	13	< 5 yrs	Bromsgrove STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC192	Burcot Lane	10	-	Bromsgrove STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC148	Meadows First School, Stourbridge Road, Bromsgrove	9	< 5 yrs	Bromsgrove STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC149	233 Worcester Road, Bromsgrove	9	< 5 yrs	Stoke Prior STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
Lickey End						
BDC152	30 Alcester Road, Bromsgrove	5	< 5 yrs	Bromsgrove STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Hagley						
BDC35B	Kidderminster & Stourbridge Road, Hagley	255	11 - 18 yrs	Roundhill STW	Ground topography indicates that sites 'BDC35B' and 'BDC49' would drain to existing sewers in Kidderminster Road (225 mm dia.) or Western Road (150 mm dia.) which eventually drain south west along Worcester Road (only 225 mm dia.). There is a known internal sewer flooding problem affecting a single property on Worcester Road where flood alleviation works are currently deferred due to the unduly high c£600,000 solution cost (this property is currently protected from flooding by anti flood devices). Connection of 255 + 58 new dwellings to an existing 225 mm dia. sewer with known capacity problems will require further detailed hydraulic modelling to evaluate how to accommodate additional flows from this development.	Medium - known sewer flooding problems and small diameter sewers
BDC49	Gallows Brook Pig Farm, Kidderminster Road, Hagley	58	11 - 18 yrs	Roundhill STW		
BDC189	Strathearn, Western Road, Hagley	79	11 - 18 yrs	Roundhill STW	This comment refers to sites 'BDC189', 'BDC51' and 'BDC188'. Whilst there is an existing 225 mm dia. sewer to the south east of these sites running along Western Road the ground topography suggests part of the site would need to be pumped or alternatively drain to the 150 mm dia. sewer in Western Road (to the south west of the sites). Connection to the 225 mm dia. sewer will bypass a known flooding problem affecting a single property on Worcester Road but there are still envisaged to be capacity issues in this area. Connection of a total of 168 new dwellings to an existing 225 mm dia. sewer with known capacity problems will require further detailed hydraulic modelling to evaluate how to accommodate additional flows from this development.	Medium - known sewer flooding problems and small diameter sewers
BDC51	Land at Algoa House, Western Road, Hagley	49	11 - 18 yrs	Roundhill STW		
BDC188	Rose Cottage, Thicknall Cottage and Land at rear of Western Road, Hagley	40	11 - 18 yrs	Roundhill STW		



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Hagley						
BDC160	Hagley Former Middle School, Park Road, Hagley	15	< 5 yrs	Roundhill STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC102	7 & 9 Worcester Road, Hagley	12	< 5 yrs	Roundhill STW	There is a known infrequent external highway flooding immediately outside this site. However provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from 12 new dwellings is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC50	33 - 41 Western Road, Hagley	6	< 5 yrs	Roundhill STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
Marlbrook						
BDC112	3 - 15 Marlbrook Lane & 203 - 215 Old Birmingham Road, Marlbrook	26	< 5 yrs	Bromsgrove STW	This site is located near to a localised sewer capacity constraint which has resulted in a known (infrequent) internal flooding problem. Further detailed modelling will be required to assess the potential impact of this development but provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any significant capacity issues.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Blackwell						
BDC122	4, 4a, 6, 8 & 10 St Catherine's Road, Blackwell	8	< 5 yrs	Bromsgrove STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
Belbroughton						
BDC37	2 - 4 Hartle Lane, Belbroughton	12	6 - 10 yrs	Belbroughton STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
Rubery						
BDC65	The Avenue, Rubery	91	< 5 yrs	Minworth STW	This appears to be a redevelopment of existing industrial units and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul / combined sewer is dis-connected. The site is upstream on known flooding problems which are currently being appraised as part of our sewer flooding investment programme for anticipated completion in 2011. On completion the size of this redevelopment site is not expected to cause any capacity issues provided storm water is not connected to the foul system. NOTE: there is an existing 225 mm dia. foul water sewer crossing this site.	Low - known hydraulic problems due to be resolved in 2011



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Catshill						
BDC93	Church Road (land off), Catshill	100	11 - 18 yrs	Bromsgrove STW	There are no known sewer flooding problems downstream of this site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
BDC9	45 - 47 Woodrow Lane, Catshill	6	< 5 yrs	Bromsgrove STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
Barnt Green						
BDC92	Kendal End Road (land at), Barnt Green	98	11 - 18 yrs	Alvechurch STW	There are no known sewer flooding problems downstream of this site although there is a combined sewer overflow immediately downstream. Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)
Wythall						
BDC66	Bleakhouse Farm, Station Road, Wythall	163	11 - 18 yrs	Minworth STW	Ground topography indicates this site is likely to connect to an existing 450 mm dia. sewer running to the north west of the site across open farmland. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Residential						
Wythall						
BDC86	Selsdon Close, Wythall	76	11 - 18 yrs	Minworth STW	Ground topography indicates this site is likely to connect to an existing 225 mm dia. sewer running along the northern boundary of the site before crossing the railway and then across open farmland. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Bromsgrove District Council						
Bromsgrove - Employment						
7	Saxon & Harris Business Park (Hanbury Road, Stoke Prior, B60)	50	TBC	Stoke Prior STW	As this appears to be a redevelopment of existing industrial units and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul / combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)
2	Ravensbank Business Park (Ravensbank Drive, near Redditch, B98)	30	TBC	Redditch (Spernal) STW	As this appears to be a redevelopment of existing industrial units and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul / combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)
11	Ravensbank ADR (BE3) (Hedera Road, Redditch, B98)	10.3	TBC	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
'Strategic' Sites						
St10	Town Centre, Northwest Quadrant	4.6	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul / combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted / relocated as part of any redevelopment.	Low (subject to hydraulic modelling)
St2	Winyates, Redditch	2.5	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul / combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
'Strategic' Sites						
St4	Woodrow, Redditch	1.7	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul / combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted / relocated as part of any redevelopment.	Low (subject to hydraulic modelling)
St8	Edward Street	0.5	Not stated	Redditch (Spernal) STW	This site appears to be redevelopment and so as part of any redevelopment consideration should be made to ensure any surface water currently draining to the foul / combined sewer is dis-connected. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
2010/12	Webheath ADR	600	6-10 yrs / 10+yrs	Priest Bridge STW OR Redditch (Spernal) STW	This site is located on the edge of the Priest Bridge and Redditch (Spernal) sewage treatment works catchments and so could potentially drain to either catchment depending on the sewer connection point. The ground contours indicate that most of the site will not be able to connect to the existing sewerage system without needing to be pumped and so this gives some flexibility over potential point of connection but either way the sewers in the immediate vicinity are only small diameter (150 / 225mm dia.) and so are likely to require upsizing to provided additional capacity to accommodate pumped flows from 600 dwellings. Further hydraulic modelling will be required to assess the extent of any capacity improvements.	Medium / Large development upstream of small dia. sewerage system(s)
2010/11	Brockhill ADR	425	1 - 5 yrs / 6 - 10 yrs	Redditch (Spernal) STW	These two sites ('2010/11' & '2010/13') are located upstream of small diameter sewerage systems and whilst there are no known sewer flooding problems downstream there is unlikely to be spare capacity to accommodate the additional foul flows from up to 825 new dwellings. Further hydraulic modelling will be required to confirm the extent of any capacity improvements once potential connection points have been identified.	Medium / Large development(s) upstream of small dia. sewerage system(s)
2010/13	Brockhill Green Belt	400	1 - 5 yrs			
2010/10	A435 ADR	360	10+ yrs	Redditch (Spernal) STW	This site is shown as a thin 2.8 km strip of development land along the south east of the Redditch sewerage system and so it has not been possible to assess where the 360 new dwellings would be located. There are numerous sewers which could serve this site depending whether the housing allocation is concentrated in a single area or in several smaller development pockets. There are no known sewer flooding problems in this part of Redditch and so depending of the concentration of housing / location, significant capacity issues are not envisaged (subject to detailed hydraulic modelling).	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
2010/14	Foxlydiate Green Belt	230	10+ yrs	Redditch (Spernal) STW	This site is located upstream of small diameter sewerage systems and whilst there are no known sewer flooding problems downstream it is envisaged that some localised capacity enhancements may be required to accommodate the additional foul flows from 230 new dwellings. Further hydraulic modelling will be required to confirm the extent of any capacity improvements once potential connection points have been identified.	Low / Medium (subject to hydraulic modelling)
2010/09	RO Alexandria Hospital	145	6 - 10 yrs	Redditch (Spernal) STW	There is a known isolated highway flooding problem to the south off the site affecting Green Lane. However the site is crossed by a 300 mm dia. foul water sewer which does not have any known flooding problems. Subject to hydraulic modelling accommodation of the additional foul flows from 145 new dwellings is not envisaged to require and significant capacity improvements.	Low (subject to hydraulic modelling)
LP05	Windsor Road Gas Works (LP147)	140	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul / combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted / relocated as part of any redevelopment.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
CS 8.38	Dingleside Middle School & playing field and land rear of 1-11 Auxerre Avenue	120	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)
2010/07	Prospect Hill	61	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul / combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)
RB03	Widney House, Bromsgrove Road	58	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
CS01	Church Hill District Centre	57	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul / combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted / relocated as part of any redevelopment.	Low (subject to hydraulic modelling)
WYG04	Marfield Farm School	53	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)
LPX04	Former Claybrook School, Matchborough	36	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
LPX05	Land at Millfields, Fire Station and RO Fire Station	35	1 - 5 yrs	Redditch (Spernal) STW	As this site appears to involve redevelopment consideration should be given to ensuring any surface water currently draining to the foul / combined sewer is dis-connected as part of redevelopment. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted / relocated as part of any redevelopment.	Low (subject to hydraulic modelling)
LPX07	South of Scout Hut, Oakenshaw Road	32	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)
LPX06	Former Ipsley School playing field	31	1 - 5 yrs	Redditch (Spernal) STW	There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling). NOTE: there are several public sewers crossing this site which may need to be diverted/relocated as part of any redevelopment.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
2010/04	Upper Norgrove House	27	1 - 5 yrs	Priest Bridge STW	Also see comment for site '2010/12'. There are no known sewer flooding problems downstream of the site and so provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues (subject to hydraulic modelling).	Low (subject to hydraulic modelling)
LP03	Rear of 144 - 162 Easemore Road (LP135)	24	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
LP06	Mayfield Works	18	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
CS03	Matchborough District Centre	17	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
LPX02	Adjacent Castleditch Lane / Pheasant Lane	16	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)

Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
L4L02	Land off Wirehill Drive (08/305)	15	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
WYG03	Tanhouse Lane	14	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
2010/27	Sandycroft, West Avenue	10	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
2010/03	Loxley Close	10	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
UCS 2.16	Rear of Sandygate Close	8	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
LP16	Land at Tidbury Close (07/214)	6	1 - 5 yrs	Priest Bridge STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Redditch						
LP13	Land off Torrs close	6	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
2010/05	Clifton Close	6	1 - 5 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
WYG02	Peterbrook Close (08/303ol)	5	6 - 10 yrs	Redditch (Spernal) STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
UCS 2.14	Land adjacent Saltways Cheshire Home (08/073)	5	1 - 5 yrs	Priest Bridge STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)
LP02	Brush Factory, Evesham Road, Crabbs Cross (LP124)	4	1 - 5 yrs	Priest Bridge STW	Provided surface water is managed sustainably and is not connected to the foul / combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)



Site Ref.	Site Name	Potential Dwellings or Site Area (ha)	Timescale	Sewage Treatment Works Catchment	Sewerage Comment – Based on Readily Available Information But Not Subjected to Hydraulic Analysis	Potential Impact on Sewerage Infrastructure
Redditch Borough Council						
Residential						
Astwood Bank						
WYG06	High Trees, Dark Lane (09/259)	5	1 - 5 yrs	Astwood Bank STW	Provided surface water in managed sustainably and is not connected to the foul/combined water sewers, the additional foul only flows generated from this development is not envisaged to have any capacity issues.	Low (subject to hydraulic modelling)

APPENDIX 21 ALLOCATION OF REDDITCH BOROUGH DEVELOPMENT SITES TO STW CATCHMENTS

Development Site Description	Receiving STW	Unique ID	Total Area (ha)	Capacity from SHLAA
High Trees, Dark Lane (09/259)	Astwood Bank	WYG06	0.70	5
Land at Tidbury Close (07/214)	Priest Bridge	LP16	0.12	6
Adjacent Castleditch Lane / Pheasant Lane		LPX02	0.52	16
Land adjacent Saltways Cheshire Home (08/073)		UCS 2.14	0.40	5
Upper Norgrove House ¹⁷⁹		2010/04	1.22	27
Webheath ADR		2010/12	47.71	600
Brush Factory, Evesham Road, Crabbs Cross (LP124)	Spernal	LP02	0.09	4
Rear of 144 - 162 Easemore Road (LP135)		LP03	0.43	24
Windsor Road Gas Works (LP147)		LP05	5.68	140
Mayfield Works		LP06	0.19	18
Land off Torrs close		LP13	0.09	6
Former Claybrook School, Matchborough		LPX04	0.74	36
Land at Millfields, Fire Station and rear of Fire Station		LPX05	1.36	35
Former Ipsley School playing field		LPX06	0.93	31
South of Scout Hut, Oakenshaw Road		LPX07	1.02	32
Church Hill District Centre		CS01	2.25	57
Matchborough District Centre		CS03	0.92	17
Peterbrook Close (08/303ol)		WYG02	0.16	5
Tanhouse Lane		WYG03	0.57	14
Marlfield Farm School		WYG04	1.41	53
Widney House, Bromsgrove Road		RB03	2.24	58
Land off Wirehill Drive (08/305)		L4L02	0.47	15
Rear of Sandygate Close		UCS 2.16	0.20	8
Dingleside Middle School & playing field and land rear of 1-11 Auxerre Avenue		UCS 8.38	3.95	120
Loxley Close		2010/03	0.31	10
Clifton Close		2010/05	0.15	6
Prospect Hill	2010/07	1.43	61	

¹⁷⁹ Is part of Webheath ADR (2010/12)



Development Site Description	Receiving STW	Unique ID	Total Area (ha)	Capacity from SHLAA
Rear of Alexandria Hospital		2010/09	7.74	145
A435 ADR		2010/10	33.43	360
Brockhill ADR		2010/11	25.5	425
Brockhill Green Belt		2010/13	27.73	400
Foxlydiat Green Belt		2010/14	22.16	230
Sandycroft, West Avenue		2010/27	0.35	10

Development Site Description	Receiving STW	Unique ID	Total Area (ha)
North of Red Ditch, Enfield	Spernal	EL01	6.6
Nash Road, Redditch		EL02	0.4
Park Farm Industrial Estate, Redditch		EL03	1.1
Land East of Brockhill		EL04	3.5
Green Lane, Wirehill		EL05	0.5
A435 Segment 2		EL06	10.44
Old Forge Drive, Redditch		EL07	1.32
Studley Road, Redditch		EL08	0.38
Enfield Industrial Estate, Redditch		EL09	0.9
Merse Road, Moons Moat, Redditch		EL10	0.65
Bartlett Road, Redditch		EL11	0.62
Palmers Road, Redditch		EL12	0.29
UCS 7.5		EL13	0.19
UCS 9.19		EL14	0.19
UCS 9.58		EL15	0.6
Washford Industrial Estate, Redditch		EL16	0.22
Edward Street		EL17	0.47

**APPENDIX 22 ALLOCATION OF BROMSGROVE DISTRICT DEVELOPMENT SITES TO STW CATCHMENTS**

Development Site Description	Receiving STW	Unique ID	Total Area (ha) ¹⁸⁰	Density from SHLAA	Capacity from SHLAA
Birmingham Road, Alvechurch	Alvechurch	BDC170	1.067	40	36
(part of) Land adj to Crown Meadow, Alvechurch		ALV6	0.595	40	25
50, 52 & 54 Red Lion Street (rear of), Alvechurch		BDC95	0.25	40	10
Kendal End Road (land at), Barnt Green		BDC92	5.00	30	98
2 - 4 Hartle Lane, Belbroughton	Belbroughton	BDC37	0.25	48.4	12
45 - 47 Woodrow Lane, Catshill	Bromsgrove	BDC9	0.202	30	6
4, 4a, 6, 8, & 10 St Catherine's Road, Blackwell		BDC122	0.95	8.4	8
88 Birmingham Road, Bromsgrove		BDC166	0.29	50	15
Land adj to Wagon Works, St Godwald's Road, Bromsgrove		BDC85	7.80	30	212
30 Alcester Road, Bromsgrove		BDC152	0.105	50	5
Perryfields Road, Bromsgrove		BDC20	69.74	40	1,500
3 - 15 Marlbrook Lane & 203 - 215 Old Birmingham Road, Marlbrook		BDC112	1.00	30	26
Finstall Training Centre, Stoke Road, Bromsgrove		BDC163	0.48	40	16
RMC House, Church Lane, Bromsgrove		BDC45	0.26	50	13
Church Road (land off), Catshill		BDC93	6.10	16.4	100
Norton Farm, Birmingham Road, Bromsgrove		BDC81	12.00	40	350
Meadows First School, Stourbridge Road, Bromsgrove		BDC148	0.80	11.3	9
Whitford Road, Bromsgrove		BDC80	24.00	32	500
The Council House, Burcot Lane, Bromsgrove		BDC168 (A&B)	1.213	50	51
Burcot Lane, Bromsgrove ^{181 182}		BDC192	0.28	35	10
Bleakhouse Farm, Station Road, Wythall	Minworth	BDC66	6.30	40	163
Selsdon Close, Wythall		BDC86	3.10	40	76
The Avenue, Rubery		BDC65	3.50	40	91
Land at Algoa House, Western Road,	Roundhill	BDC51	1.44	40	49

¹⁸⁰ Site area taken from the Bromsgrove SHLAA 2009¹⁸¹ Site BDC192 not included in SHLAA 2009¹⁸² Density and Capacity derived using the methodology in the SHLAA, assumed density of 35 dwellings per hectare

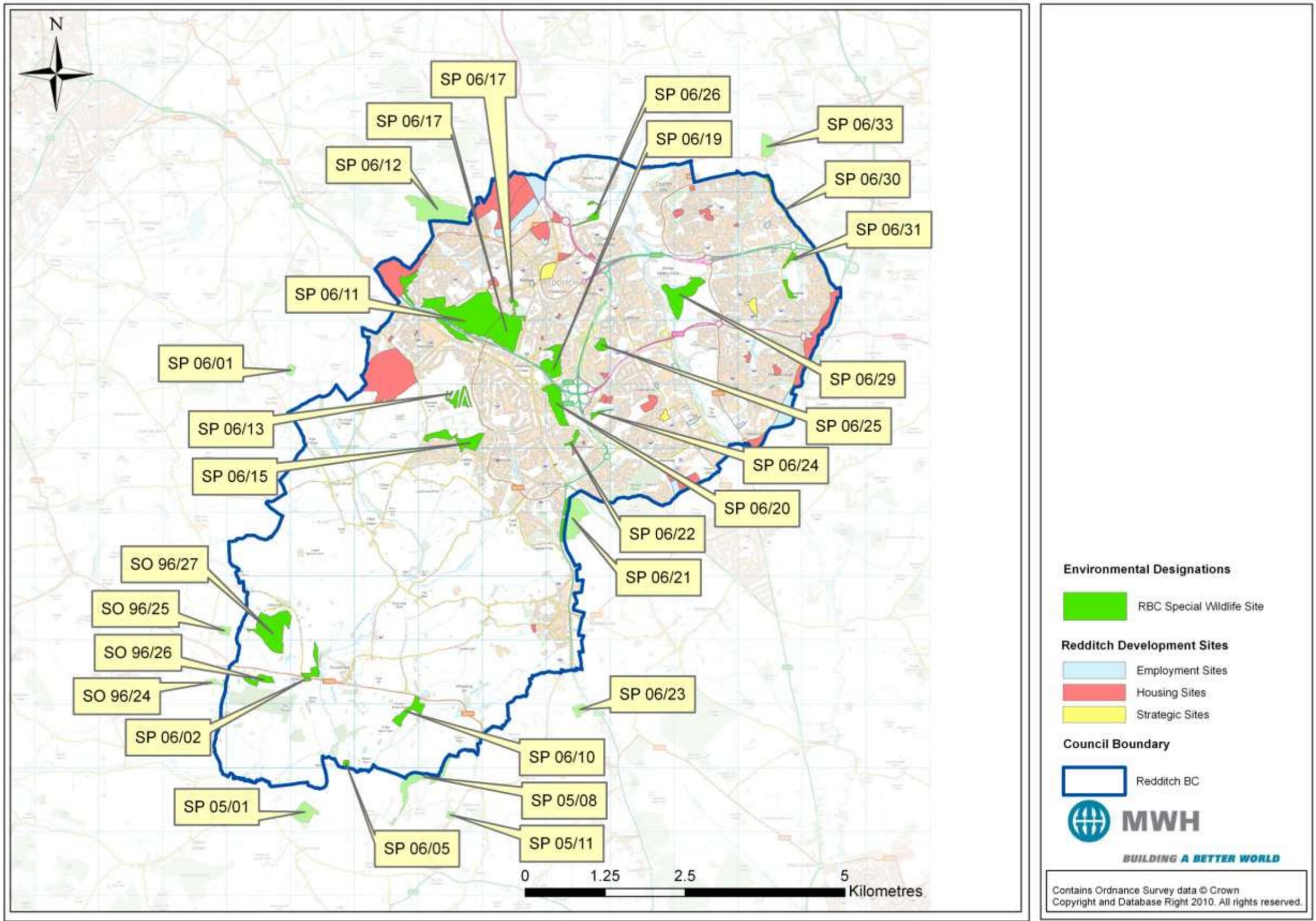


Development Site Description	Receiving STW	Unique ID	Total Area (ha) ¹⁸⁰	Density from SHLAA	Capacity from SHLAA
Hagley					
Rose Cottage, Thicknall Cottage and Land at rear of Western Road, Hagley		BDC188	1.20	40	40
7 & 9 Worcester Road, Hagley		BDC102	0.239	50	12
Kidderminster & Stourbridge Road, Hagley		BDC35B	9.80	40	255
33 - 41 Western Road, Hagley		BDC50	0.43	13.95	6
Strathearn, Western Road, Hagley		BDC189	3.05	40	79
Gallows Brook Pig Farm, Kidderminster Road, Hagley		BDC49	1.710	40	58
Hagley Former Middle school, Park Road, Hagley		BDC160	0.60	30	15
233 Worcester Road, Bromsgrove	Stoke Prior	BDC149	0.13	69.2	9

Development Site Description	Receiving STW	Unique ID	Total Area (ha)	Vacant Area (ha)
Saxon & Harris Business Park	Stoke Prior	Site 7	50	1.8
Perryfields Road, Bromsgrove	Bromsgrove	BDC20	5	5

**APPENDIX 23 REDDITCH BOROUGH SPECIAL WILDLIFE SITES**

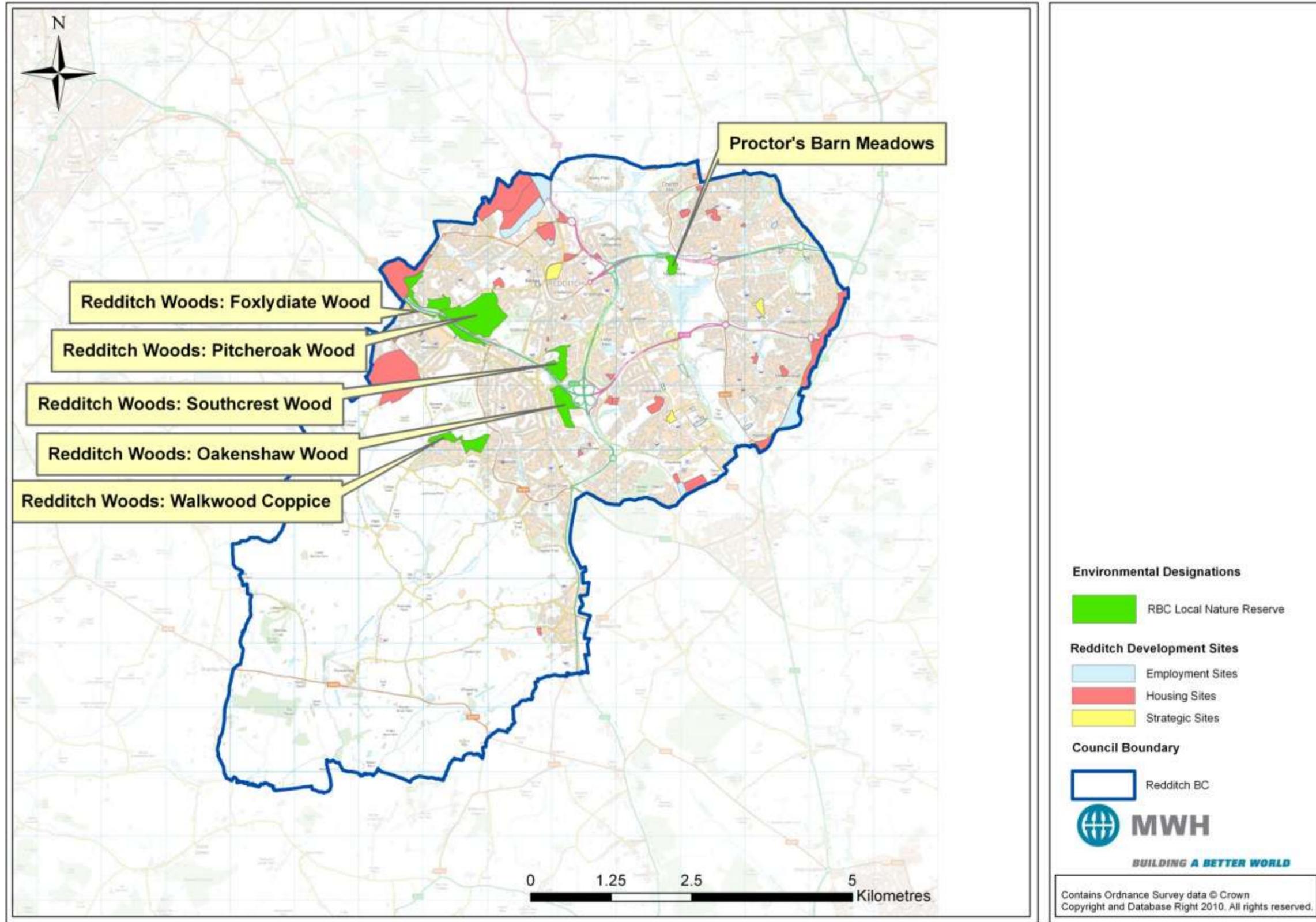
Redditch Borough Special Wildlife Sites	
SP 06/31 Ipsley Alders Marsh	SP 06/25 Lodge Pool
SP 05/11 Holberrow Green Meadow	SP 06/29 Arrow Valley Park Lake
SP 06/05 Brandon Brook Meadow	SP 06/30 Ravensbank Drive Bridle Track
SP 05/08 Lady's Coppice & Morton Bank	SP 06/12 Brockhill Wood
SP 06/23 Astwood Meadows	SP 06/20 Oakenshaw Wood
SO 96/27 Berrow Hill	SP 06/22 Oakenshaw Spinney
SP 06/02 Brookhouse Meadow and Feckenham Bank	SP 06/24 Oakenshaw Fenny Rough
SP 06/01 Callow Farm Meadow	SP 06/21 New Coppice
SP 06/33 Holt End Meadows	SP 06/13 Downsell Wood
SO 96/24 Old Rectory Meadows	SP 06/26 Abbey Forge and Mill Pond
SO 96/25 Bradley Green Meadows	SP 06/15 Walkwood Coppice
SP 06/10 Shurnock Meadows	SP 06/19 Southcrest Wood
SP 05/01 Gannow Wood	SP 06/11 Foxlydiate and Pitcher Oak Woods
SO 96/26 Upper Beanhall Meadows	SP 06/17 Pitcher Oak Golf Course



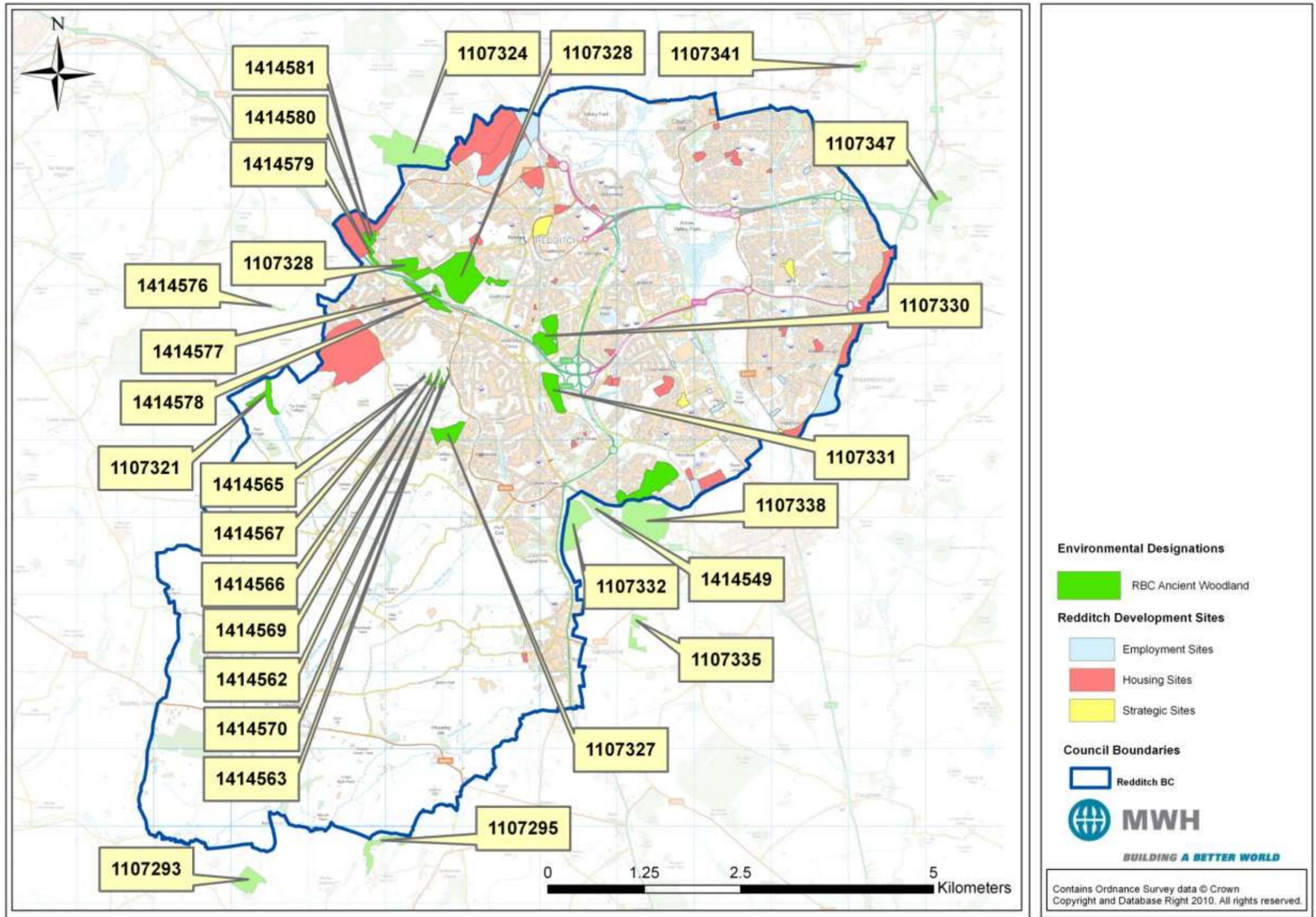
- Environmental Designations**
- RBC Special Wildlife Site
- Redditch Development Sites**
- Employment Sites
 - Housing Sites
 - Strategic Sites
- Council Boundary**
- Redditch BC
- MWH**
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APPENDIX 24 REDDITCH BOROUGH LOCAL NATURE RESERVES



APPENDIX 25 REDDITCH BOROUGH ANCIENT WOODLAND



Environmental Designations

■ RBC Ancient Woodland

Redditch Development Sites

- Employment Sites
- Housing Sites
- Strategic Sites

Council Boundaries

Redditch BC

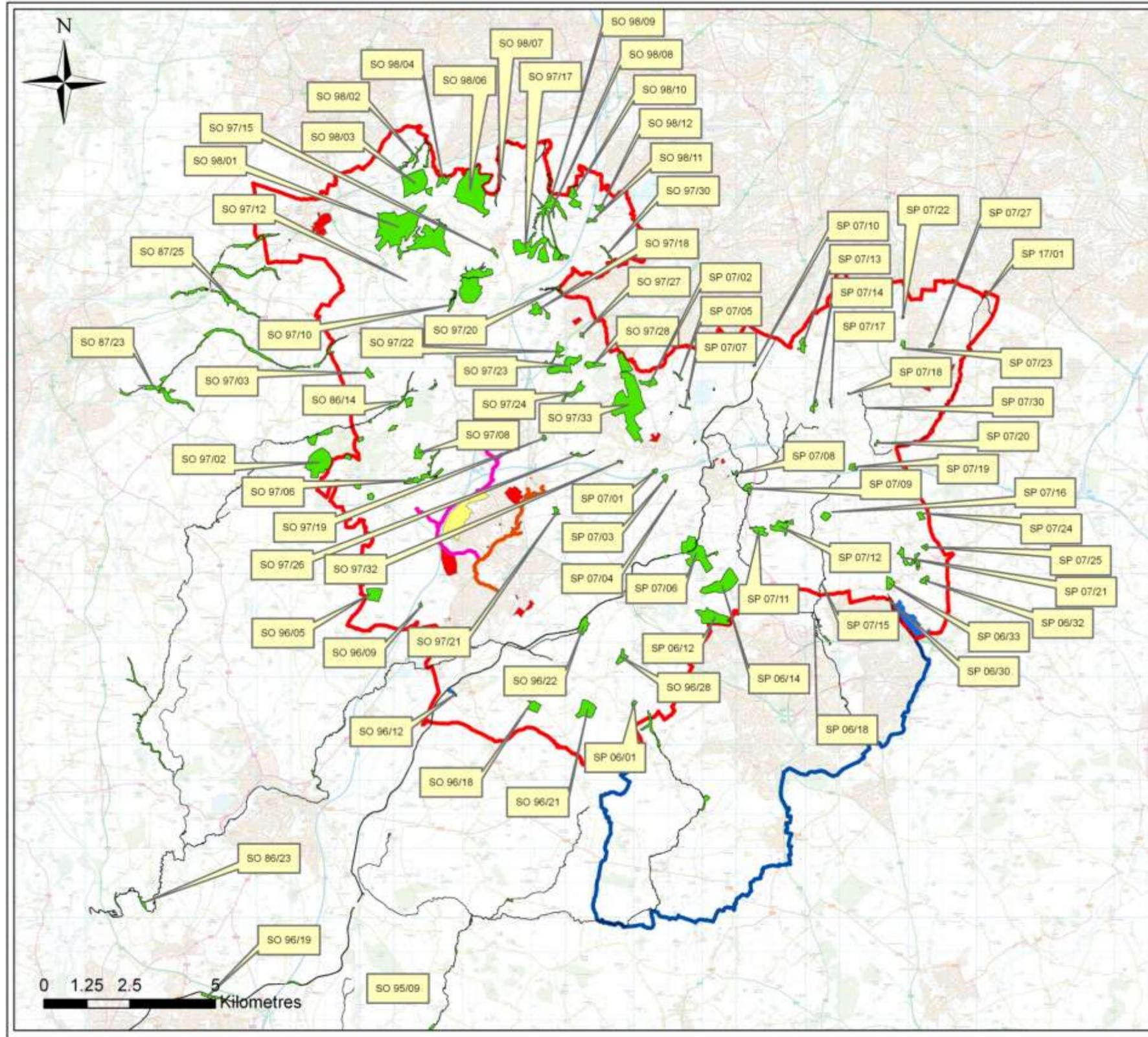


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APPENDIX 26 BROMSGROVE BOROUGH LIST OF SPECIAL WILDLIFE SITES

List of Special Wildlife Sites			
SP 07/10	Hopwood Dingle	SO 98/09	Twiland Wood
SO 97/20	Gannow Green	SO 97/17	Ell Wood Complex
SO 96/22	Tardebigge Reservoir	SO 97/32	Linthurst Wood
SP 17/01	Stratford upon Avon Canal	SO 97/27	Whetty Coppice
SP 07/08	Alvechurch Playing Fields	SP 07/16	Storage Wood
SP 07/22	Dark Lane Meadow	SP 06/14	Butler's Hill Wood
SP 07/13	Redhill Complex	SP 07/21	Carpenter's Hill Wood and Prior Fields Complex
SP 07/27	Wythall Meadow	SP 07/07	Ponds around the Bittell Reservoirs
SP 07/04	Meadow near Foxhill House	SO 96/09	Grafton Manor Pool
SP 06/01	Callow Farm Meadow	SP 06/12	Brockhill Wood
SP 06/33	Holt End Meadows	SO 96/21	The Thrift
SO 97/15	Romsley Hill Farm Meadows	SO 98/07	Breach Dingle and the River Stour
SO 97/08	Great Dodford Meadows	SO 96/18	Two Tree Hill Wood
SO 97/03	Hill Farm Meadows	SO 96/28	Brotherton's Wood
SO 97/18	Waseley Hills Country Park	SO 97/19	Round Hill
SO 97/21	Burcot Lane Meadow	SO 97/30	Egghill Dingle
SP 07/24	Lion Wood	SP 07/14	Swanshill Wood
SO 97/33	Lickey Hills	SP 07/25	Branson's Cross Wood
SO 98/06	Uffmoor Wood	SO 96/05	Cobbler's Coppice
SP 07/01	Cock's Croft Wood	SO 96/12	Land near Stoke Works
SO 97/28	Beacon Hill	SP 07/12	Rowney Green
SP 07/03	Cooper's Hill Wood	SP 07/23	Pond near Batemans Green
SP 06/32	Pinkgreen Wood	SO 97/06	Dodford Dingle
SO 98/12	Raven Hays Wood	SO 98/02	Wassell Grove Dingle
SP 07/20	Ponds north of Watery Lane	SO 97/23	Beacon Wood & Chadwich Wood
SP 07/18	Pond at Golf Course	SP 07/02	Cofton Reservoir
SO 97/24	The Roughlands	SO 98/08	Hunnington Disused Railway
SO 98/03	Hagley Wood	SO 98/04	Bogs Wood Complex
SO 98/01	Clent Hills	SO 97/02	Chaddesley & High Woods Complex
SO 97/12	Great Farley and Dale Woods	SP 07/06	Shortwood Rough Grounds
SO 97/10	Sling Pool and Marsh	SP 07/30	River Cole
SO 97/22	Broadmoor Wood & Chadwich Manor Ponds	SO 87/23	Hoo & Barnett Brook
SO 98/10	Kettles Wood	SO 87/25	Churchill & Blakedown Valleys
SP 07/17	Lake at Mount Pleasant	SO 86/14	Hadley, Elmley & Hockley Brooks
SP 07/19	Moorfield Coppice	SP 06/30	Ravensbank Drive Bridle Track
SO 97/26	Shepley Marsh	SP 06/18	River Arrow
SP 07/11	Peck Wood	SO 95/09	Bow, Shell, Swan and Seeley Brooks
SP 07/05	Cofton Plantation	SP 07/15	Dagnell Brook
SP 07/09	Old Fish Ponds	SO 86/23	River Salwarpe
SO 98/11	Frankley Green Wood	SO 96/19	Worcester and Birmingham Canal



Environmental Designations

Special Wildlife Sites

Proposed SWS

Battlefield Brook

Spadesbourne Brook

Bromsgrove Development Sites

BDC Mixed Housing & Employment

BDC Employment Sites

BDC Housing Sites

Council Boundaries

Bromsgrove DC

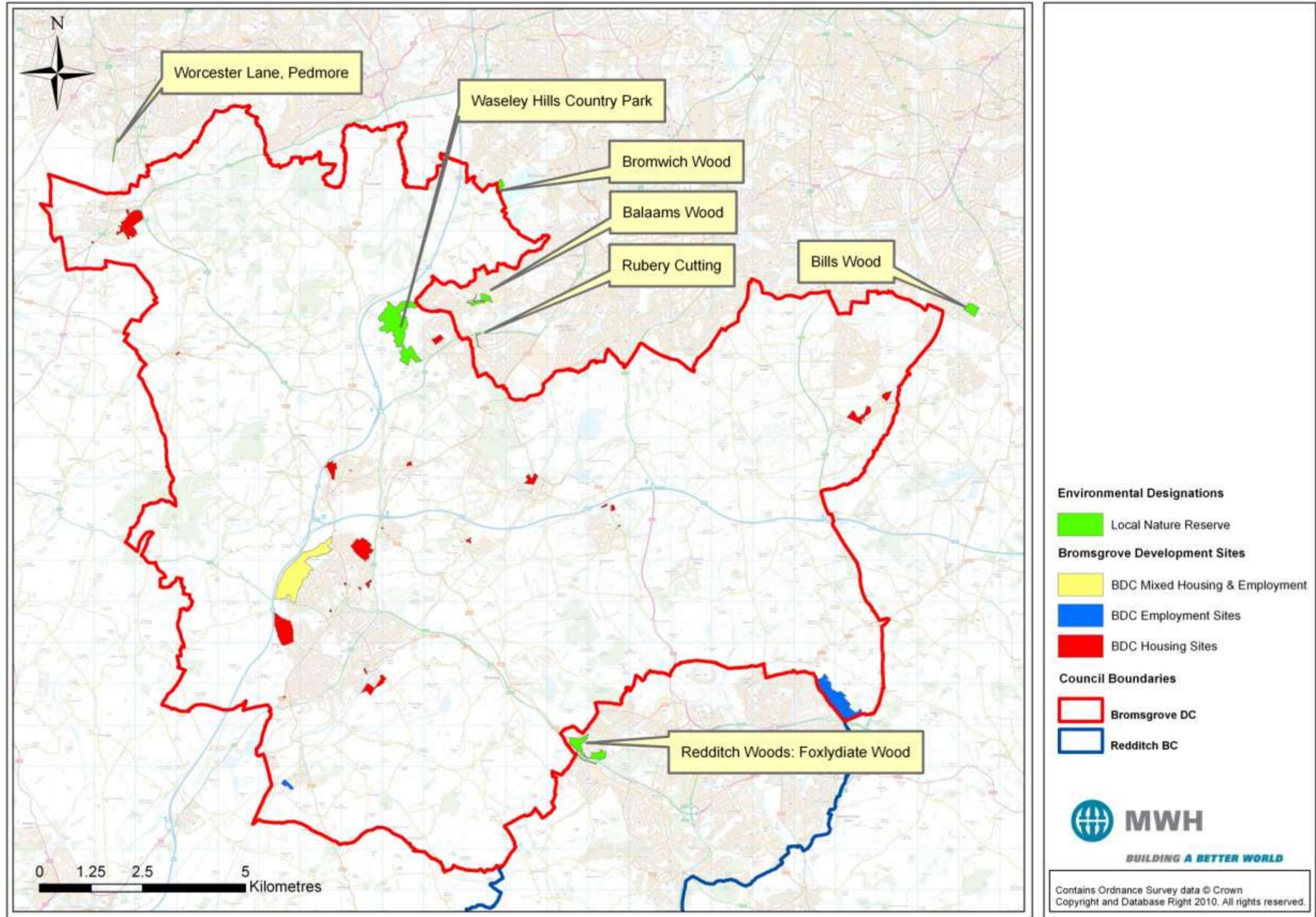
Redditch BC



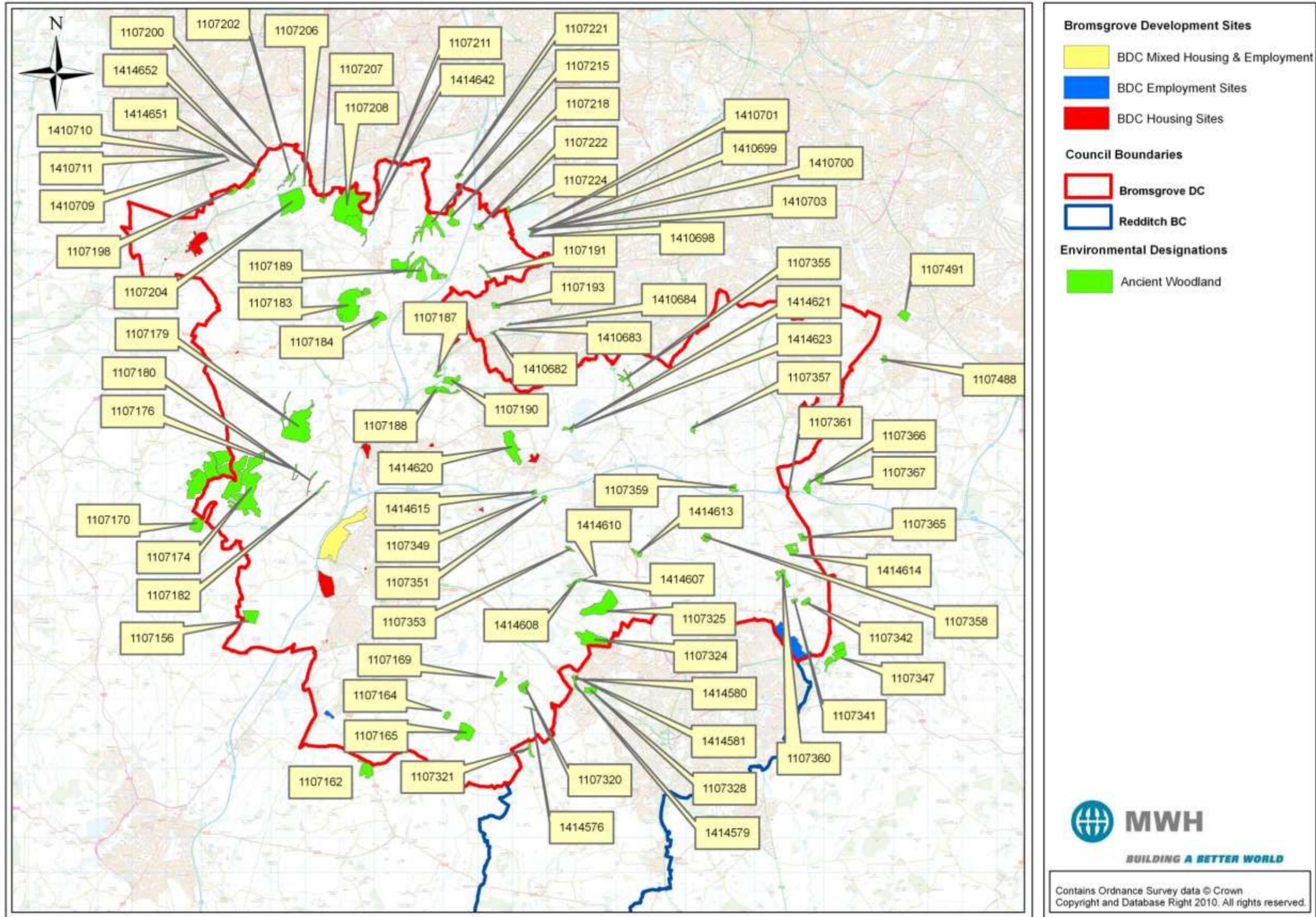
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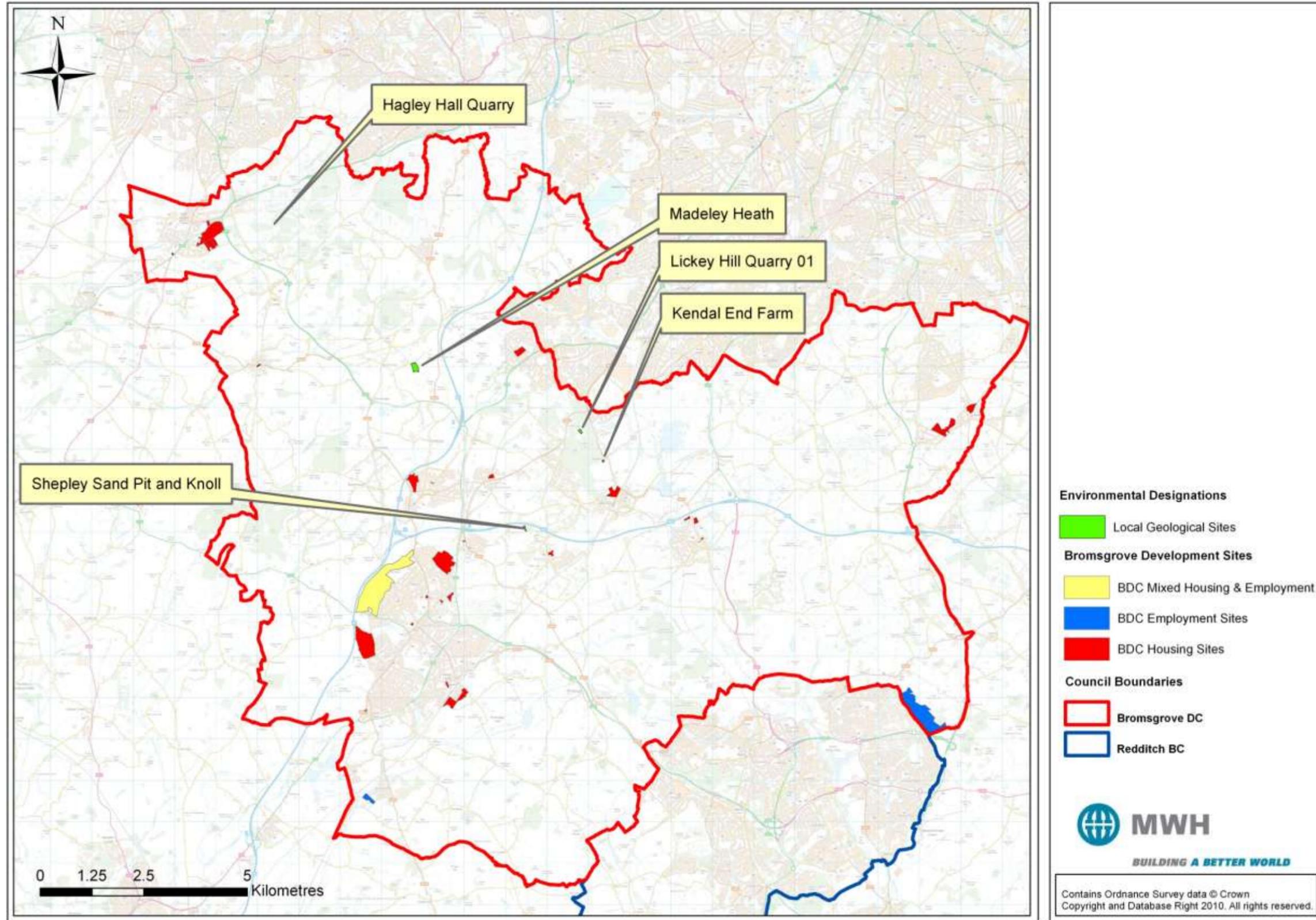
APPENDIX 27 BROMSGROVE DISTRICT LOCAL NATURE RESERVES



APPENDIX 28 BROMSGROVE DISTRICT ANCIENT WOODLANDS



APPENDIX 29 BROMSGROVE DISTRICT LOCAL GEOLOGICAL SITES



APPENDIX 30 PLANNING POLICY RELATED TO BIODIVERSITY AND GEOLOGICAL CONSERVATION

The policies and guidance given below have been reproduced from the relevant policy and guidance documents.

PPS9: Biodiversity and Geological Conservation (August 2005)

The Government's objectives for planning are:

- to promote sustainable development by ensuring that biological and geological diversity are conserved and enhanced as an integral part of social, environmental and economic development, so that policies and decisions about the development and use of land integrate biodiversity and geological diversity with other considerations; and
- to conserve, enhance and restore the diversity of England's wildlife and geology by sustaining, and where possible improving, the quality and extent of natural habitat and geological and geomorphological sites; the natural physical processes on which they depend; and the populations of naturally occurring species which they support.

To contribute to rural renewal and urban renaissance by:

- enhancing biodiversity in green spaces and among developments so that they are used by wildlife and valued by people, recognising that healthy functional ecosystems can contribute to a better quality of life and to people's sense of well-being; and
- ensuring that developments take account of the role and value of biodiversity in supporting economic diversification and contributing to a high quality environment.

Key principles to ensure that the potential impacts of planning decisions on biodiversity and geological conservation are fully considered are as follows:

- development plan policies and planning decisions should be based upon up-to-date information about the environmental characteristics of their areas. These characteristics should include the relevant biodiversity and geological resources of the area. In reviewing environmental characteristics local authorities should assess the potential to sustain and enhance those resources;
- plan policies and planning decisions should aim to maintain, and enhance, restore or add to biodiversity and geological conservation interests. In taking decisions, local planning authorities should ensure that appropriate weight is attached to designated sites of international, national and local importance, protected species and to biodiversity and geological interests within the wider environment;
- plan policies on the form and location of development should take a strategic approach to the conservation, enhancement and restoration of biodiversity and geology, and recognise the contributions that sites, areas and features, both individually and in combination, make to conserving these resources;
- plan policies should promote opportunities for the incorporation of beneficial biodiversity and geological features within the design of development; and
- development proposals where the principal objective is to conserve or enhance biodiversity and geological conservation interests should be permitted.

The aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.

Borough of Redditch Local Plan No.3 (adopted May 2006)

Policy B (NE) 1 Overarching Policy of Intent

The Council will conserve and enhance the natural environment and landscape quality of the Borough and seek to protect this from inappropriate development. To that end, it will:

- protect and enhance the biodiversity and geological interest of the Borough through the control of development and through the preparation of Development Briefs and Supplementary Planning Documents;
- where possible conserve, enhance and link habitats that are being lost from the wider countryside; for example fields and field margins, hedges, copses, small patches of less improved grassland and other areas of semi-natural vegetation; and
- work towards extending and joining up the network of 'wildlife corridors' within the Borough, in order to assist the movement of wildlife and provide recreational opportunities.

When considering development proposals, opportunities should be taken to enhance biodiversity, with particular emphasis placed on the retention and management, and the creation and enhancement of habitats and populations in both the Biodiversity Action Plan for Worcestershire and the Redditch Biodiversity Action Programme.

Policy B (NE) 1a Trees, Woodland and Hedgerows

Existing trees, woodlands and hedgerows of nature conservation, amenity or landscape value should be retained and their appropriate management encouraged. The importance of ancient semi-natural woodlands is recognised and particular emphasis should be placed on their conservation. Proposals to conserve and increase the indigenous broadleaved cover in both urban and rural areas are to be encouraged providing these do not cause damage or lead to the deterioration of existing habitats and features of biodiversity importance, are in keeping with the landscape character of the area and achieve successful integration with the landform. Proposals will be particularly encouraged where these would lead to:

- the establishment of native woodlands in appropriate places, that expand and link ancient semi-natural woodland remnants;
- the restoration to native woodland of non-native plantations on ancient woodland sites in priority locations;
- the introduction of management proposals to conserve and enhance trees and woodlands in urban areas and on the urban fringe;
- multi-purpose tree planting for nature conservation, amenity, landscape improvement, and timber production; and
- the conservation of veteran trees.

Policy B (NE) 3 Wildlife Corridors

The Borough Council will seek to protect and enhance those 'countryside features' which act as wildlife corridors, such as hedgerows and watercourses and also other biodiversity features of importance that act as 'stepping stones' from one habitat to another. Development which would be materially detrimental to the most important of these 'countryside features' will not normally be permitted. However, where it can be demonstrated that the benefits of development clearly outweigh the resultant detriment to local wildlife and to the value of that feature as a wildlife corridor, development may be permitted. In such cases, conditions and / or planning obligations will be used to minimise damage and to ensure habitat enhancement and / or creation is carried out on or close to the site wherever appropriate to maintain a corridor.

Policy B (NE) 10a Sites of National Wildlife Importance

Proposals for development, or land use change, in or likely to affect, Sites of Special Scientific Interest (SSSIs) will be subject to the most rigorous examination. Where such development may have an adverse effect, directly or indirectly on the SSSI, it will not be allowed unless there are no reasonable alternative means of meeting that development need and the reasons for the development clearly outweigh the value of the site itself and the national policy to safeguard the intrinsic nature conservation value of the national network of such sites.

Where the site concerned is a NNR or a site identified under the Nature Conservation Review (NCR) or Geological Conservation Review (GCR) particular regard will be paid to the individual site's national importance.

In all cases where development or land-use change is permitted:

- any damage to the nature conservation and / or geological value of the site will be kept to a minimum; and
- adequate and appropriate protection and enhancement of the site's nature conservation and/or geological interest will be secured, and where necessary, appropriate and adequate compensatory measures will be provided, using conditions and / or planning obligations where necessary.

Policy B (NE) 10b Sites of Regional or Local Wildlife Importance

The nature conservation value of Local Nature Reserves (LNRs), SWSs, Regionally Important Geological/Geomorphological Sites and Sites of Wildlife Importance subject to a Section 39 Agreement under the Wildlife and Countryside Act found within the Borough ranges from that of local to national significance.

Development or land-use change, likely to have an adverse effect on such sites will not be allowed unless there are no reasonable alternative means of meeting the development need and it can be clearly demonstrated that the reasons for the development or land-use change outweigh the intrinsic nature conservation and/or geological value of the site which may be affected by the development.

In all cases where development or land-use change is permitted:

- any damage to the nature conservation and / or geological value of the site will be kept to a minimum; and
- adequate and appropriate protection and enhancement of the site's nature conservation and / or geological interest will be secured, and where necessary, appropriate and adequate compensatory measures will be provided, using conditions and/or planning obligations where necessary.

Redditch Borough Council Revised Preferred Draft Core Strategy Document (January 2011)

Policy 2 Natural Environment

The need for a high quality natural environment is integral to deliver the Vision of the Core Strategy. In order to achieve this all proposals will be expected to:

- incorporate water efficiency measures and appropriate SUDS techniques that utilise detention/retention methods. For Redditch suitable methods include greywater recycling, rainwater harvesting, green roofs, permeable surfaces, swales and ponds, which are all features of the natural environment;
- protect and enhance the quality of natural resources and Green Infrastructure including water, air, land, wildlife corridors, species, habitats and biodiversity;
- integrate with biodiversity and geodiversity through enhancing, linking and extending natural habitats;
- remediate contaminated land, where necessary;
- demonstrate the Borough's distinctive natural landscape is protected, enhanced or restored, as appropriate and proposals are informed by, and sympathetic to, the surrounding landscape character;
- existing trees, woodlands and hedgerows (including ancient hedgerows) have been retained and their appropriate management encouraged. Particular emphasis should be placed on the expanding and linking of ancient semi-natural woodlands; and
- where appropriate, contributions towards the maintenance and/or management of woodland, which would be negotiated on a site-by-site basis

Policy 3 Flood Risk and Water Management

A. Flood Risk

In considering all proposals for development, the following principles will be applied:

- the expectation that all development should fall within Flood Zone 1; and
- where land in Flood Zones 2, 3a or 3b ('Functional Floodplain') is developed, a comprehensive Flood Risk Assessment (FRA) will be required to be submitted by the applicant.

Any development sites that are located in areas that are subject to flood risk will need to demonstrate that there are no other reasonable options for development in accordance with the 'Sequential Approach' and 'Exception Test', if applicable, as set out in PPS25 (Development and Flood Risk).

Any development in areas subject to flood risk will need to demonstrate that adequate flood protection has been incorporated and that effects elsewhere have been fully assessed and mitigated against.

The Borough Council will seek opportunities to use developer contributions to fund flood risk management schemes where these are not provided directly by the developer and are directly related to the proposed development.

B. Water Management

The Water Cycle Strategy identifies a need for sustainable water demand management techniques to be employed in Redditch. Therefore, every new development will require the inclusion of Sustainable Drainage Systems (SUDs) and will be required to treat all surface runoff on site. Developments will also be expected to incorporate greywater recycling and rainwater harvesting where practicable.

The development of any new site should not have a negative impact on water quality, either directly through pollution of surface or ground water or indirectly through overloading of sewage treatment work.

Water treatment infrastructure associated with new development, where appropriate will be required.

Policy 5 Green Infrastructure

The Green Infrastructure (GI) Network and Open Space provision make an important and valued contribution to the Borough of Redditch and its distinctiveness.

The existing GI Network will be safeguarded and new development will be required to contribute positively to the GI network, in line with the findings of the Redditch Borough GI Strategy and to support the Worcestershire Sub-Regional GI Framework. Opportunities will be sought to improve the network for the benefit of people, wildlife and the character and appearance of the Borough.

Open Space will be protected and, where appropriate, enhanced to improve quality, value, multi-functionality and accessibility. New development will be required to provide open space in accordance with the Council's Open Space Provision Supplementary Planning Document.

The Borough Council will, where appropriate, produce Green Infrastructure Concept Statements to guide masterplanning and development of Strategic Sites.

Bromsgrove District Local Plan (adopted January 2004)

Policy DS9 Protection of Designated Environmental Areas

Development proposals in locations designated as Landscape Protection Areas, sites of importance for wildlife and nature conservation or of importance for archaeology will be carefully evaluated against their potential impact on the landscape, ecology or individual site. Any such proposals put forward will not normally be given permission unless it can be demonstrated to the full satisfaction of the Local Planning Authority that the impact of the development on the landscape, an ecological site or an archaeological site would be negligible.

Policy C9 Development Affecting SSSI and NNR

Development proposals which would destroy or adversely affect, directly or indirectly, a designated or proposed Site of Special Scientific Interest or National Nature Reserve will not be permitted. In the event of a designated or proposed site of international importance being identified within the District it will be subject to the extra protection and special procedures appropriate to the designation.

Policy C10 Development Affecting SWS and LNR

Development proposals which would destroy or adversely affect, directly or indirectly, a Special Wildlife Site, Local Nature Reserve or sites subject to an Agreement under Section 39 of the Wildlife and Countryside Act 1981, will only be permitted where it can be demonstrated that the net adverse

impact of the proposal is not significant, having regard to the value of the nature conservation features which were the reason for the designation of the site.

Policy C10A Development Affecting other Wildlife Sites

The District Council will seek to minimise the effects of development proposals on features of nature conservation importance in the District. This will include woodlands, ponds, lakes or streams, marshland and wetlands and unimproved grasslands.

Policy C12 Wildlife Corridors

The District Council will protect major wildlife corridors wherever possible. Development proposals should minimise the damage to such corridors by careful layout and design retaining the existing overall structural framework of the landscape as far as possible. Adequate new landscaping to maintain existing wildlife corridors will be required. Proposals to enhance or extend corridors will be welcomed.

Policy C17 Retention of Existing Trees

Development proposals should retain existing trees wherever possible. New planting should be related in scale, size and species to the existing indigenous planting.

Policy C18 Retention of Existing Woodland

The District Council will seek to retain and enhance existing woodland particularly all ancient semi-natural woodland and promote sound woodland and countryside management by other bodies. The District Council will encourage the planting of trees, favouring the use of indigenous species both in hedgerows and as new woodland areas (in suitable locations) through the appropriate agencies. It will encourage and support the use of appropriate woodlands meeting multiple objectives such as timber production, recreational use and the creation of wildlife habitats. These principles will be taken into account, when that is appropriate, in considering applications for planning permission and when formulating planning conditions which relate to matters affecting woodland, hedgerows and trees.

Bromsgrove District Council Draft Core Strategy 2 Document (January 2011)

Core Policy 17: Natural Environment

The Council will achieve better management of its natural environment through:

- safeguarding European, nationally and locally protected sites and species;
- safeguarding long established nature resources including sites with geological interest;
- woodlands, veteran trees, species-rich hedgerows, acid grassland and hay meadows;
- maintaining and enhancing a network of wildlife corridors, links and 'stepping stones' between areas of natural green space;
- ensuring that development retains, protects and enhances features of landscape, ecological and geological interest, maximising their multi-functionality and providing for their appropriate management; and
- ensuring development makes space for and designs-in wildlife, ensuring any unavoidable impacts are appropriately mitigated or compensated for.

Core Policy 20: Water Management

The Council will deliver safe developments with low environmental impact through:

- supporting developments that follow the water conservation hierarchy. All housing developments should achieve the Level 3 or 4 water category for the Code for Sustainable Homes (i.e. 105 litres per person per day) and Level 5 after 2016. Where standards currently exist for a particular non-domestic building type in BREEAM, maximum points should be scored on water;
- ensuring all developments take into account flood risk of all sources, follow the flood risk management hierarchy, and do not increase the risk of flooding elsewhere. Where developments in high risk areas are necessary, appropriate design, materials and escape routes that minimise the risk(s) and loss should be incorporated;
- supporting developments that improve flood storage and flood flow routes by opening up culverted watercourses and utilising measures that work with the natural processes;
- supporting developments that incorporate the Sustainable Drainage Systems (SUDS) management train concept, maximise opportunities for enhancing the natural environment and social well-being, and provide for the appropriate management of these features;
- supporting developments that take into account of the River Basin Management Plan and contribute to delivering the Water Framework Directive objectives. This includes ensuring the phasing of development is in line with the completion of the required infrastructure and that appropriate management plans are in place for septic tanks and cesspools; and
- securing areas with a strategic flood defence function from development.

APPENDIX 31 IMPACT SUMMARY

Bromsgrove District Council Proposed Development Sites													
Development Land Type	Site_Ref / Unique_ID (from SHLAA, Employment Land Studies and WCS Level 1 Scoping Study)	Site Name	Flood Risk Constraint*	Water Resource Constraint	DAP Area	Wastewater Collection Constraint	Comment	Receiving STW	Water Course Receiving STW Effluent	Wastewater Treatment Constraint	Comment	Geological and Ecological Constraint	Comment
Housing													
	BDC51	Land at Algoa House, Western Road, Hagley	N	N	Hagley	Y	Existing flooding, small diameter local collection sewers. Additional capacity required / connect downstream. Approximately 4% lies in a high risk flood zone so development in these areas should be avoided	Roundhill STW	River Stour	N	Subject to review by STWL	N	Not linked to any development site
	BDC9	45 - 47 Woodrow Lane, Catshill	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC170	Birmingham Road, Alvechurch	N/A	N	Bromsgrove Rural	N		Alvechurch STW	River Arrow	N - but some uncertainty		N	Not linked to any development site
	BDC188	Rose Cottage, Thicknall Cottage and Land at rear of Western Road, Hagley	N	N	Hagley	Y	Existing flooding, small diameter local collection sewers. Additional capacity required / connect downstream. 0.2% lies in a high risk flood zone. Development in these areas should be avoided	Roundhill STW	River Stour	N	Subject to review by STWL	N	Not linked to any development site
	BDC102	7 & 9 Worcester Road, Hagley	N/A	N	Hagley	N		Roundhill STW	River Stour	N	Subject to review by STWL	N	Not linked to any development site
	ALV6	(part of) Land adjacent to Crown Meadow, Alvechurch	N/A	N	Bromsgrove Rural	N		Alvechurch STW	River Arrow	N - but some uncertainty	No land or other constraints	N	
	BDC122	4, 4a, 6, 8, & 10 St Catherine's Road, Blackwell	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC35B	Kidderminster & Stourbridge Road, Hagley	N	N	Hagley	Y	Existing flooding, small diameter local collection sewers. Additional capacity required. Approximately 4% lies in a high risk flood zone, development in these areas should be avoided	Roundhill STW	River Stour	N	Subject to review by STWL	N	
	BDC166	88 Birmingham Road, Bromsgrove	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC50	33 - 41 Western Road, Hagley	N/A	N	Hagley	N		Roundhill STW	River Stour	N	Subject to review by STWL	N	Not linked to any development site
	BDC85	Land adjacent to Wagon Works, St Godwald's Road, Bromsgrove	N/A	N	Bromsgrove	Y	Upgrade / new sewerage pumping station	Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC152	30 Alcester Road, Bromsgrove	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC20	Perryfields Road, Bromsgrove	N	N	Bromsgrove	Y	Existing flooding, small diameter local collection sewers. Additional capacity required, catchment separation, online / offline balancing. Very small section within a high risk flood zone and development in this area should be avoided	Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC66	Bleakhouse Farm, Station Road, Wythall	N/A	N	Wythall	N		Minworth STW	River Tame	N	Subject to review by STWL	N	Not linked to any development site
	BDC112	3 - 15 Marlbrook Lane & 203 - 215 Old Birmingham Road, Marlbrook	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	
	BDC37	2 - 4 Hartle Lane, Belbroughton	N/A	N	Bromsgrove Rural	N		Belbroughton STW	Hoo Brook	Y - significant	Small capacity available but sufficient for small level of development required	N	Not linked to any development site
	BDC149	233 Worcester Road, Bromsgrove	N/A	N	Bromsgrove Rural	N		Stoke Prior STW	Hen Brook	N - but some uncertainty		N	Not linked to any development site
	BDC163	Finstall Training Centre, Stoke Road, Bromsgrove	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC45	RMC House, Church Lane, Bromsgrove	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC93	Church Road (land off), Catshill	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC86	Selsdon Close, Wythall	N/A	N	Wythall	N		Minworth STW	River Tame	N	Subject to review by STWL	N	Not linked to any development site
	BDC95	50, 52 & 54 Red Lion Street (rear of), Alvechurch	N/A	N	Bromsgrove Rural	N		Alvechurch STW	River Arrow	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC81	Norton Farm, Birmingham Road, Bromsgrove	N/A	N	Bromsgrove	Y	Existing flooding, small diameter local collection sewers. Additional capacity required in the Bromsgrove High Street	Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC189	Strathearn, Western Road, Hagley	N/A	N	Hagley	Y	Existing flooding, small diameter local collection sewers. Additional capacity required / downstream connection. 12% of the site lies in a high risk flood zone, development in these areas should be avoided	Roundhill STW	River Stour	N	Subject to review by STWL	N	Not linked to any development site
	BDC49	Gallows Brook Pig Farm, Kidderminster Road, Hagley	N/A	N	Hagley	Y	Existing flooding, small diameter local collection sewers. Additional capacity required / downstream connection. Very small section in a high risk flood zone and development in this area should be avoided	Roundhill STW	River Stour	N	Subject to review by STWL	N	Not linked to any development site
	BDC148	Meadows First School, Stourbridge Road, Bromsgrove	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC160	Hagley Former Middle School, Park Road, Hagley	N/A	N	Hagley	N		Roundhill STW	River Stour	N	Subject to review by STWL	N	Not linked to any development site
	BDC80	Whitford Road, Bromsgrove	N	N	Bromsgrove	Y	Small diameter local collection sewers. Additional capacity required. 0.2% of the site lies in a high risk flood zone, development in these areas should be avoided	Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC65	The Avenue, Rubery	N/A	N	Rubery	N		Minworth STW	River Tame	N	Subject to review by STWL	N	
	BDC92	Kendal End Road (land at), Barnt Green	N/A	N	Bromsgrove Rural	N		Alvechurch STW	River Arrow	N - but some uncertainty	No land or other constraints	N	No likely impact, could be if hydrological links
	BDC168 (A & B)	The Council House, Burcot Lane, Bromsgrove	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
	BDC192	Burcot Lane	N/A	N	Bromsgrove	N		Bromsgrove STW	Sugar Brook	N - but some uncertainty	No land or other constraints	N	Not linked to any development site
Employment * - "Total Shapefile Area (ha)" for employment land is a best estimate using the detailed level of mapping available													
	Site 7	Saxon & Harris Business Park	N/A	N	Bromsgrove Rural	N		Stoke Prior STW (part)	Hen Brook	N - but some uncertainty	No land or other constraints	N	

* Agreed with the EA that if flooding occurs in less than 5% of the site, this is considered minor



Redditch Borough Council Proposed Development Sites

Development Land Type	Site_Ref / Unique_ID (from Revised Development Strategy 1, SHLAA 2, WCS Level 1 Scoping Study and Derived by MWH (employment))	Site Name	Site Description	Flood Risk Constraint*	Water Resource Constraint	DAP Area	Wastewater Collection Constraint	Comment	Receiving STW	Water Course Receiving STW Effluent	Wastewater Treatment Constraint	Comment
Housing (SHLAA Development Sites) 2 - 'SHLAA Report 2010.pdf' and 'Appendix A.pdf'												
	LP02	Brush Factory, Evesham Road, Crabbs Cross (LP124)	Brush Factory, Evesham Road, Crabbs Cross (LP124). 6 dwellings completed, 4 under construction	N/A	N	Redditch RAMPS / Priest Bridge	N		Priest Bridge STW	Bow Brook	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	LP03	Rear of 144 - 162 Easemore Road (LP135)	Rear of 144 - 162 Easemore Road (LP135)	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	LP05	Windsor Road Gas Works (LP147)	Windsor Road Gas Works (LP147). 255 dwellings total, 115 completed, 140 remaining	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	LP06	Mayfield Works	Mayfield Works, The Mayfields	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	LP13	Land off Torrs close	Land off Torrs close	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	LP16	Land at Tidbury Close (07/214)	Land at Tidbury Close (07/214), Walkwood	N/A	N	Spernal	N		Priest Bridge STW	Bow Brook	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	L PX02	Adjacent Castleditch Lane / Pheasant Lane	Land adjacent to Castleditch Lane / Pheasant Lane	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	L PX04	Former Claybrook School, Matchborough	Former Claybrook School, Matchborough	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	L PX05	Land at Millfields, Fire Station and RO Fire Station	Land at Millfields, Fire Station and RO Fire Station	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	L PX06	Former Ipsley School playing field	Former Ipsley School playing field	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	L PX07	South of Scout Hut, Oakenshaw Road	Land South of Scout Hut, Oakenshaw Road	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	CS01	Church Hill District Centre	Church Hill District Centre	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	CS03	Matchborough District Centre	Matchborough District Centre	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	WYG02	Peterbrook Close (08/303ol)	Peterbrook Close (08/303ol)	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	WYG03	Tanhouse Lane	Tanhouse Lane	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	WYG04	Marfield Farm School	Marfield Farm School, Redstone Close	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	WYG06	High Trees, Dark Lane (09/259)	High Trees, Dark Lane (09/259)	N/A	N	Redditch RAMPS / Priest Bridge	N		Astood Bank STW	Doe Bank Brook	N - but some uncertainty	No land or other constraints
	RB03	Widney House, Bromsgrove Road	Widney House & adjoining land, Bromsgrove Road (includes RB07 & RB38)	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	L4L02	Land off Wirehill Drive (08/305)	Land off Wirehill Drive (08/305)	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	UCS 2.14	Land adjacent Saltways Cheshire Home (08/073)	Land adjacent to Saltways Cheshire Home (08/073)	N/A	N	Redditch RAMPS / Priest Bridge	N		Priest Bridge STW	Bow Brook	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	UCS 2.16	Rear of Sandygate Close	Land to the rear of Sandygate Close	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	UCS 8.38	Dingleside Middle School & playing field and land rear of 11 Auxerre Avenue	Dingleside Middle School & playing field and land rear of 1-11 Auxerre Avenue	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/03	Loxley Close	Loxley Close, Church Hill	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/04	Upper Norgrove House	Upper Norgrove House	N/A	N	Redditch RAMPS / Priest Bridge	N		Priest Bridge STW	Bow Brook	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/05	Clifton Close	Clifton Close, Matchborough	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/07	Prospect Hill	Prospect Hill	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion

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Development Land Type	Site_Ref / Unique_ID (from Revised Development Strategy ¹ , SHLAA ² , WCS Level 1 Scoping Study and Derived by MWH (employment))	Site Name	Site Description	Flood Risk Constraint*	Water Resource Constraint	DAP Area	Wastewater Collection Constraint	Comment	Receiving STW	Water Course Receiving STW Effluent	Wastewater Treatment Constraint	Comment
Housing (SHLAA Development Sites)² - 'SHLAA Report 2010.pdf' and 'Appendix A.pdf'												
	2010/09	RO Alexandria Hospital	Rear of Alexandria Hospital	N	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/10	A435 ADR	A435 ADR	N	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/11	Brockhill ADR	Brockhill ADR	N	N	Spernal	Y	Small diameter local collection sewers. Additional capacity required	Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/12	Webheath ADR	Webheath ADR - (2 phases 6 - 10 yrs 350, 10+ yrs 250)	N	N	Redditch RAMPS / Priest Bridge	Y	Small diameter local collection sewers. Additional capacity required / gravity sewer / sewer pumping station. A small section (3.7%) lies in a high risk flood zone, development in these areas should be avoided	Priest Bridge STW	Bow Brook	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/13	Brockhill Green Belt	Brockhill Green Belt	N	N	Spernal	Y	Small diameter local collection sewers. Additional capacity required. 1.1% of the site lies in a high risk flood zone, development in these areas should be avoided	Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/14	Foxydiate Green Belt	Foxydiate Green Belt	N	N	Spernal	Y	Small diameter local collection sewers. Additional capacity required	Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	2010/27	Sandycroft, West Avenue	Sandycroft, West Avenue	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
Strategic Sites												
	St1	Church Hill, Redditch	Church Hill, Redditch						Redditch (Spernal) STW	River Arrow		
	St3	Matchborough, Redditch	Matchborough, Redditch	N/A		Spernal			Redditch (Spernal) STW	River Arrow		
	St8	Edward Street	Edward Street	N	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	St9	Prospect Hill, Redditch	Prospect Hill, Redditch		N	Spernal			Redditch (Spernal) STW	River Arrow		
Employment												
	EL01	North of Red Ditch, Enfield	Allocated Employment Development	Y	N	Spernal	Y	Small diameter local collection sewers. Additional capacity required. 5.3% of the site is located in a high risk flood zone, development in these areas should be avoided	Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL02	Nash Road, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL03	Park Farm Industrial Estate, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL04	Land East of Brockhill - not assessed	Allocated Employment Development	N/A	N	Spernal	N/A		Redditch (Spernal) STW	River Arrow	N/A	
	EL05	Green Lane, Wirehill	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL06	M435 Segment 2 - not assessed	Allocated Employment Development	N/A	N	Spernal	N/A		Redditch (Spernal) STW	River Arrow	N/A	
	EL07	Old Forge Drive, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL08	Studley Road, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL09	Enfield Industrial Estate, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL10	Merse Road, Moons Moat, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL11	Bartleet Road, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL12	Palmers Road, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL13	UCS 7.5 - not assessed	Allocated Employment Development	N/A	N	Spernal	N/A		Redditch (Spernal) STW	River Arrow	N/A	
	EL14	UCS 9.19 - not assessed	Allocated Employment Development	N/A	N	Spernal	N/A		Redditch (Spernal) STW	River Arrow	N/A	
	EL15	UCS 9.58 - not assessed	Allocated Employment Development	N/A	N	Spernal	N/A		Redditch (Spernal) STW	River Arrow	N/A	
	EL16	Washford Industrial Estate, Redditch	Allocated Employment Development	N/A	N	Spernal	N		Redditch (Spernal) STW	River Arrow	Y - significant	Secondary treatment process limitation, but no land or other constraints preventing expansion
	EL17	Edward Street - not assessed	Allocated Employment Development	N/A	N	Spernal	N/A		Redditch (Spernal) STW	River Arrow	N/A	