Gatwick Sub Region

Outline Water Cycle Study

Final Report

14 January 2011

Entec

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Executive Summary

Purpose of this Report

This report has been produced for the purpose of providing an initial overview of the water cycle, its constraints to development and requirements to meet European water quality targets in the Gatwick Sub-Region. The study area (presented in Figure 2.1) includes Crawley Borough Council and parts of Mid Sussex District Council, Horsham District Council and Reigate and Banstead Borough Council, referred to as the sub-regional authorities. Although parts of Tandridge District Council and Mole Valley District Council are within the Gatwick Sub-Region area, the bulk of their housing allocation is not within the study area and will subsequently have little influence on the water cycle within Crawley.

The aim of the assessment is to provide strategic level advice on water infrastructure and environmental capacity to inform the Local Development Frameworks, Development Plan Documents and strategic site allocations for the four sub-regional authorities. The sub-regional authorities are exploring four growth options to meet the housing requirement for growth "around Crawley".

A Water Cycle Study is normally prepared in three stages: the Scoping Stage summarising the available information and identifying any information gaps that may require further study; the Outline Stage identifying the environmental and major infrastructure constraints and identifying any significant barriers to development; and the Detailed Stage investigating potential solutions to infrastructure barriers. This report forms the Outline Stage Study in accordance with the Environment Agency Guidance. The aims and objectives can be outlined as follows:

- Take an integrated approach to management of the water environment;
- Meet EU framework targets on water quality, determining whether environmental resources can cope with providing water and receiving wastewater to/from further development;
- Determine whether the existing water and wastewater services infrastructure have sufficient capacity to support the potential development;
- Determine whether environmental resources can cope with providing water and receiving wastewater to/from further development;
- Ensure sustainable flood risk management over the long term is delivered through policies to protect future development from flooding;
- Provide the evidence base for the Local Development Framework and Development Plan Documents.

The study has involved working with the key stakeholders to establish the key constraints within the water cycle. The Steering Group comprises the four sub-regional authorities, South East Water, Southern Water, Sutton and East Surrey Water, Thames Water and the Environment Agency. Data has been collated from these third party

organisations to inform the potential housing and employment growth numbers and to review environmental and infrastructure capacity. The study is based on data that was made available between May and October 2010 on water infrastructure plans and projected growth scenarios up to 2031. It has been recommended in this study that a Detailed Phase is undertaken and that regular correspondence between the utility providers, the Environment Agency and the Councils takes place to review and update both planning and water infrastructure and environmental data.

Development Plans

This assessment has reviewed the potential impact of growth on the water environment using regional growth targets from the South East Plan Regional Spatial Strategy, which set a target for housing provision across the Gatwick Sub-Region of 36,000 dwellings between 2006 and 2026, distributed as follows:

- Crawley Borough – 7,500 dwellings;
- Horsham District (part) – 9,200 dwellings;
- Mid Sussex District (part) – 16,800 dwellings;
- Reigate & Banstead Borough (part) – 2,500 dwellings.

During the course of this study the regional tier of planning policy framework was revoked by the new Coalition government and has since been re-instated. Not withstanding this, the indicative housing numbers used for the period to 2026 and 2031 may be subject to change in the future in light of the proposed localism bill. It was confirmed during the study that the regional housing targets should still be used, for the purposes of this study, to assess environmental and infrastructure capacity.

Four growth scenarios have been compiled for the study, in liaison with the sub-regional authorities, to reflect current uncertainty over the location of a strategic neighbourhood development of 2,500 homes in and around Crawley and the capacity of the potential strategic site options in Horsham District. It should be noted that in the Crawley and Horsham context, greater certainty will be provided in later stages of the Councils' Core Strategy Review process as the evidence base is compiled. The strategic sites considered in this study use indicative housing capacities only, based in some cases on the remaining housing requirement to meet the revoked regional targets.

Water Cycle Context

The Gatwick Sub-Region lies within the catchments of the River Arun, River Ouse, River Mole, River Adur and River Medway (Figure 3.1). The Rivers Arun, Ouse and Adur are located in the wider Southern River Basin District, as defined by the Environment Agency in preparing River Basin Management Plans for the Water Framework Directive (see below). The Rivers Mole and Medway are located in the Thames River Basin District.

Water supply is provided by South East Water (to most of Mid Sussex), by Southern Water (Crawley, Horsham and a small area of Mid Sussex) and by Sutton and East Surrey Water (to Reigate and Banstead). The supply areas are presented in Figure 3.3. Public sewerage services are supplied to small areas of Horsham and Mid Sussex and all of Crawley and Reigate and Banstead by Thames Water. Southern Water provides public sewerage services to most of Mid Sussex and the extent of Horsham that falls within the study area. Figure 3.2 presents the indicative wastewater treatment works catchment areas in the study area.

The Water Framework Directive is the leading legislation in Europe for matters relating to the water environment and is set within a River Basin District context. It sets out a requirement to prevent deterioration of current water quality and overall status, and to achieve good ecological status in rivers, estuaries and coastal waters, together with good status of groundwater by at least 2027. Currently the water quality in the study area's rivers is mostly classified as Moderate to Poor Status.

Water Supply and Availability

The study has used the water companies Business Plans and Water Resource Management Plans (WRMP) to review their investment plans over the growth period. The WRMP for South East Water was being investigated at public inquiry during the production of this report. This study is therefore based on their Draft WRMP. The decision on the public inquiry was made at the end of this study, and therefore a review of the published plans should be undertaken in the detailed phase study.

Using the latest available data, it has been identified that the three water supply companies have plans to secure supply based on the regional growth targets, through the planning period. The plans to secure supply are dependant on demand management (customer side metering and water efficiency, leakage reduction etc) as well as resource development schemes. In the case of the Sutton and East Surrey, the report is based on the Final WRMP as amended by Final Determination for the AMP5 period. The funding available for the AMP5 period means that the company's resource development at Reservoir A has to be carried out in two phases. The second phase, together with other proposed supply/demand balance activity in later AMP periods, will be subject to review at PR2014.

An estimation of the increased demand in the study area over the growth period has been undertaken using different water efficiency levels in new and existing homes. The results (Figure 5.1) suggest that the most efficient option whereby all new homes meet the water efficiency level 3/4 from the Code for Sustainable Homes could reduce the demand by approximately 4 Ml/d by the end of the period. The study recommends that water efficiency is embedded in policy in the study area, to support the water companies demand management schemes which are used to support management of supply.

Further information is required to establish whether the physical infrastructure to connect development to the available supply is needed. Development within pre-existing developed sites can generally be connected to the mains network with limited delay. It is advisable that the sub-regional authorities and developers confirm development plans with the water companies as soon as possible to ensure that connections can be made as required, particularly if there is widespread and/or large scale development planned simultaneously.

Water Quality and Wastewater Treatment

The water quality of the rivers in the study area is generally Moderate Status, with Poor Status present on the River Adur. Elevated nutrient levels contribute to the water quality issue in the area, with particular regard to phosphorous that can arise from agricultural sources as well as from sewage discharges. There is potential for growth to increase pressure on meeting the WFD target of Good Status if growth levels exceed existing wastewater discharge consents. Detailed modelling is required to assess the impacts of growth on effluent and on receiving water quality, which lies outside the scope of this study. A high level assessment of quality constraints and future flow capacity has been undertaken.

It has been determined that there is capacity at Horsham WwTW to accommodate the planned growth under all scenarios. Although the River Arun is failing to meet Good Status, it has been advised that within the current flow consent, the quality of effluent will not deteriorate with the proposed growth levels, within the Best Available Technology (BAT) operating at the Horsham works.

Thames Water has advised of a planned upgrade at Crawley WwTW during the AMP5 period to accommodate a population equivalent of 167,000 by 2021. Assuming an occupancy rate of 2.4 and an existing PE of 148,600, this equates to 7,666 homes that could be accommodated at the works. It has been assessed in this study that the potential growth levels from the development scenarios will be approximately 6,924 by 2021 and up to 7,970 by 2026 (Scenarios 1 and 2) or 2031 (Scenario 3a and 3b), exceeding the number of homes that can be accommodated at the works by approximately 300. The additional growth beyond the 167,000 population equivalent in the Crawley catchment is likely to require additional capacity to be provided at Crawley WwTW.

It is advised that the continued discussions take place with Thames Water to monitor the impact of growth at the works, as they have advised of potential constraints post 2021, and because the growth levels assessed in this study are indicative only. Furthermore, investigation into the potential for changes in occupancy rate and in water consumption and the potential to contribute to offsetting the additional growth in development in the Crawley catchment should be considered. There are currently no environmental constraints, however there is the possibility that future standards might be tightened to contribute toward meeting WFD targets.

Goddards Green WwTW will potentially reach the flow capacity during the growth period. An upgrade will be required to provide capacity for new development in excess of 2,600 new houses. The WwTW is currently at BAT and cannot treat waste to higher BOD standards. Environmental constraints may require additional flows to be discharged at an alternative location agreed by the Environment Agency.

Eden Vale WwTW may also require an increase in flow consent at the end of the planning period if the indicative growth levels occur in the area of East Grinstead that is served by this works. Felbridge, Handcross and Horsted Keynes WwTWs are also forecast to potentially exceed their flow capacity during the growth period, based on potential housing numbers and locations. The capacity for process treatment is dependent on the ability of the receiving watercourses to accept increased flows without affecting WFD targets. These works are currently operating at BAT and additional work is required to determine if increased flows and loads can be accommodated.

The flow capacity issues at Crawley, Goddards Green and Felbridge WwTW (and also at Eden Vale, Handcross and Horsted Keynes) present constraints to the indicative levels of growth used in this study. Further detailed modelling of the impact of growth on wastewater flow and on water quality is required to identify potential solutions.

Large scale developments are also likely to require new sewerage infrastructure to convey waste flow to the treatment works. No major constraints are identified, however, there is recognition that local infrastructure on site will be required to connect large sites to the nearest works, which developers will be required to fund.

Flood Risk and Sustainable Drainage

Level 1 Strategic Flood Risk Assessments (SFRAs) have been prepared for all four of the sub-regional authorities. Proposed development sites have been identified in areas of Flood Zone 1, the zone with the lowest probability of flooding, and therefore further assessment in Level 2 SFRAs were not considered necessary. This study has summarised the findings of the Level 1 SFRAs in Section 3.4.3. It has also been identified in this report that possible developments locations at West of Ifield, North East Sector, North Horsham, and North West of Burgess Hill should be aware of watercourses running through the proposed site boundaries and the associated flood risk close to the watercourse channels. The potential for infiltration drainage techniques based on the underlying groundwater vulnerability in the study area has been assessed as low to medium. A review of the Environment Agency's Catchment Flood Management Plans and flood policies is also included in Table 3.4.

Recommendations

Summary of Outline WCS Recommendations
Recommendation 1: Policy for water efficiency The DPDs should require developers of private homes to design new homes to meet the minimum water use standard in Level 3/4 of the Code for Sustainable Homes (105 l/p/d) or ensure any wider sustainable design policy or policies provided meets this standard for water use. The sub-regional authorities should consider a policy for non-household development making it mandatory for commercial buildings to be assessed by a BREEAM assessor, with the expectation that buildings meet Good standard for water consumption targets for the building type (industrial/commercial/office/retail/education etc).
Recommendation 2: Water efficiency campaign It is recommended that in addition to policies for water efficiency in new buildings, the sub-regional authorities promote awareness in the communities of the need to save water, for example through hosting or co-sponsoring annual events to promote water conservation. The sub-regional authorities may choose to lead by example by employing policies to minimise the unnecessary use of resources in its own buildings, vehicles and in all its activities.
Recommendation 3: Consider policies for SuDS The WCS recommends that the DPDs include policies that promote sustainable drainage techniques (SuDS) that mimic natural drainage, rather than using traditional piped systems in all new developments. Suggested wording is provided in Section 8.2. The preferred hierarchy of managing surface water drainage from any development is through first infiltration measures, secondly attenuation and discharge to watercourses, and if these cannot be met, through discharge to surface water only sewers. As part of suggested policies for SuDS it is suggested that a policy is adopted to ensure redeveloped brownfield sites disconnect any surface water drainage from the foul network. These issues should be assessed during the planning application (see Recommendation 4)

Summary of Outline WCS Recommendations

Recommendation 4: Water sustainability and drainage assessment for all new developments of more than 10 dwellings

It is suggested that the sub-regional authorities each consider a policy which makes it compulsory for all new developments for more than 10 dwellings to submit a Water Sustainability and Drainage Assessment as part of their planning application. This would enable developers to demonstrate:

1. the development will meet the water consumption level 3/4 from the Code for Sustainable Homes for all residential developments
2. non-residential developments should demonstrate that they have been assessed by a BREEAM assessor, with the expectation that buildings meet Good standard for water consumption targets for the building type
3. for all developments SuDS have been incorporated to control surface water run-off
4. for the redevelopment of brownfield sites, any surface water draining to the foul sewer network has been disconnected and is managed through SuDS
5. a Flood Risk Assessment has been completed where required. This should be approved by the Environment Agency and in line with the requirements of Planning Policy Statement 25
6. the developer has contacted the sewerage provider to determine if capacity exists offsite for foul and surface water provision. Where capacity off site is not available, ensure that plans are in place for provision ahead of the development's occupation
7. the developer has contacted the water supply provider to determine if capacity exists offsite for water supply. Where capacity off site is not available, ensure that plans are in place for provision ahead of the development's occupation

Recommendation 5: Undertake Surface Water Management Plans

Potential constraints to development exist in the sewerage network as well as wastewater treatment works flow capacity, especially in Horsham, Burgess Hill and Haywards Heath. Sewerage providers consider SWMPs a valuable tool in alleviating network capacity issues, by addressing surface water management and reducing storm overflows into the combined sewer system.

In line with CFMP recommendations, the Outline WCS recommends that SWMPs are considered for Horsham, Burgess Hill and Haywards Heath to determine where improvements in the drainage can be delivered.

Recommendation 6: Detailed WCS

It is recommended that a Detailed WCS is prepared in order to:

- review the Final WRMP for South East Water and confirm plans can accommodate growth;

- undertake water quality modelling to review impacts of growth on receiving waters and potential solutions for wastewater treatment within the Goddards Green, Eden Vale, Felbridge, Handscross and Horsted Keynes WwTW catchments, assessed in this Outline study as reaching flow capacity within the growth period;

- undertake detailed modelling to assess requirements for upgrades at Crawley WwTW;

- review supply and sewerage network capacity and solutions

- prepare a Water Cycle Strategy for provision of infrastructure solutions to potential growth over the planned period; and

- facilitate ongoing communication between Steering Group members

Recommendation 7: Continue liaison with Steering Group

The Outline WCS has identified potential constraints at Horsham and Crawley WwTW. Although the planned housing trajectories can be accommodated at the works, any increase in growth in particular as a result of phasing could potentially erode current headroom in the flow consent. Through monitoring growth rates and increased flows at the works, informed decisions can be made on future investment and planning permissions. The Outline WCS provides a starting point to arrange regular updates between Steering Group members, for example through ongoing SWMPs/WCS update or through agreed meeting dates at suitable intervals.

Contents

Glossary

AMP	Asset Management Plan
BOD	Biological Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Method
CAMS	Catchment Abstraction Management Strategy
CLG	Communities and Local Government
CFMP	Catchment Flood Management Plan
CSH	Code for Sustainable Homes
CSO	Combined Sewer Overflow
Defra	Department for Environment, Food and Rural Affairs
DPD	Development Plan Document
Dry Year	A term used in water resource planning for a year where demand for water is more than is usual in a typical 'normal' year
DWF	Dry Weather Flow
EA	Environment Agency
EIA	Environmental Impact Assessment
GIS	Geographical Information System
GQA	General Quality Assessment
Headroom	Spare hydraulic or flow capacity
IUD	Integrated Urban Drainage
LDF	Local Development Framework
l/h/d	Litres per household per day
LPA	Local Planning Authority
Ml/d	Megalitres per day
PE	Population Equivalent, unit per capita loading
Peak Period	A term used in water resource representing average daily demand during the hottest/driest point usually at the height of summer
pcc	Per capita consumption
PPS25	Planning Policy Statement 25
PR	Periodic Review (for water companies' investment plans)
RBD	River Basin District
RBMP	River Basin Management Plan
RSS	Regional Spatial Strategy
SAC	Special Area of Conservation

SFRA	Strategic Flood Risk Assessment
SPA	Special Protection Area
SPZ	Source Protection Zone
SES	Sutton and East Surrey Water
SEW	South East Water
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
SWS	Southern Water Services
TW	Thames Water
WCS	Water Cycle Study
WFD	Water Framework Directive
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone
WwTW	Wastewater Treatment Works
UKCIP	United Kingdom Climate Change Impacts Programme
UKCP	United Kingdom Climate Projections

1. Introduction

1.1 Background and Aims

A Water Cycle Study (WCS) is one of a number of strategic studies used by Local Planning Authorities as part of the evidence base for Local Development Frameworks, which set out the future growth plans. This study is for the Gatwick Sub-Region which has been identified at a regional level as having a significant growth target for development in and around Crawley. The study area includes Crawley Borough Council and parts of Mid Sussex District Council, Horsham District Council and Reigate and Banstead Borough Council. Although parts of Tandridge District Council and Mole Valley District Council are within the Gatwick Sub-Region area, the bulk of their housing allocation is not within the study area and will subsequently have little influence on the water cycle within Crawley. These two Councils have, therefore, opted out of inclusion within the study.

The aim of a water cycle study is to:

- Assess the capacity of current water infrastructure to accommodate required growth without adversely affecting the environment by considering:
  - The availability of water resources and the supply network;
  - The capacity of existing wastewater infrastructure and the drainage network;
  - The environmental capacity of receiving watercourses to receive wastewater;
  - The potential of development to increase flood risk;
- Determine the potential impact of the proposed development in the context of requirements of environmental legislation including the Water Framework Directive, Habitats Directive and any other relevant water policy;
- Identify the infrastructure necessary to achieve the proposed growth within the constraints of the environment and legislation; and
- Develop a strategy for a phased approach to development that allows key growth targets to be met whilst providing sufficient time for the identified infrastructure to be adopted.

The Environment Agency has issued a National Guidance document (http://publications.environment-agency.gov.uk/pdf/GEHO0109BPFF-e-e.pdf) to ensure that water cycle studies are carried out in a consistent way. This guidance outlines the required approach for Scoping, Outline and Detailed phases of water cycle studies:

- Scoping: The primary aim of the Scoping Phase is to collate and review existing information (e.g. previous studies and monitoring data) on the water environment within the study area, identifying development plans, and engaging with key stakeholders, including the Environment Agency, water

companies and drainage authorities to identify key issues that require consideration in the following stages of the work;

- Outline: The primary aim of the Outline Phase is to identify potential environmental and water infrastructure constraints to development, providing an evidence base to support the delivery of Development Plan Documents (DPDs), such as Core Strategies, as well as identifying preferred sites for development. The study should identify areas of uncertainty that may require further detailed studies;

- Detailed: The Detailed Phase aims to resolve any areas of uncertainty identified in the Outline Phase through further more detailed studies. It identifies what water cycle management measures and infrastructure are needed, where and when they are needed, who is responsible for providing the systems, and by what deadline. This may involve an assessment of the costs and benefits of options. It also provides guidance to the local authorities to facilitate implementation and funding of the Strategy.

A Scoping Study was completed in March 2010 by the four leading authorities within the Gatwick Sub-Region. The study collated a range of existing documents to review sub-regional and local planning policy, Water Resource Management Plans, position statements from water and sewerage providers and information from the Environment Agency relating to water quality and availability. The gathered information has been used to inform the Councils' position on the balance between the water environment and development pressure in the sub-region, and identified the need for an Outline Phase Study. The findings from this Outline Study will be used as part of a robust evidence base to inform the Councils' future policy approach, and will help to determine the suitability, location and intensity of development. It is also intended for the study to identify whether there is a requirement for a Detailed Study.

1.2 The Water Cycle

The water cycle describes the pathways and processes through which the water we use moves through the natural and built environment, as well as through the above and below ground infrastructure on which the domestic population and industry depend. Figure 1.1 illustrates the traditional image of the water cycle showing how water enters a river catchment, how it runs through and over the land, before returning to the river system and ultimately returning to the sea.

Figure 1.1 Traditional View of the Water Cycle without Artificial Influence

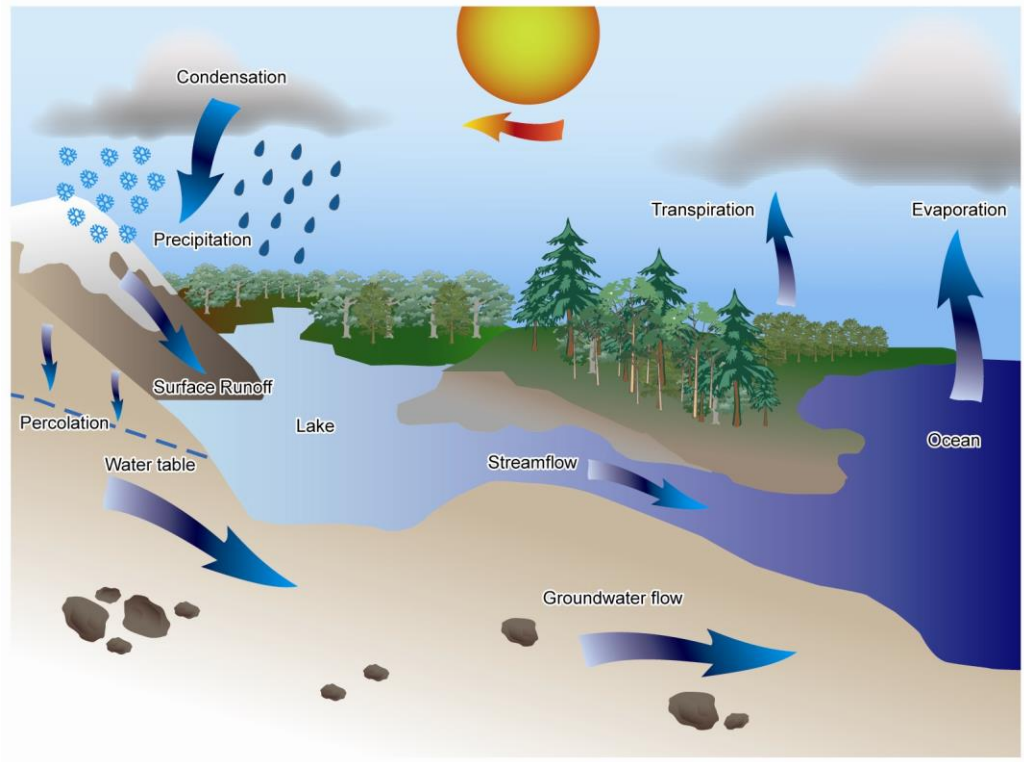
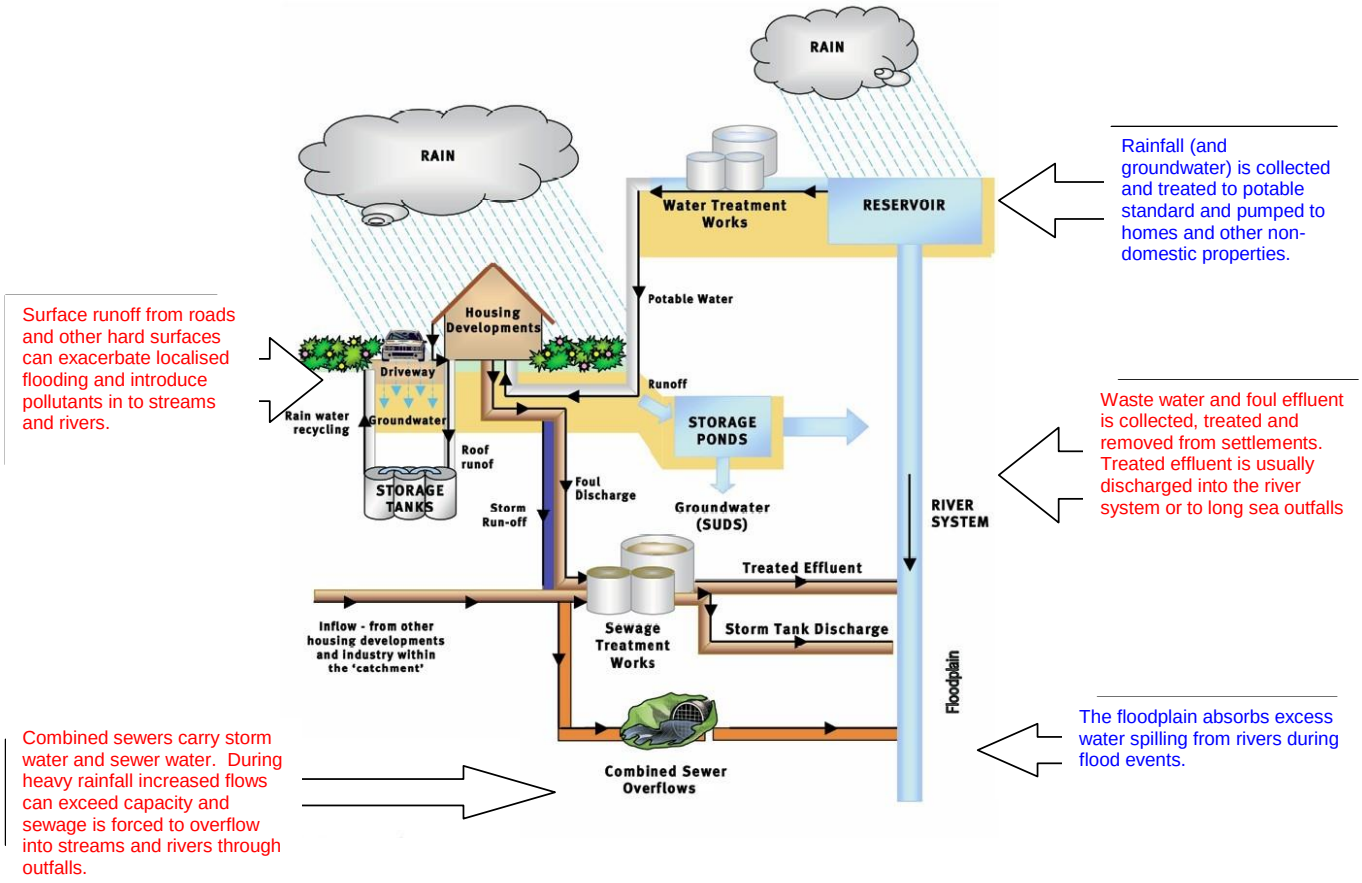


Figure 1.2 Schematic of the Urban Water Cycle Based on Current Practice



Source of background figure: Environment Agency website

Figure 1.2 illustrates the added complexities within the urban water cycle (in schematic form) as a result of housing development and the infrastructure required to support it. The main differences between the natural and the urbanized water cycle relate to the rate of surface runoff (and percolation in to the ground), and the streamflow. In the urbanized cycle, water is captured and stored for use and this water only re-enters the river network once it has been used and then treated at wastewater treatment works. The timing and quality of water entering the river network can be significantly different in the urban version of the cycle.

The capacity of water infrastructure needs to be sized appropriately to ensure the sufficient supply of clean water to homes and industry, and to receive foul drainage, whilst preventing the discharge of polluted runoff and untreated foul drainage to protect the quality of the receiving water and any dependant habitats, whilst also reducing the risk of flooding.

1.3 Structure of the Report

The report has been structured around the requirements of the Environment Agency's National Guidance and the needs of the four sub-regional authorities:

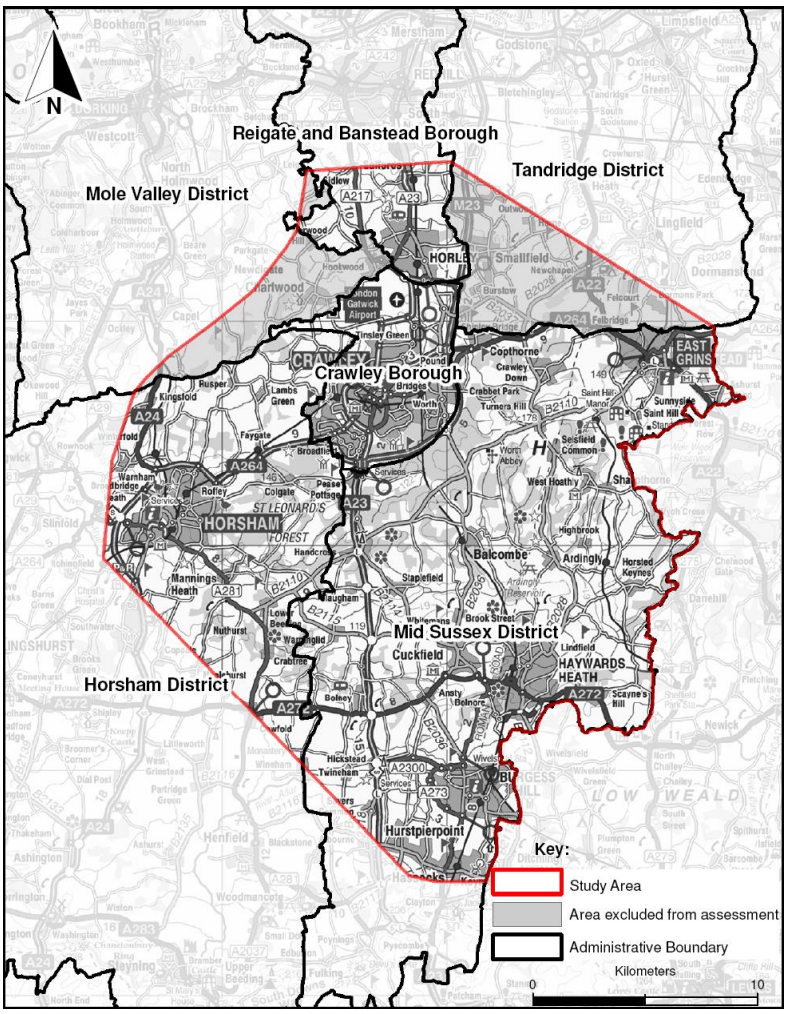
- Chapter 2 summarises the planning context with regard to growth and water related infrastructure;
- Chapter 3 presents an update to the baseline information on the water cycle, summarising the Scoping Study findings and updating where necessary with more recent information;
- Chapter 4 sets out the existing constraints to growth in the study area from either the water environment or water related infrastructure;
- In Chapter 5, capacity assessments are presented to review the potential constraints to growth under various scenarios, up to 2026, and to review the issues facing the strategic sites in the study area;
- The impact of climate change on the potential development constraints is summarised in Chapter 6;
- Chapter 7 presents the preferred approach to development based on the water cycle issues discussed in the previous chapters. Provisional planning trajectories for each of the four development scenarios are presented against potential constraints in a draft Development Strategy;
- Chapter 8 summarises the Future Recommendations for the Councils in assessing the Water Cycle.

2. Context

2.1 The Study Area

The Gatwick Sub-Region includes the six local authority areas of Crawley Borough Council, Mid Sussex District Council, Horsham District Council, Reigate and Banstead Borough Council, Mole Valley District Council and Tandridge District Council. As previously stated in Section 1.1, Mole Valley Council and Tandridge District Council's housing allocation is predominantly identified in the northern portion of their respective districts and will subsequently have little influence on the water cycle environment within the study area. They have therefore opted out of being involved in the Gatwick Sub-Region WCS. The study area boundary is presented in Figure 2.1 below and shows the excluded areas of these two Councils.

Figure 2.1 Study Area



2.2 Planning Policy

National and local planning policy currently sets out guidance and requirements for delivering sustainable development and therefore addresses, amongst other things: housing and employment growth and its distribution; water management and protection; infrastructure provision; and flood risk management. Following the recent change in Government, the regional tier of the planning policy framework was revoked, though has since been re-instated following a High Court ruling stating that the revocation of the RSS's was in fact illegal. The removal of the regional tier of planning remains a key objective for the Coalition Government, though it is anticipated that reinstated RSS's will form part of the development plan for a minimum 12 month period until such time that they are formally revoked through legislation. The following sections therefore outline the current relevant planning policy for the study area, with Section 2.2.2 discussing the recent regional changes in more detail.

2.2.1 National Policy

Government guidance is provided through a series of Planning Policy Statements (PPSs), the most relevant of which are summarised in the table below.

Table 2.1 National Planning Policy

PPS1 Delivering Sustainable Development and Supplement to PPS1: Planning and Climate Change
PPS1 and its 2006 supplement set out how the planning system can deliver sustainable development by responding to climate change, including achieving zero carbon development and implementing the Code for Sustainable Homes. PPS1 requires Local Planning Authorities (LPAs) to prepare development plans which are in line with the principles for sustainable development and promote outcomes in which environmental, economic and social objectives are achieved together over time. This should be achieved using a spatial planning approach. Specifically, planning authorities should identify land suitable for meeting housing and other types of development, taking into account the need to provide essential infrastructure and avoid flood risk. PPS1 advises that local authorities should promote amongst other things: - the sustainable use of water resources; and - the use of sustainable drainage systems in the management of runoff. The supplement advises local authorities to take into account the capacity of existing and potential infrastructure including water supply, sewage and sewerage, to service future development sites in ways consistent with successfully adapting to likely changes in the local climate.
PPS3 Housing
PPS3 underpins the delivery of the Government's strategic housing policy objectives, where the goal is to ensure that everyone has the opportunity to live in a decent home, which they can afford, in a community where they want to live. Most future development within the Gatwick sub-region will be for housing. PPS3 requires that 'new housing should be built on previously developed land' (PDL) before greenfield land, a requirement that PPS25 reiterates in its Exception Test.

Table 2.1 (continued) National Planning Policy

PPS12 Creating Strong, Safe and Prosperous Communities through Local Spatial Planning
PPS 12 was published in June 2008. The document outlines the nature of local spatial planning, setting out the key components of local spatial plans and how they should be prepared. It should be taken into account by LPAs in preparing Local Development Frameworks (LDFs) which include Development Plan Documents (DPDs) and other Local Development Documents (LDDs). With regard to infrastructure, PPS12 states that Core Strategies should be supported by evidence of what physical, social and green infrastructure is needed to enable the amount of development proposed for the area, taking account of its type and distribution. This evidence should cover who will provide the infrastructure and when it will be provided. The Core Strategy should draw on and in parallel influence any strategies and investment plans of the local authority and other organisations. **This water cycle study forms part of the robust and credible evidence base which will underpin policies within the Authorities' Core Strategies and other relevant LDDs.**
PPS23 Planning and Pollution Control
PPS23 advises that "any consideration of the quality of land, air or water and potential impacts arising from development, possibly leading to impacts on health, is capable of being a material planning consideration" so that potential contamination can be identified at an early stage and mitigated through planning.
PPS25 Development and Flood Risk
PPS25 aims to ensure that flood risk is taken into account at all stages in the planning process in order to avoid inappropriate development in areas at risk of flooding. It also aims to ensure that new development does not increase the risk of flooding elsewhere. Where, in exceptional circumstances, new development is necessary in such areas then the aim is to ensure development is safe, does not increase flood risk elsewhere and, where possible, reduces flood risk overall. This approach is supported in the Government's Pitt review of the summer 2007 flooding, which reiterates the requirements of PPS25 to make clear that development within Flood Zone 2 and 3 should not be allowed to proceed unless there is clear proof that they are compatible developments for these zones. The review also outlines that LPAs should become responsible for ensuring localised flood risk is not worsened by development by directing development away from areas of flood risk through planning and development control.

2.2.2 Regional Planning Policy

Under the Planning and Compulsory Purchase Act 2004, Regional Spatial Strategies replaced Structure Plans as the strategic planning framework for regions in England. The Regional Spatial Strategy (RSS) for the South East of England (known as the South East Plan) was adopted in May 2009 and provided a regional framework within which Local Planning Authorities have been required to prepare their Local Development Frameworks (LDFs) for the plan period to 2026.

During the course of this study all Regional Spatial Strategies were revoked by the Secretary of State for Communities and Local Government in a letter to Chief Planning Officers dated 6th July 2010. This action was later challenged in the High Court by developer Cala Homes and it was concluded that the revocation of RSS's was in fact illegal. All RSS's have since been reinstated, however the new government has advised that the indicative housing numbers used for the period to 2026 and 2031 may be subject to change in the future in light of the proposed localism bill. In the longer term the legal basis for Regional Strategies will be revoked through the

'Localism Bill', which is being introduced in the current parliamentary session (expected Winter 2010). The key aim of this new bill places onus on local planning authorities to be responsible for determining the right level of local housing provision in their area without the influence of regional housing targets.

The South East Plan (SEP) identified nine sub-regional centres, of which the Gatwick Sub-Region is one. Of particular relevance was Policy GAT3, which set a target for housing provision across the Gatwick Sub-Region of 36,000 dwellings between 2006 and 2026, distributed as follows:

- Crawley Borough – 7,500 dwellings;
- Horsham District (part) – 9,200 dwellings;
- Mid Sussex District (part) – 16,800 dwellings;
- Reigate & Banstead Borough (part) – 2,500 dwellings.

Each Council has been planning for the number of dwellings stated above as a minimum in the preparation of their Core Strategy Development Plan Documents (DPD) over the period to 2026. In the case of Crawley Borough Council and Horsham District Council, which have adopted Core Strategies informed by the housing numbers of the now superseded West Sussex Structure Plan (2001) an on-going review of the adopted Core Strategies will consider this requirement for the plan period up to 2026.

South East Plan Policy GAT3 stated that the majority of these required dwellings would need to be provided within or adjoining Crawley, and the other main towns in the main north/ south and east/ west transport corridors. SEP policies also highlighted the provision of a new university campus at Crawley, the continued functioning of Gatwick Airport and the provision of employment floorspace in association with major development at identified strategic locations as key sub-regional objectives.

The Secretary of State for Communities and Local Government does recognise that some authorities may wish to retain their existing housing targets as set out in the revoked Regional Strategies, whereas others may decide to review their housing targets. As this change has occurred during this study, it should be noted that the latest available information from each of the Councils with regards to housing and employment targets has been used at the time of writing, and these targets may be subject to change. The numbers used are set out for each Council in the following section.

2.2.3 Local Planning Policy

The WCS will help to identify opportunities and constraints for development, and provide evidence to inform the choice of preferred spatial options for the Core Strategies of the sub-regional authorities in relation to water issues. The Core Strategies will look to deliver the housing targets for the part of each authority that lies within the Gatwick Sub-Region. It should be noted that Crawley Borough Council and Horsham District Council have

adopted Core Strategies, however both are in the process of reviewing them in light of emerging evidence, policy guidance and the most up-to-date housing figures[1].

In liaison with the sub-regional authorities, four growth scenarios have been compiled by Entec for the study area and these have been used in assessments detailed in this report. The four growth scenarios have been developed to reflect current uncertainty over the location of strategic sites capable of accommodating comprehensive neighbourhood development of 2,500 homes in and around Crawley and the capacity of the potential strategic site options in Horsham District. It should be noted that in the Crawley and Horsham context, this uncertainty is a reflection of the emerging nature of the Councils' Core Strategy Reviews and greater certainty will be provided in later stages of the process as the evidence base is compiled.

Growth Scenarios

The strategic sites considered in this study are listed below in Table 2.2 and shown in Figures 2.2a and 2.2b. Housing capacities for each site are indicative only, based in some cases on the remaining housing requirement to meet the revoked regional targets. In practise there may be negotiation between authorities as to the precise split of housing numbers between sites and across administrative boundaries (i.e. a proportion of any strategic development at Crabbet Park or West of Ifield would likely contribute to the Crawley figures).

Table 2.2 Existing and Potential Strategic Sites across the Gatwick sub-region study area

Local Authority	Strategic Site	Housing Capacity (no. of dwellings)
Crawley Borough Council	North East Sector	2500
	Town Centre North	400
	Leisure Centre Site, Haslett Avenue	784, 320 to be completed
	Lucerne Drive	107
	Ifield Community College	170
	Thomas Bennett School	200
	Dorsten Square, Bewbush	143
	Haslett Avenue/Telford Place	100
	West of Pegler Way (Southern Counties Site)	218

[1] For Crawley, the most up-to-date housing requirement is the Option 1 figure of 7,000 dwellings that was not contested at the South East Plan Examination in Public. It should be noted that the adopted Crawley Borough Core Strategy sets out an annual completion rate of 300 dwellings per annum for the period 2001-16. For Horsham, the adopted Core Strategy, 2007 sets an annual completion rate of 620 homes per annum and this figure is supported up by the more recent Locally Generated Needs Study (2010).

Table 2.2 (continued) Existing and Potential Strategic Sites across the Gatwick sub-region study area

Local Authority	Strategic Site	Housing Capacity (no. of dwellings)
	Station Way (Crawley Station)	100
	Land East of Tinsley Lane	150
	Three Bridges Station	100
Horsham District Council	West of Bewbush*	2,500
	West of Ifield*	2500
	North Horsham	1725 under Scenarios 1 and 2 2300 under Scenario 3a
	Southwater	1725 under Scenarios 1 and 2 2300 under Scenario 3b
Mid Sussex District Council	Land East of Gravelye Lane	528
	Crabbet Park*	2,300
	Land to North and Northwest Burgess Hill	3,800
	Land West of East Grinstead	570
	Land East of Burgess Hill	700
Reigate and Banstead Borough Council	Horley North East	710
	Horley North West	1,570
	Horley	371

* Sites draining to Crawley WwTW but not within Crawley Borough Council

Figure 2.2a Strategic Sites across the Study Area

Figure 2.2b Strategic Sites - Crawley

The four scenarios assessed in this study are based on the housing totals identified in Table 2.3, to be delivered between 2006 and 2026, taking into account existing completions, planning permissions and proposed sites. All scenarios assume for existing Core Strategy allocations and the development of a new neighbourhood West of Bewbush of 2,500 homes. These should not be taken as definite scenarios, but rather as a high level prediction of the most likely combination of potential site options to be brought forward through each of the sub-regional authorities Core Strategies, reflecting the likely capacities of those strategic sites to enable a strategic level assessment of the water cycle elements to be undertaken.

The phasing of each scenario has been based on information provided by the sub-regional authorities. It should be noted that whilst the phasing of Scenario 2 used in this study shows development up to 2031, there is potential for development to be delivered sooner than the Scenario 2 phasing used in this study. This is because if the North East Sector site does not come forward under Scenario 1, the Crabbet Park site might be delivered sooner which would result in different conclusions to the capacity assessments in this report.

Table 2.3 Potential Growth Scenarios Assessed for this Study

Strategic Housing Scenarios
Scenario 1: Strategic development for 2500 homes at Crawley is provided on the North East Sector site, contributing to Crawley Borough Council's housing contribution. No development is progressed at Crabbet Park or West of Ifield, and 3450 homes are provided between North Horsham and Southwater in Horsham District. • Crawley total – 7200 • Horsham total – 9128 • Mid Sussex total – 13240 • Reigate and Banstead total – 3000 • TOTAL - 32628
Scenario 2: Strategic development for 2500 homes at Crawley is provided on the Crabbet Park site in Mid Sussex, with 2300 homes contributing to the Mid Sussex housing requirement, and 200 homes provided from Crawley Borough Council's housing contribution. No development is progressed at NE Sector or West of Ifield, and 3450 homes are provided between North Horsham and Southwater in Horsham District. • Crawley total – 4960 • Horsham total – 9128 • Mid Sussex total – 15740 • Reigate and Banstead total – 3000 • TOTAL - 32628
Scenario 3a: Strategic development for 2500 homes at Crawley is provided on the West of Ifield site in Horsham District, with 1150 homes contributing to Horsham's housing requirement and 1350 additional homes provided from Crawley Borough Council's housing contribution. The North Horsham site is progressed with 2300 homes, and no development takes place at Southwater, NE Sector or Crabbet Park. • Crawley total – 6110 • Horsham total – 9128 • Mid Sussex total – 13240 • Reigate and Banstead total – 3000 • TOTAL - 31478

Table 2.3 (continued) Potential Growth Scenarios Assessed for this Study

Strategic Housing Scenarios
Scenario 3b: Strategic development for 2500 homes at Crawley is provided on the West of Ifield site in Horsham District, with 1150 homes contributing to Horsham's housing requirement and 1350 additional homes provided from Crawley Borough Council's housing contribution. The Southwater site is progressed with 2300 homes, and no development takes place at North Horsham, NE Sector or Crabbet Park. • Crawley total – 6110 • Horsham total – 9128 • Mid Sussex total – 13240 • Reigate and Banstead total – 3000 • TOTAL - 31478

In addition to planned housing, the study area will be subject to an increase in employment land over the growth period. A recent Employment Land Review (2010) has been undertaken on a joint basis on behalf of Crawley Borough Council, Horsham District Council and Mid Sussex District Council, and the draft outputs of this work have been used to inform this study. Data from the Scoping WCS and the Industrial Estates Monitor, March 2009 have been used to inform the employment sites in Reigate and Banstead. Table 2.4 presents the assumed increase in employment land that has been included in the study's assessment. Reference is also made where appropriate to the impact of development at Gatwick airport on the water cycle.

Table 2.4 Planned Employment Land

District	Office and Light Industry (inc General Industrial), m^2	Storage and Distribution, m^2	Total Floorspace, m^2
Horsham	36,563	9674	4,6237
Crawley	97,903	8876	106,779
Mid Sussex	26,790	1733	28,523
Reigate and Banstead	127,200	115,000	242,200
Total	**288,456**	**135,283**	**423,739**

New Market Town

Crawley Borough Council (CBC), Horsham District Council (HDC) and Mid Sussex District Council (MSDC) are in the process of considering the possibility of a new market town within the A23 corridor area. The aim of the settlement will be to meet any remaining need for new housing and employment that cannot readily be accommodated within or adjoining existing settlements in the sub-region. Therefore, led by HDC and in

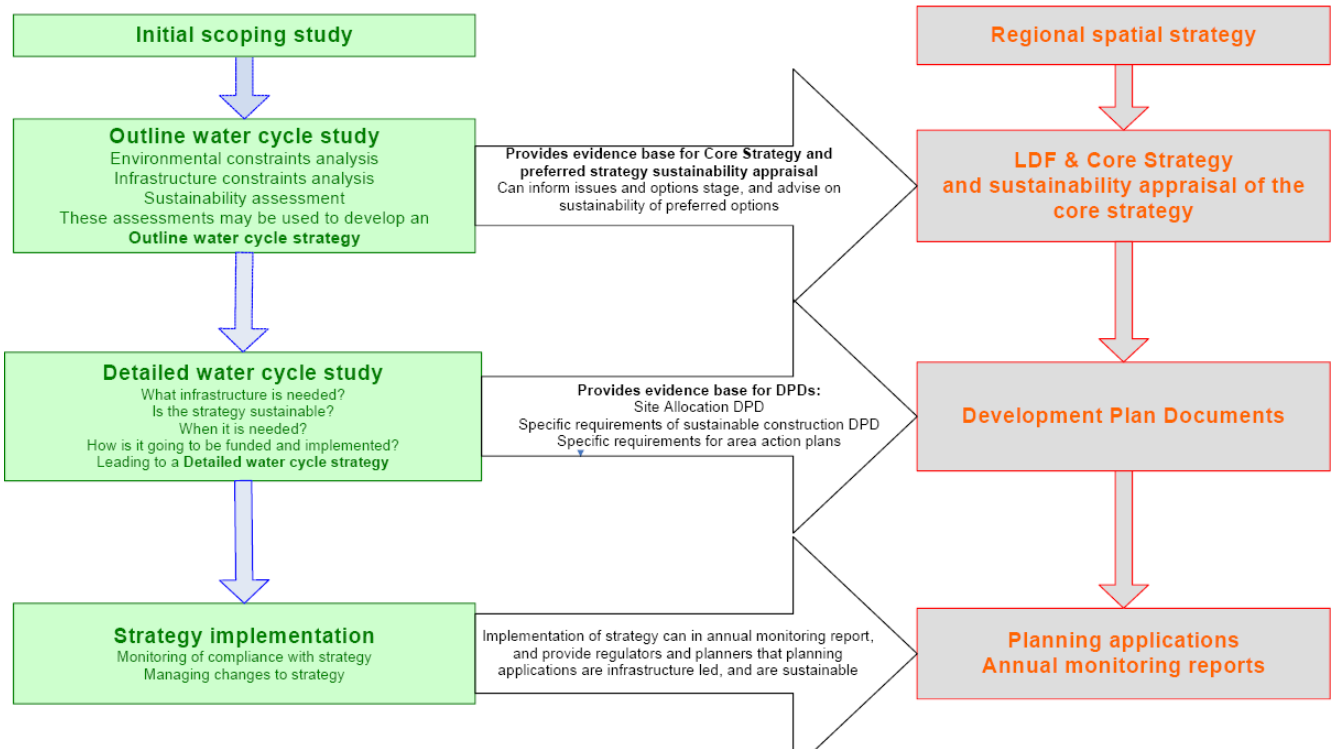
partnership with CBC and MSDC, feasibility work is being undertaken to investigate the requirement for a possible new market town in the Gatwick Sub-Region in parallel with the short listing of other possible strategic development locations in Horsham District.

This WCS concentrates on the potential housing trajectories arising from the four development scenarios set out in Table 2.3 above. After consideration of the impacts of development to 2026 on the water cycle and related infrastructure, a high-level commentary is provided on potential impacts and solutions for a new market town. This is presented in Section 7.2.

It is important that water resource and infrastructure issues are addressed and incorporated into the development of each Council's Core Strategy. The WCS will form part of the robust evidence base supporting the sub-regional authorities respective LDFs, thereby assisting in delivering the growth with key partners in a timely and structured manner when bringing development forward, and also providing an integrated approach to the management of the water environment and the implications of proposed development locations in the study area.

Figure 2.3 sets out how the water cycle study fits in with the local planning policy context. The diagram shows how the Detailed Phase of the WCS can provide important information to other DPDs, such as the Infrastructure Strategy. The most up to date information on infrastructure collated by the Councils was provided for use in this study, and the outputs of the Outline Stage will also assist in informing infrastructure planning.

Figure 2.3 Planning Context of Water Cycle Studies



2.3 Water Cycle Context

2.3.1 Water and Sewerage Infrastructure Planning

Sewerage services are supplied by Thames Water, to small areas of Horsham and Mid Sussex and all of Crawley and Reigate and Banstead. Southern Water provides sewerage services to most of Mid Sussex and the extent of Horsham that falls within the study area. Water supply is provided by South East Water (to most of Mid Sussex), by Southern Water (Crawley, Horsham and a small area of Mid Sussex) and by Sutton and East Surrey Water (to Reigate and Banstead).

It is important to understand the different scales at which water supply and sewerage are managed, and the impacts this has on assessing constraints to growth. Water supply is managed strategically, as there is a high level of connectivity in the water supply network and water can be moved great distances from the raw water sources (rivers, reservoirs, or groundwater) to the point of delivery. Generally, new developments can be connected to the main system relatively easily. In contrast, wastewater treatment works have much smaller defined catchment areas comprising public foul and public surface water sewers and so the location of development relative to the capacity of the nearest treatment works and receiving water can be critical.

Water and sewerage companies plan for investment in infrastructure for new development through the Asset Management Plan (AMP) process which runs in 5 year cycles. The water regulator, Office of Water Services (OFWAT), reviews the plans and sets the level of investment the water company can deliver in that AMP period.

The current AMP period is AMP 5 (2010-2015) and water companies have just recently completed the process of preparing their programme and capital expenditure plan, referred to as Price Review 2009 (PR09). Water companies are able to submit interim determinations within the 5 year planning cycle to seek additional funding for unforeseen requirements, but most plans should be covered by the normal submission process. A Water Cycle Strategy covers a longer planning period and can therefore inform longer term water company asset planning.

Water companies are also required to produce Water Resource Management Plans which report on longer term planning related to the development of water resources over a period of 25 years. The Water Resource Management Plan (WRMP) identifies the level of investment required in water resources schemes to meet additional demand related to population growth and changes in per capita consumption of water. WRMPs have recently been published by Southern Water (October 2009) and Sutton and East Surrey Water (March 2010), and these documents have duly fed into this Outline Water Cycle Study. The Final WRMP for South East Water is being investigated at public inquiry during the production of this report. Assessments of water resource availability and supply constraints have therefore been based on unconfirmed plans by the water company. The Draft WRMP has been used to inform the assessments as it represented the latest available information at the time. The Final WRMP was only published at the very end of this study and will therefore need to be reviewed in a Detailed WCS.

2.3.2 Legislation and Guidance

Legislation, guidance and supporting evidence for water related issues, such as water quality, flood risk management and urban drainage, have a significant impact on the water cycle and are often the cause of changes in water infrastructure as much as development pressures. Any adaptations to the water cycle must be compliant with such legislation and some are undertaken within the regulatory framework.

The primary pieces of legislation which set the context relating to the water cycle are summarised in Table 2.5 below.

Table 2.5 Primary Water Related Legislation

Water Framework Directive
The Water Framework Directive (WFD) sets out a requirement to prevent deterioration of current water quality and overall status, and to achieve good ecological status in rivers, estuaries and coastal waters, together with good status of groundwater by at least 2027. It presents a unique opportunity for holistic environmental management for all users of the water environment. The WFD is set within a River Basin Planning context. The Environment Agency has divided England and Wales into nine river basin districts in order to manage targets on both surface water and groundwater quality. For each River Basin District, a River Basin Management Plan has been prepared with the objective of protecting and improving the water environment in line with WFD requirements. River Basin Management Plans were published in December 2009 and set the objectives and programme of measures necessary to meet these objectives for first River Basin Planning cycle, running until December 2015. **The study area is located within both the South East River Basin (Rivers Adur, Arun and Ouse) and the Thames River Basin (River Mole and Medway). Figure 3.1 maps the boundary between the two river basins for context.**
Habitats Directive
The Habitats Directive recognises the increasing demand and pressure placed on wildlife from human activity, and aims to protect the wild plants, animals and habitats that make up our diverse natural environment. The European Directive created a network of protected areas of national and international importance. These are called 'Natura 2000' sites and include Habitats Directive Special Areas of Conservation (SACs). The Habitats Directive has been transposed into English law as the Conservation (Natural Habitats &c) Regulations 1994, now known as the Habitats Regulations. Existing and future water management has the potential to affect a number of these designations., The Environment Agency Review of Consents process has identified a series of amendments that will be required to existing abstraction licences and discharge consents if adverse effects on the European Sites are to be avoided.
Urban Wastewater Treatment Directive
The Urban Wastewater Treatment Directive (UWWTD) regulates the collection and treatment of wastewater from residential properties and industry. Under this Directive receiving waters can be designated as 'Sensitive' where additional levels of treatment are required at significant contributing discharges. These can either be direct discharges or those upstream of the designated reach / water body that serve a population equivalent in excess of 10,000. One type of sensitive area is the "Sensitive Area [Eutrophic]", where elevated nutrient concentrations, mainly nitrogen or phosphorus, present a risk to the ecological status of the receiving water. In these areas, larger sewage discharges must be treated to reduce nutrient loads.

Table 2.5 (continued) Primary Water Related Legislation

Nitrates Directive
Adopted by the European Union in 1991, this directive aims to reduce water pollution caused by nitrogen from agricultural sources and to prevent such pollution occurring in the future. The directive requires Defra and the Welsh Assembly Government to identify surface or groundwaters that are, or could be high in nitrate from agricultural sources. Nitrogen is one of the nutrients that can effect plant growth. Once a water has been identified, all land draining to that water is designated as a Nitrate Vulnerable Zone. Within these zones, farmers must observe an action programme of measures which include restricting the timing and application of fertilisers and manure, and keeping accurate records.
Freshwater Fish Directive
Designed to protect and improve the quality of rivers and lakes to encourage healthy fish populations. The directive sets water quality standards and monitoring requirements for areas of water which are chosen, or 'designated' by Defra. These 'designated' areas of water are selected because they are significant bodies of water which are capable of supporting fish populations.
Floods Directive and Flood Risk Regulations 2009
The Floods Directive is designed to help EU Member States prevent and limit floods and their damaging effects on human health, the environment, infrastructure and property. It requires Member States to first carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas at risk of flooding. For such zones they would then need to draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by 2015. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU. The Flood Risk Regulations 2009 was published in December 2009 to transpose the directive into UK law. The regulations also set the legislative obligation for relevant authorities to provide information to the Environment Agency where reasonable to fulfil the requirements of the regulations. The named authorities in the regulations include the lead local flood authority, a district council for an area, an internal drainage board(s), a highway authority, water company, reservoir undertakers, navigation authority, Natural England, Historic Building and Monuments Commission for England, the Countryside Council for Wales and the Welsh Ministers.
Floods and Water Management Act 2010
The Flood and Water Management Act was published in April 2010. It is designed to improve how the UK prepares for and responds to flood emergencies, and better protect water quality and water supplies during drought. It also gives the Environment Agency an overview of all flood and coastal erosion risk management, and unitary and county councils the lead in managing the risk of all local floods. As well as giving more responsibility to water and sewerage companies, it encourages the uptake of sustainable drainage systems (SUDS)by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SUDS for new developments and redevelopments.

3. Update of Baseline Information

This section presents a summary of the Scoping Study findings, information regarding the Steering Group responsibilities and wider stakeholder engagement, data requests issued for the study, and an overview of additional baseline information not presented in the Scoping Report. It has been assumed that the reader will be familiar with the Scoping Report, which provides a thorough overview of the existing climate, river catchments, geology, water resources, wastewater treatment, water quality and ecology and biodiversity.

3.1 Review of Scoping Report

The Scoping Study report was prepared in-house by Crawley Borough Council (CBC), Horsham District Council (HDC), Mid Sussex District Council (MSDC) and Reigate and Banstead Borough Council (RBBC), (hereafter referred to as the 'sub-regional authorities'). Publicly available information and position statements from the water and sewerage companies were used to prepare the report and collate the baseline information on the water cycle, in consultation with the Environment Agency.

Table 3.1 below outlines a review of the study against the requirements of the Environment Agency's National Guidance. This was undertaken by Entec at the start of the project in order to ensure no information was missing and to confirm that the methodology of the Outline Study was appropriate.

Table 3.1 Scoping Study Gap Analysis

WCS Guidance (page 14 of EA Guidance)	Gatwick Scoping Study Reference	Gap Analysis
Set up Steering Group	Section 1.3, Section 3.1	
Confirm partners and their responsibilities	Section 3.3.3 identifies the infrastructure responsibilities of the water and sewerage companies	Outline Study to identify stakeholder engagement strategy and confirm Steering Group members responsibility on the study
Define Study area	Gatwick Diamond Sub-Region, defined in Figure 1.1	
Identify previous studies* and data	Section 3.3.3	For completeness the Outline Study will also summarise the Catchment Flood Management Plan policies for the study area
Confirm planning scenarios and planning data	Section 3.4	Outline Study to determine remaining targets from 2010

Table 3.1 (continued) Scoping Study Gap Analysis

WCS Guidance (page 14 of EA Guidance)	Gatwick Scoping Study Reference	Gap Analysis
Identify WCS objectives	Section 1.2	
Identify which plans / strategies will be informed by study	Section 2.4 and section 3.3.3 highlights the various stages of the LDF each council are at.	Additional work required in Outline Study to identify interlinking strategies, e.g. infrastructure strategies
Identify if further work is required	Chapter 5	
Agree project scope for further work	Section 5.1	
Identify source of funding for further work	N/A Outline Study commissioned	
Assess flexibility of development plans regarding their location		To be included in the Outline Study
Gather data on Political boundaries	Figure 1.1	
Gather data on Water supply boundaries		To be included in the Outline Study
Gather data on Sewage catchment boundaries		To be included in the Outline Study
Gather data on River catchment boundaries	Figure 4.1	

* For example: Regional flood risk appraisal: Strategic flood risk appraisal; Stakeholders statements to RSS EiP/ LDF; Catchment management abstraction strategy; Water Company strategic water resource plans; Water Company drainage area plans; Conservation designation in study; River Basin Management Plan; Surface water management plan; Catchment flood management plan; RSS and LDF requirements; Significant Water Management Issues report

The Scoping Study provided a thorough overview of the issues in the study area, and through the gap analysis the Outline methodology remains the same as submitted in the tender proposal.

A summary of the Scoping Study findings is presented below:

- The Gatwick Sub-Region lies within the catchments of four main rivers, which are the River Arun, River Ouse, River Mole and River Adur. The hydrological context of the study area is presented in Figure 4.1 of the Scoping Study. Figure 3.1 below provides the context alongside the River Basin District boundaries;

- Southern Water identifies a water supply/demand balance deficit in the Sussex North Water Resource Zone during the period 2010-2015 and the South East Water WRMP demonstrates that leakage is a major area of concern in this area. The Sutton and East Surrey WRMP identifies sufficient resources to meet average demands, however recognises there is a deficit to meet peak demands in dry years. All three water suppliers remain confident that the risks to water supply can be appropriately managed through a twin-track approach including bulk transfer of water from other areas as well as water efficiency and leakage reduction measures. As such it is not currently anticipated that water supply should act as a constraint to development in the study area over the plan period to 2026;

- Wastewater treatment capacity represents a major constraint to sub-regional development over the South East Plan period. Crawley Wastewater Treatment Works (WwTW) is likely to reach capacity if all potential development sites come forward, whilst wastewater treatment works have reached, or are nearing capacity in areas of both the Horsham and Mid Sussex Districts. Identified development at Horley will also place further strain on sewage treatment capacity;

- The most significant environmental constraint is identified as being the environmental quality of the River Arun on future discharge of pollutants contained in the wastewater discharged from the Horsham WwTW. The river has high levels of phosphate despite the WwTW operating at Best Available Technology for phosphorous removal and the river is at risk of not meeting European standards set by the Water Framework Directive;

- In light of the identified waste water treatment constraints and water quality issues in the River Arun and in the region's other watercourses it is recommended that an Outline Study is undertaken to investigate the capacity of the water environment to absorb further discharges from receiving water courses, and consider whether further development would result in an unacceptable deterioration of the water environment within and beyond the study area.

3.2 Steering Group

A Steering Group was formed for the Scoping Study comprising representatives from the following organisations:

- Crawley Borough Council;
- Horsham District Council;
- Mid Sussex District Council;
- Reigate and Banstead Borough Council;
- Environment Agency – Southern Region;
- Environment Agency – Thames Region;
- Southern Water;
- South East Water;
- Thames Water;
- Sutton and East Surrey Water.

In order to formalise the Steering Group and to identify wider stakeholders, a stakeholder plan was produced, which set out levels of interest in the study, information on how each stakeholder might influence the study and contact details where necessary. This confirmed that the above organisations would attend Steering Group meetings, provide data for the study, comment on draft outputs and make use of the study to assist in planning for

growth. Those organisations that were identified as needing to be aware of the study included Natural England, both Surrey and West Sussex County Councils, the Homes and Communities Agency and the South East England Development Agency. An information leaflet has been issued to these organisations to summarise the aims of the project.

Figure 3.1 Main Rivers and River Catchments in Study Area

3.3 Data Requirements

In order to develop the findings of the Scoping Study into an Outline WCS for the sub-region, a list of data requirements was issued to the Steering Group members. Where appropriate, information has been collated from publicly available sources, such as the River Basin Management Plans (RBMP) and WRMPs. Appendix A lists the data request issued and records which data has been provided.

3.3.1 Water and Sewerage Company Data

Measured flows discharging from wastewater treatment works were requested from Thames Water and Southern Water for the main works in the study area, so that the performance of the works could be compared to the consented flow. The indicative flow capacity of the works can be estimated by comparing the two flow values. However, measured flows for Southern Water works were only provided by the Environment Agency from 2008 data.

Discussions were held with both sewerage providers over the estimated treatment capacity at the major works affected by water quality targets.

The Scoping Study anticipated that the adopted WRMP would be available for the Outline Study. The final WRMP for Southern Water has been available since September 2009 and this Outline WCS is based on information and data within the plan. Sutton and East Surrey Water have published their final WRMP and the study uses data and information dated March 2010. As discussed in Section 2.3.1, at the time of producing this report South East Water had not published its final WRMP and a public inquiry of its plan was underway (11 May 2010 to 11 June 2010). Therefore, this Outline WCS has used data and information contained within the revised draft WRMP dated January 2010, which covers the Mid Sussex District Council supply area. The Final plans should be reviewed as part of the detailed phase WCS.

3.3.2 Planning Data

The sub-regional authorities provided information on proposed and potential housing and employment locations to be assessed in the study. The information provided is summarised in Section 2.2.2 above.

3.4 Baseline Update

A summary of the Scoping Study findings is presented in Section 3.1. The main baseline information is provided in the Scoping Report and presents a thorough overview of the existing climate, river catchments, geology, water resources, wastewater treatment, water quality and ecology and biodiversity. The baseline information is not repeated in this section. However, Figure 3.1 presents the hydrological and WFD context, also mapping the presence of the River Medway headwaters in the east of the study area within Mid Sussex. Figures 3.2 and 3.3 at

the end of the chapter present the water supply zones and sewerage services across the study area to provide additional context.

Additional information that has become available on water quality, water resources and flood risks and policy since the Scoping Study is presented in the following sections. Figure 3.3 also presents additional information on the Water Resource Zones, which are discussed in Section 3.4.2.

3.4.1 Water Quality Update

Under the WFD, water quality targets are set in the RBMPs. The study area is located within the Arun and Western Streams catchment and the Adur and Ouse catchment of the South East RBMP, and in the Mole catchment and the Medway catchment of the Thames RBMP. Key actions for these catchments are presented in Table 3.2 below. The table includes a summary of actions for the Medway catchment, however the study area only overlaps with the very head of this catchment at East Grinstead in the headwaters of tributaries to the River Eden, and was not discussed in the Scoping Study. Although only a small proportion of the study area is impacted by these actions, they are listed here as some are relevant to the East Grinstead area.

Table 3.2 Summary of Key Actions per Catchment from the River Basin Management Plans

River Basin	Catchment	Main Settlements Affected	Key Actions Relevant to the Study Area
South East	Arun and Western Streams	Horsham	The EA will work with Southern Water to modify abstraction licences within the Arun Valley catchment and achieve more sustainable levels of abstraction. The EA will work with landowners to realign some embankments on the River Arun, providing new wetland habitats and improving ecological status. The fish pass programme will aim to address barriers to fish passage at Lording Lock, North Mill and Stedham Mill on the rivers Rother and Arun. The England Catchment Sensitive Farming Delivery Initiative will focus its land management advice on the Western Rother and River Arun to address rising trends of nitrate. Southern Water will improve sewage works at 17 locations such as Horsham, to reduce levels of phosphate, nitrate and organic pollutants. The EA will target pollution prevention campaigns around industrial areas, and investigate reasons for low ecological quality. The Highways Agency, local authorities and the Environment Agency will develop targeted pollution prevention initiatives to prevent and limit the introduction of pollutants to groundwater from road drainage, private sewage disposals, oil and chemical use and storage, and pesticide use in urban areas

Table 3.2 (continued) Summary of Key Actions per Catchment from the River Basin Management Plans

River Basin	Catchment	Main Settlements Affected	Key Actions Relevant to the Study Area
South East	Adur and Ouse	Burgess Hill, Haywards Heath	Southern Water will improve sewage works at seven locations to reduce levels of nutrients including phosphate and organic pollutants. The EA will, subject to funding, modify abstraction licences to ensure no adverse impact on Sites of Special Scientific Interest. The EA's 'better rivers' programme will improve habitat at nine priority water bodies including River Ouse, Uck and the Adur at Knepp Castle. A fish passage programme will address priority barriers to fish passage, including Wineham Bridge and Barcombe Mills. The EA will survey the Lewes Winterbourne and four other Chalk Streams in East Sussex to inform Restoring Sustainable Abstraction investigations. The Highways Agency, local authorities and the Environment Agency will develop targeted pollution prevention initiatives to prevent and limit the introduction of pollutants to groundwater from road drainage, private sewage disposals, oil and chemical use and storage, and pesticide use in urban areas.
Thames	Mole	Crawley Horley, Salfords and Sidlow	The EA will undertake farm visits and work with farmers to provide pollution prevention advice and information to ensure farming activities are not causing a detrimental impact on the environment. The EA will investigate improvements to sewage treatment works that could be included in the programme of work under the 2014 periodic review. Throughout the catchment, there is a requirement for further monitoring and investigation to allow targeting of additional measures to improve the status of this catchment
Thames	Medway	East Grinstead	Southern Water will improve sewage works at five locations to reduce inputs of nutrients including phosphate and improve shellfish waters. South East Water will investigate abstraction from the Greensand Sources in the Leybourne and Bourne in the Periodic Review process. The EA will educate and raise awareness of the impact that small discharges to ground and surface water have on water quality of the receiving waters, This is with a view to advising residents of the need to connect to the mains sewer system across many of the rivers including the Eden. Pollution prevention campaigns around groundwater abstractions to decrease the inputs of nitrates, pesticides, hydrocarbons and solvents.

For the Outline Study, a map of the WFD classifications for the main waterbodies in the study area has been provided by the EA (see Figure 3.4). In this figure it can be seen that the majority of waterbodies in the study area are failing to meet the WFD objective of Good Status, which is one of the key issues facing this study. The exceptions are Shovelstrode Stream through East Grinstead (a tributary of the River Medway), a small section of the Arun headwaters in Horsham and the River Adur East tributary near Cuckfield.

Good Status is determined by the Ecological and Chemical Status of the water body. An explanation of the key elements is as follows:

- *Chemical Status*: Chemical status is assessed by compliance with environmental standards for chemicals that are listed in the Environmental Quality Standards Directive 2008/105/EC1. These chemicals include priority substances, priority hazardous substances and eight other pollutants carried

over from the Dangerous Substance 'Daughter Directives'. Chemical status is recorded as 'good' or 'fail', which is determined by the worst scoring chemical. An assessment of chemical status is only required in water bodies where priority substances and other specific pollutants are known to be discharged in significant quantities;

- *Ecological Status*: Ecological classification comprises four groups - Biological, Physico-Chemical, Specific Pollutants and Hydro-morphological. It should be noted that the hydro-morphological element only helps define High Ecological Status. Ecological status is recorded on the scale of High, Good, Moderate, Poor or Bad. 'High' denotes largely undisturbed conditions and the other classes represent increasing deviation from this natural condition – from here on described as 'reference condition'. The ecological status classification for the water body, and the confidence in this, is determined by the worst scoring quality element.

The Chemical Status and the status of the Physico-chemical elements of Ecological Status are both helpful in understanding the water quality context for this Study.

The River Arun is currently at Moderate Status downstream of the Horsham WwTW. The River Adur, which receives discharges from the Goddards Green WwTW serving Burgess Hill, is currently at Poor Status, with phosphate levels at Bad Status. The watercourse receiving discharges from the Crawley WwTW is classified as being a Heavily Modified Water Body and having Moderate Potential. The Eden Brook, which is a tributary of the River Medway and receives discharges from both Felbridge and Eden Vale WwTWs is at Moderate Status. The Luxford Lane WwTW serving parts of East Grinstead discharges into a section of the River Medway which is Heavily Modified and has Poor Potential. Table 4.2 presents the wastewater treatment works against the receiving watercourses and their WFD status.

As the majority of watercourses are failing to meet Good Status, there are a number of actions listed within the RBMPs for different sectors to take in improving the water environment, some of which are listed in Table 3.2 above. Careful consideration of the location and intensity of future housing and employment development is required by local authorities, the Environment Agency and the sewerage providers to ensure that growth does not adversely affect existing water quality and improvements required to meet Good Status.

Ecology and biodiversity are not discussed in this report. The Environment Agency has advised that the existing procedures for licensing abstraction and wastewater treatment between them and the utilities providers are in place to ensure that infrastructure provision does not impact on sites of ecological importance. Therefore, the licensing system for water resources and wastewater associated with future development will deal with the ecology and biodiversity impacts: if there is capacity in the WwTW and available water supply through existing consents then the ecology has been considered. Furthermore the environmental assessments within the plan making process also include existing procedures to consider ecology and biodiversity, such as the Habitats Regulations Assessments and Strategic Environmental Assessments for development strategies and Environmental Impact Assessments and Appropriate Assessments for planning applications.

3.4.2 Water Resources Update

The Scoping Study sets out how water resources are managed in the region in which the study area is located. Water resources are under significant pressure in this area due largely to increasing demand, which is forecast to exceed existing supplies within the next few years. Figure 3.3 shows the Water Resource Zones with a summary of the baseline forecasts of supply and demand. These forecasts take into account the growth projections in the South East Plan, existing water demand management activities, and existing resources (including resource developments that have already been approved).

Water companies plan how they will manage supply and demand based on forecasts of annual average conditions in a dry year, and also in a peak demand period, if they have one. In basic terms a dry year is one in which demand for water is more than is usual in a typical 'normal' year. A 'peak period' represents average daily demand during the hottest/driest point usually at the height of summer. To remove the effect of intense demand over a few days, the peak period is usually based on demands over a few weeks. A water company can plan to manage its resources specifically to cover peak demand periods, preventing drought conditions occurring. In many cases a water company abstraction license permits more abstraction during the peak period than during the rest of the year.

Approximately half of the study area, including East Grinstead, Haywards Heath and Burgess Hill is supplied by South East Water in its Resource Zone 2. In their draft WRMP, South East Water assesses the resources in both the dry year and peak demand periods. South East Water forecasts a deficit of supply below demand from 2012/13 which is set to increase over the next 25 years. Some 8% of South East Water's baseline supplies come from the bulk supply of water from other water companies. This is the highest percentage of any company in South East England. The Company also makes use of significant inter-zonal transfers, to balance the use of resources across its supply area[2].

Southern Water supplies the Crawley and Horsham areas from its 'Sussex North' resource zone for which dry year and peak demand periods are assessed in the WRMP. Supplies in the Sussex North zone are predominantly from surface water (57%). There is currently a small deficit of supply below demand (dry year annual average scenario) but after 2011/12 this will be resolved and the longer term forecast is a balance (no deficit and no surplus). Water resources are more of an issue during the critical, peak demand period. The Scoping Study has summarised the reasons why the zone is susceptible to drought, the risk to water supplies, and the potential for water restrictions. Southern Water's strategy is to increase the margin to create a small surplus in the dry year scenario, and to remove the deficit that occurs in the critical peak period.

Sutton and East Surrey Water supplies Horley and the Gatwick Airport area within its East Surrey Resource Zone. The supply area also includes Tandridge District Council and Mole Valley District Council who opted out of the study. Both dry year and peak demand periods are assessed in their WRMP. As detailed in the Scoping Study there are sufficient water resources to balance supply and demand in dry year annual average conditions. However,

[2] South East Water Draft WRMP main report, p72

demand in the peak period increases significantly above annual average levels and the Company has forecast a deficit to occur in the peak period from 2023/24.

3.4.3 Flood Risk and Policy Update

Strategic Flood Risk Assessments

All four authorities have had Level 1 Strategic Flood Risk Assessments (SFRAs) undertaken, which concluded that Level 2 SFRAs were not needed. In recognition of the importance of considering flood risk in a wider context (i.e. outside of the immediate Borough boundaries) the Reigate & Banstead SFRA was commissioned in conjunction with the Crawley and Horsham SFRAs to ensure a consistent and robust planning policy response.

The Crawley and Reigate & Banstead SFRAs were completed respectively in April 2007 and December 2007. The Horsham SFRA has been revised by Scott Wilson in April 2010 and the Mid Sussex SFRA is dated March 2008. The Reigate and Banstead's SFRA is currently being updated in house. Table 3.3 below provides a summary of the main findings.

Table 3.3 Summary of Flood Risks from each of the Local Authorities SFRAs

District	Main Rivers within the Gatwick Study Area	Flood Risk
Crawley Borough Council	Upper reaches of the River Mole	The Borough of Crawley falls entirely within the upper reaches of the River Mole catchment. Flooding has been observed within the Borough a number of times in living memory, with no less than eight floods occurring since 1947, most recently in Ifield in December 2008. It is estimated that 846 properties in Crawley are at 'significant' risk of flooding (i.e. at risk of flooding, on average, once in every 100 years). .. Crawley Borough (including the Gatwick Airport precinct) is also situated immediately upstream of Reigate & Banstead Borough, where a large number of properties are susceptible to flooding from the River Mole. As such, the SFRA recognises that future development in Crawley must be carefully managed to ensure that downstream risk of flooding is not exacerbated
Reigate & Banstead Borough Council	River Mole and its two tributaries Gatwick Stream and Burstow Stream	A relatively large number of homes and businesses in Horley are at risk of flooding from the River Mole and its tributaries, the Gatwick Stream and Burstow Stream. All three rivers flow on the periphery of the Horley built up area in open channels, and all pose a risk of flooding to homes and businesses in events up to (and including) the 1 in 100 year flood. There are low lying areas within the town centre of Horley that have seen urban development progressively encroach into areas that are at risk of flooding. The River Mole and its tributaries are a key characteristic of the Green Belt areas of the Borough. These areas retain their rural character, and development has not been permitted to encroach upon the natural floodplain of the river corridors. The future protection of these areas is imperative to retain essential flood storage away from the built-up areas of the Borough, and the Council's Riverside Green Chain policy in an important contributor to this goal. Uncontrolled development within the upper reaches of the catchment, within the adjacent Boroughs of Crawley and Horsham, may increase the frequency and severity of flooding in the town.

Table 3.3 (continued) Summary of Flood Risks from each of the Local Authorities SFRAs

District	Main Rivers within the Gatwick Study Area	Flood Risk
Horsham District Council	Upper reaches of the Rivers Mole and Arun	There are no major urban areas at risk of fluvial flooding in the catchments of the Upper and Eastern Arun, however, a number of properties in rural areas and in parts of Horsham have been flooded in the past and are at risk from surface water flooding. The results of the application of the sequential test identified that all nine potential strategic site options identified in the 'Leading Change in Partnership to 2026' Consultation document were sequentially appropriate.
Mid Sussex District Council	Upper reaches of the Rivers Ouse (through Haywards Heath) and Adur (through Burgess Hill); Parts of upper catchments of the Rives Mole and Medway	The SFRA has demonstrated that due to the nature of Mid Sussex, in terms of it being at the source of the four catchments that cover the district, the level of risk of fluvial flooding is comparatively low when compared to neighbouring authorities. Uncontrolled development within the district may increase the frequency and severity of flooding in towns of the neighbouring authorities. An example of this is on the tributaries of the River Mole where existing flooding problems in Crawley could be exacerbated by inappropriate drainage schemes on development that is within this catchment and within Mid Sussex.

Catchment Flood Management Plans

The study area is covered by 5 Catchment Flood Management Plans (CFMP) that were adopted by the EA in 2008. The area of Crawley and Horley is included in the Thames CFMP, Horsham and the surrounding Weald area are included in the Arun CFMP, Burgess Hill and Hassocks in the Adur CFMP, Haywards Heath and the Upper Ouse to the north and west are covered by the Ouse CFMP and the remaining area including East Grinstead is covered by the Medway CFMP.

The CFMPs give an overview of the flood risk in each catchment and set out the EA's preferred plan for sustainable flood risk management over the next 50 to 100 years. To set policies and objectives, each catchment is divided into Policy Units. The study area spans across seven Policy Units for which the selected policies include Policies 3, 4 and 6, which are defined as follows by the EA:

- Policy 3 - Areas of low to moderate flood risk where we are generally managing existing flood risk effectively;
- Policy 4 - Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change;
- Policy 6 - Take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits, locally or elsewhere in the catchment.

The preferred policies for each area are presented in Table 3.4 below.

Table 3.4 Preferred Strategies from the Catchment Flood Management Plans (Environment Agency, 2008)

Area	CFMP	CFMP Region	Flood Issues	Recommended Strategy
Upper Mole (Crawley, Horley, parts of Horsham and Mid Sussex)	Thames	Sub-area 5	Areas of low to moderate flood risk where some properties have a 1% risk of flooding from rivers The communities at risk are often located in narrow riverside corridors throughout the catchment There have been some river modifications and flood defences built in the past but some people remain at risk from multiple sources of flooding	Policy option 6: Safeguard open space Identify opportunities for flood storage Maintain and improve river flows in urban areas Improve existing drainage systems Increase the resistance and resilience of buildings through redevelopment Develop emergency response planning
Horsham	Arun	Sub-area 2	Flooding from surface water significant and expected to increase in future Climate change and urban growth will place considerably more pressure on drainage networks No raised flood defences but significant control structures that modify the flow	Policy option 4: Promote SUDS and no increase in run-off from new developments Prepare a Surface Water Management Plan (SWMP) Maintain current standard of protection
The Weald	Arun	Sub-area 1	This rural area has opportunities for changing land use and possible flood storage to reduce some of the current rapid run-off due to soils, slope and land use	Policy option 6: Develop a System Asset Management Plan (SAMP) to review maintenance regimes Promote wetland habitats to landowners Explore the potential for changes in land use and land management practices (with Natural England and National Farmers Union)
Burgess Hill and Hassocks	Adur	Sub-area 2	Existing risk is relatively low Localised surface water flooding combined with urban drainage problems and under capacity of local streams Pressure for urban expansion and climate change likely to cause a significant increase in flood risk	Policy option 4: Promote SUDS and no increase in run-off from new developments Prepare a Surface Water Management Plan (SWMP) Increase coverage of the flood warning service Improve and develop emergency response plans Assess potential for more and improved defences
Haywards Heath	Ouse	Sub-area 2	Localised flooding may occur from the Scrase Bridge Stream and West Common Stream as a result of surface water overwhelming urban drainage systems Proposed urban development will have an impact on flood risk into the future	Policy option 4: Develop a System Asset Management Plan (SAMP) to review maintenance regimes Develop a Surface Water Management Plan (SWMP) Work towards long-term protection and re-creation of the Scrase Bridge Stream and West Common Stream Promote no increase in run-off from new developments Increase the coverage of the flood warning service in Haywards Heath and Lindfield

Table 3.4 (continued) **Preferred Strategies from the Catchment Flood Management Plans (Environment Agency, 2008)**

Area	CFMP	CFMP Region	Flood Issues	Recommended Strategy
Medway Upper catchment (East Grinstead)	Medway	Sub-area 1	Flood risk is managed well and risk is relatively low. Surface water flooding can occur in urban areas such as East Grinstead	Policy option 3: Improve the flood warning service Undertake System Action Management Plans (SAMPs) to review maintenance regimes Promote appropriate management of runoff in planned development in East Grinstead Promote wetland habitats to landowners Influence the development of emergency response plans

Upper Mole Strategy

The Upper Mole Flood Alleviation Scheme was developed by the EA following extensive flooding in 2000 across Crawley, Horley and at Gatwick Airport. Its objectives are to provide an improved level of flood protection to these areas and adapt to future changes in climate. The project involves creating new, or improving existing reservoirs to store large amounts of water during spells of heavy rainfall. Work on the first project of the scheme, Tilgate Lake, began in summer 2010.

The scheme is made up of five individual projects which are planned to be implemented between 2010 and 2012:

- Tilgate Park improvements;
- Ifield flood detention reservoir;
- Clays Lake flood detention reservoir;
- Grattons Park river restoration;
- Worth Farm flood detention reservoir.

Figure 3.2 Indicative Wastewater Treatment Works Catchments

Figure 3.3 Water Supply Zones covering the Study Area

Figure 3.4 Water Framework Directive Overall River Status

4. Potential Constraints to Development

This section presents the potential constraints to development based on the state of the existing environment and water infrastructure, as provided from the Scoping Report information and from data provided by third parties for this study. The constraints for development are presented below in a traffic light context, for each topic area. The key for the traffic light system is as follows:

	Development ok, no constraints identified
	Development may be ok, constraints identified, mitigation required to meet planned trajectory
	Development should not proceed due to major constraint

A series of annotated maps (Figures 4.1 to 4.3) are also provided at the end of the chapter, to direct the reader to the main constraints to development.

Constraints for each strategic site are presented separately in Chapter 7, which discusses the development strategy for the study area. The assessment of strategic sites is presented later in the report to inform the sub-regional authorities' preferred options decisions.

4.1 Environmental Constraints

4.1.1 Water Quality

The EA data indicates that most rivers in the study area are at Moderate or Poor Status. In line with the requirements of the WFD the aim for the watercourses is to reach Good Status. Some rivers are failing to meet WFD targets due to nutrient levels. Failures to meet targets are not necessarily caused primarily by development and resultant wastewater discharges; however the EA will continue to monitor and set the discharge limits from wastewater treatment works with regard to quality, in order to ensure that water quality does not deteriorate further to meet WFD targets. Housing and employment growth has the potential to increase pressure on meeting the WFD target of Good Status if growth levels exceed existing wastewater discharge consents. There is also further uncertainty in planning for future wastewater treatment, as the Environment Agency might seek to tighten existing discharge quality permits to help achieve Good Status by 2027 in the watercourses in the study area.

The capacity of the River Arun to receive additional waste flows from Horsham WwTW was identified as one of the main potential constraints in the study area in the Scoping Study. Phosphorous levels are high in the river, and the treatment works serving Horsham are currently operating at Best Available Technology for phosphorous removal and cannot meet a stricter discharge consent at this time. The South East RBMP discusses the Habitats Directive Review of Consents, which has identified a number of localised impacts on nutrient levels from sewage treatment works, and indicates point source pollution as a major reason why more water bodies in the Arun

catchment are not currently achieving Good Status. The potential constraint at the Horsham WwTW is discussed separately in Section 4.2.

The River Mole, receiving wastewater from Crawley WwTW, is currently at Moderate Status upstream of the works and downstream is currently Poor Status, predicted to remain poor by 2015. If the growth levels to the Crawley works were to increase against consented levels in terms of flow volume, then an increased consent for flow and quality would be required. If the discharge quality required is greater than the economic limit of treatment at the work, this could present a constraint to growth.

Upstream and downstream of the Goddards Green WwTW and Scaynes Hill WwTW, the River Arun and River Ouse are currently at Poor Status, predicted to remain Poor by 2015 and at East Grinstead the River Medway is currently Poor Ecological Potential, predicted to increase to Moderate Ecological Potential by 2015. The Goddards Green treatment works serving Burgess Hill is at Best Available Technology for BOD removal and cannot meet a stricter discharge consent with regard to this element (Biological Oxygen Demand). Based on available information, this poses a constraint to future growth in the Burgess Hill area (see Section 4.2 for further information on the wastewater treatment issues).

Whilst the WFD status and in particular phosphorous levels has the potential to constrain development, through the EA's policies to prevent deterioration (i.e. no further development should lead to adverse impacts on the status or any contributing elements), the EA has advised that growth will be permitted **within the existing consent limits.** That means that as the Horsham works is not currently operating at its flow capacity, further growth can be accommodated without reducing the water quality of the Arun.

The Weir Wood and Ardingly Reservoirs are both classified as having Moderate Ecological Status and do not pose constraints to strategic growth in the study area as they do not receive wastewater flows in their upstream catchment.

4.1.2 Water Resource Availability

Within the study area and wider supply zones, water resources are under significant pressure and consideration of water management is necessary to prevent constraints to growth. This section examines the water companies' strategies to manage water supplies in the context of water resource availability in the region. All three water companies include demand management (customer side metering and water efficiency, leakage reduction etc). However, all three also include resource development schemes in their plans to secure water supply. The Scoping Study refers to these schemes, and this section examines each one in more detail. Information from the Environment Agency Catchment Abstraction Management Strategies (CAMS) assessments is used to consider resource availability. The Scoping Study presented the CAMS assessments for catchments directly within the study area (the Arun and Western Streams, the Adur and Ouse, and the Mole). Figure 4.1 shows the additional CAMS that are relevant to the wider water resources zones supplying the study area. Therefore, this study also includes a review of the Medway, a small part of the Rother, a small part of the Cuckmere and Pevensey Levels, and the Thames Corridor catchments.

South East Water (draft WRMP)

- Option: Increase the quantity of a groundwater abstraction licence at Eridge by 0.5Ml/d.

This source abstracts from the Ashdown aquifer and is close to the Eridge Stream which is a tributary of the River Medway. South East Water recognises that the abstraction could "impact on baseflow of tributaries of the Upper Medway, but the size of the impact is considered minor or negligible"[3]. The abstraction is in the Medway CAMS catchment and the Environment Agency CAMS assessment states that there is 'No water available' in the groundwater catchment[4]. Despite this, the WRMP states that this option aligns with options selected by the Water Resources in the South East (WRSE) technical group, of which the Environment Agency is a partner. Figure 4.1 shows that water resource availability in all catchments available to SEW have either no water available or are over licensed.

- Option: Winter storage reservoir (Clay Hill, East Sussex north of Ringmer).

South East Water has concluded that the least cost, optimal option to secure supplies is to develop a new winter storage reservoir, and its preferred site is at Clay Hill (outside of the study area). The option is to develop an impounding reservoir (approximately 150ha) on the Clay Hill stream, a tributary of the River Ouse. This is within the Adur and Ouse catchment which has no water available (for further abstraction) at low flows, but abstraction at higher flows is permitted. High flows from the River Ouse would be pumped into the reservoir during the winter. The option includes building a dam, a water treatment works, and installing 3.5km of pipelines[5]. This scheme would meet supply needs in both dry year annual average and peak period conditions.

- Option: Desalination at Newhaven.

From 2025, South East Water believes that a desalination plant will be necessary to provide 9.5 megalitres a day (Ml/d) of extra potable water. This will not be constrained by water availability but the need for such an option demonstrates the severity of water stress in this area.

- Option: Maintain transfers between Resource Zones 2 and 3.

South East Water intends to maintain its existing transfers between Resource Zones 2 and 3 to secure supplies in both zones.

South East Water states in its draft WRMP that its strategy to manage demand and increase resources will remove the forecast deficit and secure public water supplies. However, South East Water's strategy was going through public inquiry during preparation of this study and this report does not aim to preclude the outcomes of that inquiry. This section simply presents the environmental constraints that could affect development in the study area.

[3] SEW Strategic Environmental Assessment Main Report page 1-17

[4] CAMS Medway page 14

[5] South East Water Strategic Environmental Assessment Main report page 8-103

Southern Water

- Option: Transfer 15Ml/d from Sussex Worthing Resource Zone;
- Option: Maintain a bulk supply 15Ml/d from Portsmouth Water.

These transfers already exist and are expected to continue without any problems. Sussex Worthing Resource Zone starts the planning period in surplus and remains so throughout the planning period, enhanced by some AMP5 source improvements. Similarly, Portsmouth Water's WRMP shows that the Company forecasts a surplus of supply over demand until 2032.

- Option: Improvement of groundwater sources.

No information has been made available to this study on which sources will be improved. However, the part of the Adur and Ouse catchment that is accessible to Southern Water is assessed as 'water available'. The Adur and Western Streams catchment has water available in the east, is over licensed in central areas, and is over abstracted in the west.

- Option: A new abstraction from the tidal stretch of the River Arun (15Ml/d peak period).

This option is less constrained by water resource availability due to the tidal element and has now been confirmed by the EA and is due to be delivered in March 2011.

Sutton and East Surrey Water

- Option: increase peak output at Reservoir A.

Sutton and East Surrey Water claims that *"the most cost effective means of overcoming this deficit is to upgrade the treatment works at Reservoir A to 70Ml/d, and to reinforce the distribution system to enable water from Reservoir A to be transferred over a much wider area in sufficient volumes to meet peak demands"*[6]. (This reservoir has not been identified due to confidentiality issues). The assumed location of this reservoir is in a catchment which is assessed as having 'no water available'. However, the new daily peak licence of 70Ml/d for Reservoir A was granted by the Environment Agency in May 2007.

In the critical peak week scenario there is a deficit in the amount of water required to cover the uncertainties in the supply and demand forecast. This increases the risk of water restrictions during the peak demand period. Sutton and East Surrey Water is confident that its twin-track approach of demand management and resource development will reduce the deficit within the next five years, fully removing the deficit within the next 25 years.

[6] Sutton and East Surrey Water, WRMP Main report page 7.

Sutton and East Surrey Water supply potable water to London Gatwick Airport. Information in the Gatwick Airport Utilities Action Management Plan report (2009-2011) states that annual demand in 2007 was 973,074m^3. Sutton and East Surrey Water has confirmed that approximately 19% of its total demand is from non-households (including Gatwick Airport). The company does not anticipate any significant increase in non-household demand over the next 25 years (either average or peak). Gatwick Airport represents approximately 2% of total demand, which means a significant change in demand would be required to impact on the total forecast. The airport has set itself an action plan to reduce its demand for water by 2% each year until 2011 (compared to operating business as usual). The airport action plan also specifies further engagement with Crawley Borough Council[7]

Review of the water company forecasts and the assumptions within them, and discussions with the water companies clearly show that development in the study area should not be constrained by water supply availability. This is on the condition that demand across all sectors is adequately managed, and critically, that the water companies are able to develop their resources.

4.1.3 Flooding

Where zones of high flood probability are defined by the Environment Agency's Flood Zone 3, development categorised as being highly vulnerable should be prohibited in accordance with PPS25. When considering the suitability of sites for development, the flood zones defined in the Level 1 SFRAs should be referred to, in order to steer development into the lowest flood risk zones through application of the Sequential Test.

Fluvial flood zone 3 is present along the route of all watercourses, and does not generally extend into wide floodplains in the study area. The Level 1 SFRAs for each Council have not identified a need for Level 2 SFRAs as none of the identified or potential locations for developments are located in areas of flood risk. Fluvial flooding does not therefore present a major constraint to growth. Nevertheless, possible development locations at West of Ifield, North East Sector, North Horsham, and North West of Burgess Hill should be aware of watercourses running through the proposed site boundaries and the associated flood risk close to the watercourse channels. Site specific flood risk assessments will be required for any site greater than 1 hectare, and for any site with areas of Flood Zone 2 or 3 encroaching onto the site. Figure 4.2 presents an assessment of sites which may require site specific FRAs. Sites with a minor part of a flood zone within the potential site boundary are indicated as having a minor flood risk. During initial planning stages, the developer should consult with the EA and aim to avoid the flood risk areas, which only occupy a very minor part of the land available.

In the future, flood risks may increase as a result of climate change impacts on rainfall, which might potentially constrain development. PPS25 Table B.2 recommends that a 5% increase in rainfall and/or a 10% increase in peak flows is considered for the period up to 2025. A 'Flood Zone 3 plus climate change' flood extent was presented in the Horsham SFRA where modelling work was undertaken, and in other areas the Flood Zone 2 extent was agreed

[7] LGA action plan, page 15

to represent the Flood Zone 3 plus climate change. Mid Sussex DC agreed with the EA that a 20m horizontal buffer strip be applied to the existing Flood Zone 2 outline and to the outer edge of mapped historical flooding records, as an allowance for climate change. In the Crawley SFRA it was also estimated that flood depths within the current Zone 3 may increase by up to 400mm as a result of climate change over the next 50 years.

Development on existing greenfield sites, as with all development, will require compliance with PPS25 to prevent increases in run-off. Larger sites on greenfield land may require particular consideration of the land take required to meet PPS25 requirements of limiting run-off to greenfield rates. Sufficient attenuation and sustainable drainage should be allowed for, as well as consideration of strategic SuDS solutions for drainage control.

Surface water flooding is discussed below in Section 4.2.3.

A summary of the Environmental Constraints is presented in Table 4.1.

Table 4.1 Environmental Constraints

Council	Water Quality	Water Resources	Flooding
Crawley	WFD standards are Moderate to Poor. Growth has the potential to increase pressure on meeting the WFD target of Good Status if growth levels exceed existing wastewater discharge consents	Water resources are in short supply across the south east where population levels are highest and where significant growth is planned. The water companies do have plans to resolve the situation and these include a combination of schemes to increase resources and demand management, which the sub-regional authorities can support. Refer to Section 8.1 of this report for policy recommendations to be included in DPDs	Level 1 SFRAs map flood risks across the study area. Land identified to be in Flood Zone 1 and available for development. Figure 4.2 identifies sites with watercourses running through site boundary, that may require Flood Risk Assessments Development can be accommodated within areas at low risk of fluvial flooding
Horsham	Potential issue in River Arun regarding WFD phosphorous levels. EA advised capacity exists up to flow consent. See Section 4.2. Growth has the potential to increase pressure on meeting the WFD target of Good Status if growth levels exceed existing wastewater discharge consents. Note development on the boundary of Horsham and Crawley likely to drain to Crawley WwTW and therefore needs to consider water quality in Crawley.		
Mid Sussex	WFD standards are Moderate to Poor. Constraints to growth from water quality exist from the River Adur, Poor Status. Growth has the potential to increase pressure on meeting the WFD target of Good Status if growth levels exceed existing wastewater discharge consents. Note development on the boundary of Mid Sussex and Crawley likely to drain to Crawley WwTW and therefore needs to consider water quality in Crawley.		
Reigate and Banstead	WFD standards are Moderate to Poor. Growth has the potential to increase pressure on meeting the WFD target of Good Status if growth levels exceed existing wastewater discharge consents		

4.2 Infrastructure Constraints

4.2.1 Wastewater Treatment Flow Consent

Southern Water and Thames Water have provided the existing consented wastewater flow, known as Dry Weather Flow (DWF), for each of their works in the study area. Southern Water has indicated the existing headroom (spare flow capacity) at each of the works, while Thames Water has provided measured flows, which have been deducted from the consented flow to determine a high level assessment of hydraulic/flow capacity (see Table 4.2 below).

Comparing measured flows to the consent for flow volume provides a high level assessment of potential flow capacity at a wastewater treatment works. However, this assessment is very crude, as there are inevitable margins of error associated with the equipment used to measure the outflow from any treatment works. Furthermore, sewerage providers also allow for headroom on the consented flow to allow for uncertainties and seasonality of flows. Nevertheless, this comparison provides an approximate assessment of the existing capacity.

This assessment is based on existing consents; however through discussions with both sewerage providers, additional commentary is included with regard to planned improvements during the AMP5 period, from 2010 to 2015, to accommodate planned growth below Table 4.2.

The potential growth (number of houses planned) for the main WwTWs in the study area in Table 4.2 has been determined using either GIS data of potential development sites, or ward data of potential development locations and comparing these to the indicative WwTW catchment provided in GIS by Southern Water and Thames Water. The potential number of houses per WwTW presented in Table 4.2 represents the maximum potential housing from the four scenarios listed in Table 2.2 and Table 2.3. It should be noted that as described in Section 2.2.3 the capacities of potential sites is indicative only and may be subject to change. This study has used potential housing numbers only, in place of more definitive housing growth which has not yet been determined.

Table 4.2 Assessment of Indicative Flow Headroom[a] at Main Wastewater Treatment Works

Sewerage Provider	Wastewater Treatment Works	Settlements served in Study Area	Consented DWF (m^3/day)	Measured DWF (m^3/day)	Available Headroom[b] (Properties)	Difference between Consent & Measured DWF	Potential Houses Planned through scenarios[c]
Thames Water	Crawley[d]	Crawley	27,482	26,226[e]	-	1,256	7.974
Thames Water	Horley	Horley	9,622	4,881[f]	-	4,741	2,721
Southern Water	Horsham	Horsham, Southwater	16,500	-	8,200	-	6,134

Table 4.2 (continued) Assessment of Indicative Flow Headroom[a] at Main Wastewater Treatment Works

Sewerage Provider	Wastewater Treatment Works	Settlements served in Study Area	Consented DWF (m^3/day)	Measured DWF (m^3/day)	Available Headroom[b] (Properties)	Difference between Consent & Measured DWF	Potential Houses Planned through scenarios considered [c]
Southern Water	Scaynes Hill	Haywards Heath	10,725	-	6,000	-	2,705
Southern Water	Goddards Green	Burgess Hill	9,917	-	2,600	-	7,317
Southern Water	Luxford Lane East Grinstead	East Grinstead (South), Sunnyside, Ashurst Wood	3,000	-	1,100	-	104
Southern Water	Eden Vale East Grinstead	East Grinstead (North and East)	2,524	-	720	-	824
Southern Water	Felbridge	Felbridge, East Grinstead (West)	1,779	-	700	-	1,117[g]
Southern Water	Horsted Keynes	Horsted Keynes	250	-	20	-	75
Southern Water	Handcross	Handcross	186	-	6	-	234

[a] This assessment does not take account of onsite infrastructure, hydraulic throttles, land take or financial issues that might prevent the delivery of physical flow against consented flow.

[b] Provided by Southern Water, based on 500 litres per property per day

[c] Potential number of houses within existing the wastewater treatment works catchments receiving most of the growth – minimal growth is also anticipated within some of the smaller WwTW catchments that have sufficient headroom in the flow consent.

[d] Planned upgrades will increase capacity at Crawley WwTW, see paragraph below

[e] Measured in 2008,

[f] Measured in 2006,

[g] Based on Land West of East Grinstead within Felbridge WwTW catchment.

Red text highlights where planned growth is greater than available headroom

Although the Crawley works appears to have very little flow capacity, when comparing the existing consent of flow to the latest measured flow from 2008 (the latest data available for this study), Thames Water has advised that a growth upgrade is planned for the AMP5 period at this works (between 2010 and 2015). The upgrade has been planned based on the growth figures within the Local Authorities' Development Plans. Initial discussions with Thames Water indicate that the upgrade will take between one and three years to complete, and has been designed to accommodate growth to 2021, based on approximately 167,000 population equivalent by 2021. This is approximately equal to an increase of 7,666 new homes between 2010 and 2021 (based on current PE of 148,600 and occupancy rate of 2.4). Compared to the potential housing numbers of 6,924 by 2021, provision is available at the works. Development numbers will rise to 7,974 by 2026 however and this is likely to constrain development

post 2021. Additional capacity will be required to be provided at the Crawley WwTW to serve houses beyond the 167,000 population equivalent after 2021. It is recommended that ongoing liaison between the sub-regional authorities, Thames Water and the Environment Agency takes place to monitor the capacity of the works against development rates, as any windfall development or increased passenger numbers at Gatwick Airport might take up the existing headroom in advance of sites on the trajectory. This issue is discussed again in Section 5.2 with regard to future capacity in the flow consent.

The Environment Agency (EA) has advised that there is potential capacity at the Horsham works to accommodate approximately 9,000 more homes, not taking into account completions since 2008. This is an approximate figure based on the EA's understanding of the current DWF assessed against the current consent and using Southern Water's assumptions for water use. From data provided for this study, an estimate of completions of 228 in the Horsham section of the study area has been assumed. Therefore based on the EA's advice, a further 8,700 homes (approximately) could be developed in the Horsham WwTW catchment before capacity is reached, within the flow consent and the current Best Available Technology for phosphorous removal. Further discussion of the implication of this on the growth scenarios is presented in Section 5.2 below.

Southern Water has also advised that a planned upgrade at Goddards Green by 2015 will allow the existing headroom on the flow consent to be taken up by planned growth. As indicated in Table 4.2 the works will therefore be able to accommodate approximately 2,600 more homes. Based on the predicted growth of approximately 7,300 homes in this sewer catchment there is currently insufficient capacity at the works within the consented DWF which could pose a major constraint to development in the future. Additional upgrades will be required to match the house build rates but are potentially constrained by the capacity of the receiving watercourse and the economic limit of process treatment at the works, which is already operating at Best Available Technology for Biological Oxygen Demand. The quality constraints at the WwTW are discussed in Section 4.2.2 below.

The Felbridge WwTW would potentially exceed the flow consent if development at West of East Grinstead is served by this works. Eden Vale WwTW also sees a slight exceedance in houses planned compared to available headroom. Two smaller works at Handcross and Horsted Keynes have also been identified as potentially having more growth than the available headroom advised by Southern Water and are listed in Table 4.2. Additional assessment is required, outside the scope of works for the Outline Study, to review the impact of additional growth in these catchments on water quality and to determine future consent requirements.

The Environment Agency has advised that their policies to prevent deterioration would apply to any works that requires an increase in flow consent. Therefore any increase in flow consent must demonstrate that there is no impact on the WFD status of the receiving watercourse: if the watercourse status is currently Moderate it would have to remain Moderate, for example. Quality consent issues are discussed in Section 4.2.2 below.

Based on the information provided by Thames Water and Southern Water, no other treatment works in the study area except for those discussed above are deemed to pose a constraint to development based on the current consented flow capacity up to approximately 2021. Section 5.2 looks at the potential increase in Dry Weather Flow from the four growth scenarios being investigated to determine when flow consents might be breached during the

growth period. However, it should be noted that trade effluent flows are not included which could have an impact on flow consent and treatment requirements, as there are a substantial amount of trade premises within Crawley, Thames Water has advised of the possibility of constraints after 2021. Figure 4.3 presents the indicative wastewater treatment work catchments that may present a constraint to future growth from consented flow capacity.

4.2.2 Wastewater Treatment Quality Consent

With regard to the treatment of effluent and the process capacity of works, additional detailed modeling is required to review the capacity of receiving waters to accommodate growth, which is outside the scope of the Outline Study. A high level discussion of issues has taken place with the sewerage providers and the Environment Agency regarding quality consent issues. Where the flow capacity has been identified as being at capacity against the potential growth, constraints on upgrading the treatment works might be present in the process capacity and quality of the receiving watercourse. The Environment Agency will require that any change to flow consent does not degrade the receiving watercourse quality status. If a WwTW is not currently operating at Best Available Technology for process treatment however, there may be potential to increase the quality standards to accommodate an increase in flows. Table 4.3 presents the quality consent limits for the WwTW, the status of the receiving watercourse and whether the works is operating at Best Available Technology.

Table 4.3 Wastewater Treatment Works Quality Consents

Wastewater Treatment Works	Receiving Watercourse & WFD Status	Settlements served in Study Area	BOD mg/l (Summer/ Winter)	Suspended Solids mg/l (Summer/ Winter)	Ammonia mg/l (Summer/ Winter)	Consent at Best Available Technology
Crawley	Gatwick Stream, Moderate Potential	Crawley	7/50	10	14/20	No, potential to tighten consent to Best Technology Known Not Exceeding Excessive Cost (BTKNEEC), but additional infrastructure may be required on-site to meet this level
Horley	River Mole, Poor	Horley	15 (95%ile) /50 (max)	30	8 (95%ile) /30 (max)	As above
Horsham	River Arun, Moderate	Horsham, Southwater	5	10	2	**Yes** BOD/ Phosphorous
Scaynes Hill	River Ouse, Heavily Modified, Poor Potential	Haywards Heath	15/20	25/30	5/10	No
Goddards Green	River Adur, Poor	Burgess Hill	5	8	2	**Yes** BOD

Table 4.3 (continued) Wastewater Treatment Works Quality Consents

Wastewater Treatment Works	Receiving Watercourse & WFD Status	Settlements served in Study Area	BOD mg/l (Summer/ Winter)	Suspended Solids mg/l (Summer/ Winter)	Ammonia mg/l (Summer/ Winter)	Consent at Best Available Technology
Luxford Lane East Grinstead	River Medway, Heavily Modified, Poor Potential	East Grinstead (South), Sunnyside, Ashurst Wood	10	20	2	No
Eden Vale East Grinstead	Eden Brook, Moderate	East Grinstead (North and East)	5	8	3	**Yes** BOD
Felbridge	Eden Brook, Moderate	Felbridge, East Grinstead (West)	5	7	2	**Yes** but Consent h'room for approx.2,500 hses agreed with EA at AMP5 standard
Handcross	River Ouse, Poor Status	Handcross				No

BOD = Biological Oxygen Demand

Thames Water has advised that works operated by them in the study area are not currently constrained by environmental capacity, and quality issues are not forecast to constrain growth over the growth period based on current information of quality consents and indicative growth scenarios. However, as discussed in Section 4.1.1 above, additional capacity will be required to meet the indicative growth levels at Crawley works beyond 2021 and this also has potential to increase pressure on meeting the WFD target of Good Status. The works is not currently operating at BAT but there is potential to increase treatment levels to BTKNEEC, but additional infrastructure may be required on-site to meet this level subject to land availability. There is further uncertainty in planning for future wastewater treatment, as the Environment Agency might seek to tighten existing discharge quality permits to help achieve Good Status by 2027 in the watercourses in the study area. As recommended in Section 4.2.1, regular contact with the EA and Thames Water should be undertaken by CBC, HDC and MSDC to monitor growth rates against the flow and quality consents at Crawley WwTW.

It can be seen from Table 4.3 above that works where the flow capacity will potentially be exceeded, the quality consent is currently operating at BAT for certain elements, at Horsham, Eden Vale, Felbridge and Goddards Green WwTWs. Future expansion of the Horsham works, operated by Southern Water, is dependant on the future quality requirements of the River Arun, which receives the outflow. As discussed above, the river is currently failing to meet its WFD objectives for phosphorous and overall status. The treatment works quality consent for phosphorous has recently been upgraded to the Best Available Technology for phosphorous removal and cannot be further improved. The Environment Agency has advised that within the current consent conditions, additional growth can be accommodated within the flow consent without further impact on the water quality and therefore water quality and process capacity is not currently constraining the potential growth in the area.

At Goddards Green WwTW, the potential growth numbers in and around Burgess Hill exceed the current flow capacity of the works. Southern Water is dependant on the Environment Agency increasing the consented flow at the current discharge quality standards to be able to serve the potential development in the area. If the Environment Agency requires higher quality standards than can be delivered via the Best Available Technology currently installed, Southern Water will need to find an alternative discharge point for the additional flows. This could potentially constrain development if future quality consents are tightened for the receiving River Adur. It has been advised that it could take up to 10 years (over two AMP cycles) to deliver a solution to wastewater treatment for Burgess Hill area, which could affect the timing of proposed development.

This situation also exists for potential growth at Eden Vale and Felbridge works, particularly in relation to the Land West of East Grinstead development which could significantly exceed the consent at Felbridge works.

4.2.3 Sewer Network and Drainage

The risk of flooding from surface water run-off, foul and combined sewers and culverted watercourses can be relatively high in urban areas. New developments can increase the percentage of impermeable surfaces through new roads and roofs, which have the potential to increase flooding from surface-water run-off both on the proposed site and to downstream developments.

The Environment Agency has recently prepared maps showing a high-level assessment of areas that may be susceptible to surface water flooding. Within the study area, the areas of intermediate or high levels of susceptibility to surface water flooding are within the main urban areas (Crawley, Horsham, Horley and Burgess Hill). The CFMP policy units that cover Horsham, Burgess Hill and Haywards Heath advise that Surface Water Management Plans should be prepared to better understand and respond to surface water flood risk. This highlights a potential constraint to development from the surface water drainage capacity, if there are existing surface water flood risks in these areas.

Southern Water has advised that additional infrastructure in the sewerage network would be required to connect the strategic site at Southwater to the Horsham wastewater treatment works. Local infrastructure will be required on site to connect large sites to the nearest works, which developers will be required to fund. Thames Water has advised that it is likely that significant network upgrades will be required to serve any of the strategic sites around Crawley with those furthest from the WwTW being the greatest. Figure 4.4 provides high level commentary on where sewerage infrastructure would be required.

4.2.4 Water Supply

Section 4.1.2 above has set out how the water companies plans will provide sufficient water supply for new development, however further information is required to establish whether the physical infrastructure to connect development to the available supply is needed. All new developments require individual supply pipes, and the

water companies have a statutory duty under the Water Industry Act 1991 (article 45 section 1) to connect any building

that has domestic water use, or where part of the building has a domestic use, to mains supply. Development within pre-existing developed sites can generally be connected to the mains network with limited delay. It is advisable that the sub-regional authorities and developers confirm development plans with the water companies as soon as possible to ensure that connections can be made as required, particularly if there is widespread and/or large scale development planned simultaneously. If development is planned in areas that are not currently served by the mains infrastructure then the water companies may require a longer lead-in time to prepare and install the required infrastructure.

A summary of the infrastructure constraints discussed in this report are presented in Table 4.4 below.

Table 4.4 Infrastructure Constraints

Council	Wastewater Treatment Flow Consent	Wastewater Treatment Quality Consent	Sewerage Network / Drainage	Water Supply Network
Crawley	Plans to upgrade Crawley works will accommodate growth up to approximately 7,666 homes (167,000 PE),up to 2010, however each scenario would result in approximately 7,974 homes so capacity would be reached toward the end of the planning period (2021 - 2026)	Risks in the future might arise if quality standards are tightened to meet WFD targets, but this is currently unquantifiable. Based on latest available data, quality consent does not constrain development.	No absolute constraint identified. New strategic development will require dedicated infrastructure to connect to Crawley WwTW	Not assessed as further detail required. New developments will require water requisitions to connect to mains supply
Horsham	Plans to upgrade Horsham works will accommodate growth in Horsham WwTW catchment based on indicative growth scenarios Parts of Horsham District lie within Crawley WwTW. Potential constraint toward end of planning period – see above.	Growth can be accommodated within current process capacity	Potential constraint to Southwater – sewerage infrastructure and investment needed to connect site to Horsham works	
Mid Sussex	Future constraint to growth, existing consent limit will be breached at Goddards Green during growth period at around 2015. Southern Water will be dependant on EA increasing flow consent and current quality standard. Potential constraint at Crawley WwTW for development on boundary between Crawley and Mid Sussex administrative areas – see above.	Potential constraint at Goddards Green if quality consent is tightened to higher than BAT to permit increased flow consent. If required level of treatment cannot be achieved within current technology and alternative discharge location will be needed	No constraint identified, however SWMP could review potential improvement options to existing drainage issues, e.g in Burgess Hill	
Reigate and Banstead	Flow capacity at works sufficient for projected growth within Horley WwTW based on DWF consent. Infrastructure may be required at the works to provide DWF consent.	No current environmental or process constraint identified. Risks that future standards might tighten to meet WFD targets, but this is currently unquantifiable	Although no constraint identified in the public drainage network, all new strategic development will require local infrastructure to connect to Horley WwTW, and SuDS to manage surface water flooding	

Figure 4.1 Constraints on developing Water Resources in Water Resource Zones (based on CAMS Assessment)

Figure 4.2a Flood Zones and FRA Requirements Study Area

Figure 4.2b Flood Zones and FRA Requirements Crawley

Figure 4.3 Wastewater Treatment Works Constraints

Figure 4.4 Sewerage Commentary

5. Capacity and Opportunities for New Development

This section assesses the future capacity of the water cycle to accommodate growth from 2010 to 2026 in line with the growth scenarios provided to inform the sub-regional authorities' Core Strategies. The demands of the proposed level of growth on the existing water environment, wastewater treatment and water services infrastructure are reviewed, and demand management scenarios are discussed.

5.1 Water Supply

The constraints assessment has identified that development in the study area should not be constrained by water supply availability on the condition that demand is adequately managed and, critically, that the water companies are able to develop their resources.

The four growth scenarios have been assessed against a range of water consumption/ demand management levels, as demand is most sensitive to future per capita consumption levels (indicator of water efficiency levels). For the purposes of this study, the estimated future demand for the study area has been assessed against two water efficiency scenarios; the "most efficient" and "least efficient" scenarios. The assumptions made under these two scenarios are detailed in Table 5.1.

Table 5.1 Water Efficiency Assumptions

MOST EFFICIENT
Existing household pcc is 10% below water company forecast*
Forecast households: All new homes reach CSH level 4 as a minimum
35% at 80 l/h/d household water use
65% at 105 l/h/d household water use
LEAST WATER EFFICIENT
Existing household pcc is 10% above water company forecast*
Forecast households: Over half of new homes only reach CSH level 1
45% at 130 l/h/d household water use
55% at 150 l/h/d household water use

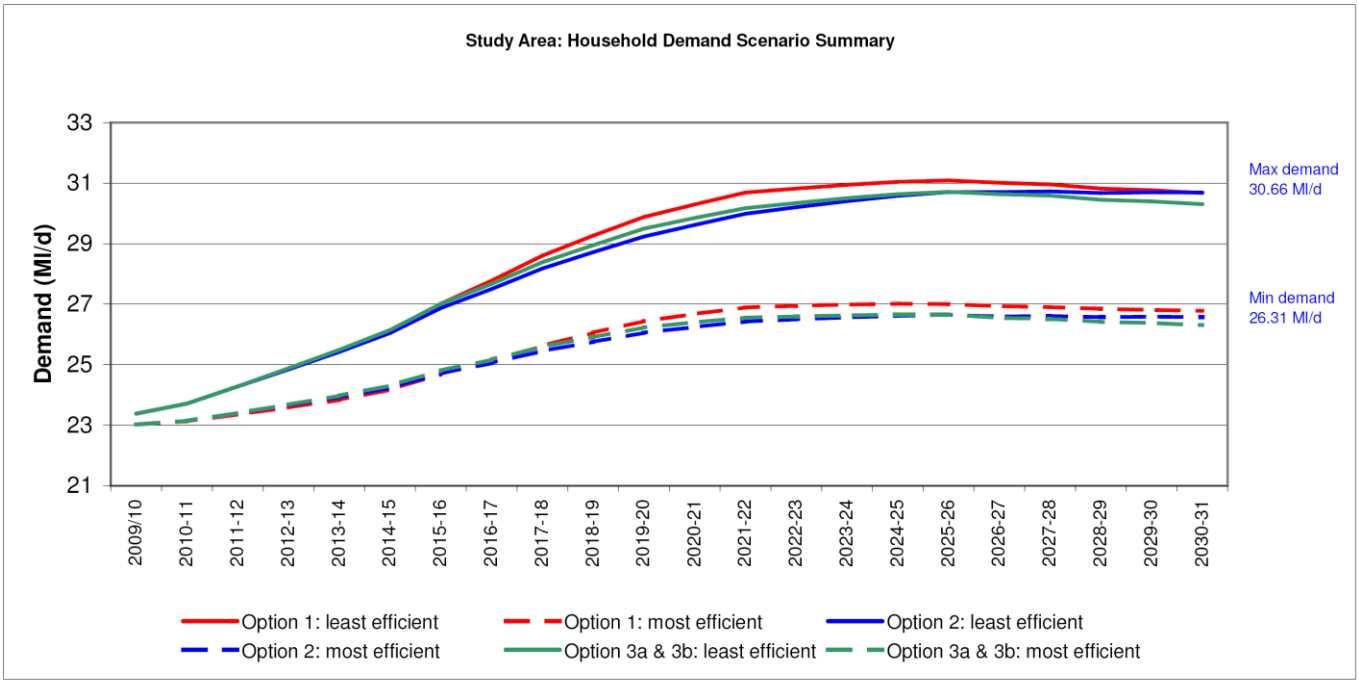
*Based on the forecast annual change to per capita consumption (pcc) from Water Resource Management Plans for existing households, l/h/d = litres per household per day

Figure 5.1 shows that by 2030/31 the range of household demand in the study area could vary by approximately 4Ml/d depending on the growth scenario and the water efficiency levels. What is clear is that reducing the per capita consumption of existing households and new households below those forecast by the water companies could reduce overall household demand considerably.

The sub-regional authorities have also provided information on the size and expected type of non-household development that is being considered in the emerging plans. By applying assumptions regarding future employee density and consumption behaviour based on these non-household types it is possible to estimate future daily consumption. Similarly, water efficiency scenarios have been applied to this to assess the potential range. It is important to note that demand from new non-households has been assessed based on total development plans, rather than over a timeline.

The analysis shows that new non household demand across the study area could be 0.63Ml/d (630,000 litres) once all development is complete. However, if new non-households are fitted with efficient and highly efficient water-using products and appliances, that demand could reduce to 0.47Ml/d for efficient or 0.21Ml/d for highly efficient respectively.

Figure 5.1 Impact of Water Efficiency Scenarios on Demand for Water Supply



27879-b014 R:\Data\Projects\HM-255\27879 Gatwick Sub-Regional WCS\D040 Design\water resources - updated\D059 GATWICK WCS water demand RESULTS v3.xls

Reducing household demand for water can be seen to be one of the most useful ways of ensuring development is sustainable. It is significantly easier to reduce demand in new homes rather than existing homes as planners are able to introduce clauses into planning applications requiring that new homes meet water efficiency levels as prescribed by the Code for Sustainable Homes. This is something that the sub-regional authorities can exert significant influence over. In contrast, reducing demand in existing homes requires significant effort to influence consumptive behaviour and uptake of more water efficient fittings and appliances. However, this is something that the Council could help to influence by working with the water supply companies.

Analysis of alternative water efficiency scenarios applied against the growth scenarios, as presented in Figure 5.1, show that by 2025/2026 4Ml/d of water could be saved in a water efficient scenario compared to a 'business as usual' scenario. The 'most efficient' option, which sees most households meeting CSH Level 3/4 could help reduce demand by approximately 4 Ml/d by the end of the planning period and is relatively easy to achieve, in contrast to the more stringent CSH Level 5/6 which could be costly to developers and would require larger scale schemes such as greywater recycling and rainwater harvesting.

5.2 Wastewater Treatment Works and Water Quality

Using the planned increase in housing numbers from 2010 to 2026 to inform the four growth scenarios, as provided by the sub-regional authorities (Section 2.2.3, Table 2.3), an assessment of the future flows arriving at the six main works serving the growth areas has been undertaken. This has been estimated using Southern Water's approach of assuming a rate of 500 litres per property per day, which takes account of potential non-domestic flows. For the purposes of this study, this assumption is also considered appropriate in application to Thames Water works, to ensure a consistent approach between all works.

Headroom allowance has not been included, which sewerage companies add onto the predicted DWF to allow for seasonal variations. It must be remembered that headroom will be added to the predicted DWF by the sewerage providers to allow for seasonal variation; therefore the works may reach capacity in terms of flow consent slightly earlier than suggested in these graphs, once headroom is added.

Figure 5.2 Wastewater Treatment Works Assessment of DWF Consent

Figure 5.2 shows that the wastewater treatment works at Horsham and Crawley are the two works that will be affected by the growth options, due to the uncertainty around the North East Sector, Crabbet Park and West of Ifield strategic sites. The other main works of Horley, Felbridge, Scaynes Hill and Goddards Green are subject to the same amount of growth under all scenarios.

Thames Water has advised that growth upgrades will be undertaken, allowing the works to accommodate a total of approximately 167,000 population equivalent by 2021. This is approximately equal to an increase of 7,666 new homes between 2010 and 2021 (based on current PE of 148,600 and occupancy rate of 2.4). Revision of the consented DWF is anticipated ahead of planned upgrade at Crawley WwTW, however only the existing DWF consent is currently available and is shown on Figure 5.2. The total number of homes to be delivered within the Crawley WwTW catchment area is approximately 7,970 under all scenarios. The phasing of this growth however varies. Scenarios 1, 3a and 3b see higher growth rates to reach the target number by 2026. Scenario 2 includes development at Crabbet Park, which sees lower growth rates over the period to 2031. Based on these numbers the capacity at the Crawley works will be exceeded toward the end of the growth period. The additional growth beyond the 167,000 population equivalent is likely to require additional capacity at the WwTW after 2021, which will require either less land intensive treatment processes than are currently used at the works, or will require additional land to be purchased to allow construction of similar treatment processes. Spare capacity at the works could be eroded further by windfall development or from the expansion of Gatwick airport, which are not included in the growth scenarios.

Additional assessment is required to model the impact of the growth on DWF and determine if changes in occupancy rates or household demand would enable higher growth levels to be accommodated within the existing planned upgrade at Crawley WwTW. For example, if the average occupancy rate of 2.1 is applied to the planned upgrade, then 8,761 homes could be accommodated at the works. It is advised that the sub-regional authorities continue to liaise with Thames Water, to review the proposed growth levels and the capacity at the works as growth progresses.

The Environment Agency has advised that approximately 9,000 new homes can be delivered within the Horsham wastewater treatment work catchment, not taking into account the approximate 228 completions since 2008, without any detrimental impact on the quality of the River Arun. The maximum growth within the Horsham works catchment would take place under Scenarios 1 and 2, reaching a total of approximately 7,400 homes. Based on these numbers Horsham works has capacity for growth, however it is advised that Horsham District Council continues to liaise with Southern Water, to review headroom at the works as growth progresses.

The remaining works see the same number of potential homes under all four growth scenarios. Felbridge and Goddards Green could reach capacity in a scenario where no further investment is planned, and if the site West of East Grinstead connects to Felbridge works. The Goddards Green consent could be exceeded by approximately 2015 and the Felbridge consent could be breached by approximately 2017 if no upgrades are delivered.

Treatment capacity of the WwTWs has not been assessed in this study because of the need for more detailed modelling; therefore the impact of growth on discharge quality cannot be determined. The receiving watercourses

are all below the WFD target of Good Status. High levels of growth could therefore potentially be constrained if additional treatment cannot be provided to meet standards required by the Environment Agency because of the limit on treatment technology. Felbridge and Goddards Green are considered to be operating at Best Available Technology and it could potentially be difficult to meet stricter quality consent limits. It is recommended that a Detailed Study is undertaken to model the impacts of the indicative growth levels and Dry Weather Flow on water quality, to review consent requirements to prevent deterioration of WFD status.

5.2.1 Private Sewage Treatment

Developments discharging 'domestic' sewage will be expected to connect to the public foul sewer where it is reasonable to do so. The Environment Agency will not normally grant a discharge consent for a private sewage treatment system where it is reasonable to connect to the public foul sewer. Likewise, discharges of trade effluent will be expected to connect to the public foul sewer where it is reasonable to do so and agreement can be reached with the sewerage undertaker to issue a trade to sewer consent. The objectives of this policy are to:

- Satisfy the requirements of relevant England, Wales and EU legislation;
- Protect the environment;
- Deliver our own and Government policies, codes of practice, guidance and targets;
- Support Development Plan policies;
- Take into account costs, practicality and sustainability when deciding if a connection to the public foul sewer is reasonable;
- Work in close co-operation with local planning authorities, water companies and developers to identify local and regional strategic needs for sewerage service provision;
- Resist the proliferation of private sewage treatment in locations where it is reasonable to connect to the public foul sewer, at both development planning and planning application stages.

5.3 Sustainable Flood Risk Management

In order to minimise flooding resulting from heavy rainfall and drainage constraints, development plans must consider the potential runoff and discharge rates from potential development sites, as well as consulting with the sewerage undertaker to determine existing capacity of the drainage network. PPS25 advocates consideration of flood risk and sustainable drainage throughout all stages of the planning process and states that all developments greater than one hectare must provide a Flood Risk Assessment to consider surface water management in order to prevent increased flood risk downstream. Although flooding from rivers will not generally constrain development within the study area, new development provides a unique opportunity to promote sustainable management of

flooding through drainage and run-off control. This section sets out the potential capacity for implementing sustainable drainage at the proposed strategic sites.

The Environment Agency promotes the use of Sustainable Drainage Systems (SuDS). SuDS are designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges by making more use of natural processes to convey surface water away from development. They aim to:

- Control runoff at source;
- Improve water quality by treating runoff and removing pollutants prior to discharge off site;
- Enhance the amenity value of a development;
- Encourage groundwater recharge; and
- Integrate with the environmental surroundings.

By implementing SuDS measures, multiple benefits can be achieved, such as improved water quality and amenity value, reducing in storm overflows, contributing to Green Infrastructure targets and creation of important habitats, as well as flood risk mitigation.

SuDS are the name given to a drainage approach, rather than any particular drainage type, and are often described in terms of a "management train", a series of progressively larger scale practices to manage runoff and control water quality. The management train is:

- **Prevention**, Application at individual sites, e.g. use of rainwater harvesting, management to prevent accumulation of pollutants;
- **Source Control**, Control of runoff at or very near to its source e.g. through permeable pavements, green roofs etc;
- **Site Control**, Management of water in a local area or site e.g. by routing water from building roofs and car parks to large soakaways or infiltration/ detention basins;
- **Regional Control**, Management of runoff from a site or number of sites, typically in a balancing pond or wetland.

Infiltration techniques are generally the preferred SuDS method because they provide Source Control close to the location of run-off generation. Groundwater vulnerability data provides an indication of the potential for using infiltration techniques based on the aquifer type and leaching potential of the soils. The strategic sites proposed for development in the study area are located on soils that are classed as having either insignificant quantities of groundwater ("Non Aquifer" type) or variably permeable groundwater of various degrees of leaching potentials ("Minor Low", Minor Intermediate" and Minor High"). Such soils present low to medium potential for infiltration. On the basis of this information a high level assessment of infiltration potential at each site is presented in

Table 5.2. It is advised that site specific infiltration tests are undertaken during detailed planning applications however, to determine if local variations in soil conditions will permit infiltration SuDS.

None of the possible strategic sites are located within groundwater source protection zones for public water supply abstractions, which can present further constraint to infiltration techniques to prevent water supplies from being contaminated.

Table 5.2 Potential for Infiltration SuDS

Council	Site	Infiltration Potential
Crawley	North East Sector (2,500 dwellings)	Low
Crawley	Town Centre North (400)	Medium
Crawley	Leisure Centre Site, Haslett Avenue (784 dwellings, 320 to be completed)	Medium
Crawley	Lucerne Drive (107)	Low
Crawley	Ifield Community College (170)	Low
Crawley	Thomas Bennett School (200)	Low on 75% of the site area; Medium elsewhere (north)
Crawley	Dorsten Square, Bewbush (143)	Medium on about 65% of the site area; Low elsewhere (west of south site)
Crawley	Haslett Avenue/Telford Place (100)	Medium on about 80% of the site area (north); Low elsewhere
Crawley	West of Pegler Way (Southern Counties Site) (218)	Medium
Crawley	Station Way (Crawley Station) (100)	Low. Soil classes as “Non Aquifer”. Soils directly adjacent to the north of the site have medium potential for infiltration
Crawley	Land East of Tinsley Lane (150)	Medium
Crawley	Three Bridges Station (100)	Medium
Crawley	Land East of Brighton Road	Low
Horsham	SA119 Land west of Worthing Road, Southwater	Low
Horsham	SA101 Land west of Ifield & SA120 Land at Ifield Court Farm	Low
Horsham	SA296 Holbrook Park & SA297 Chennells Brook (North Horsham)	Low
Mid Sussex	Land E of Gravelye Lane	Low on about 65% of the site (east); Medium elsewhere
Mid Sussex	Crabbet Park	Low
Mid Sussex	Land to N and NW Burgess Hill	Low
Mid Sussex	Land W of East Grinstead	Low
Mid Sussex	Land E of Burgess Hill	Low

Table 5.2 (continued) Potential for Infiltration SuDS

Council	Site	Infiltration Potential
Reigate & Banstead	Horley North East	Medium
Reigate & Banstead	Horley North West	Medium
Reigate & Banstead	Horley Town Centre	Medium, depending on land availability

Examples of SuDS that should be considered are presented in Table 5.3 below.

Table 5.3 Examples of SuDS Techniques

SuDS Technique	Description	Attenuation/ Infiltration
Soakaways	Excavations either filled with rubble or lined with brickwork, pre cast concrete or perforated storage structures surrounded by granular backfill.	Both
Permeable Paving	Paving that will permit rainwater to infiltrate into the soil or constructed layers beneath the surface. Lining can be used where soils are sensitive so that paving can also provide attenuation	Both
Infiltration Basins	Depressions that store and dispose of water through infiltration when required during heavy rainfall events. During dry periods the basins remain dry.	Both
Infiltration Trench	Vegetated strips of gently sloping ground that allow infiltration through the base and sides, as well as filtering out silt and pollutants.	Both
Filter Strips	Vegetated strips of gently sloping ground to drain water from impermeable surfaces and filter out pollutants, silt and suspended sediments.	Both
Swales	Shallow vegetated channels that conduct and/or retain water, and allow filtering of particulates through the vegetation. If unlined these features allow infiltration into the underlying ground.	Both
Ponds	Permanently wet basins designed to store water and attenuate peak flows, with permanent bankside and emergent vegetation.	Attenuation
Detention Basin	Dry basins designed to attenuate peak flows and store water for specific retention times.	Attenuation
Wetlands	Shallow pond systems with aquatic vegetation that allow water to be stored and passed through vegetation for filtration of pollutants.	Attenuation
Green Roofs	Vegetated roofs that reduce runoff volumes and rates.	Attenuation

5.4 Summary of Capacity and Opportunities

- Based on the water companies' plans for demand management and resource development, there is capacity in the water resources to accommodate growth under all proposed options;

- The sub-regional authorities have a good opportunity to support the water companies' plans for demand management by encouraging water efficiency in new and existing homes. The capacity assessment has indicated that a saving of 3 Ml/d could be achieved by imposing the Code for Sustainable Homes Level 3/ 4 on all new homes. This is considered relatively easy to achieve in comparison to more costly Level 5 / 6, which sees an even higher level of water efficiency than planned in the WRMPs which indicate sufficient resource availability;

- If new non-households are fitted with efficient and highly efficient water-using products and appliances, demand could reduce by approximately 0.42 Ml/d. The calculation of wastewater flows has used the Southern Water approach of assuming wastewater flows of 500 litres per property per day, which is a conservative approach and allows for non-household flows also contributing to the works;

- Thames Water has advised that planned upgrades at Crawley WwTW during the AMP5 period will accommodate approximately 7,666 new homes to 2021. Under all growth scenarios there are potentially approximately 7,974 homes in the Crawley catchment, suggesting that flow capacity will be exceeded post 2021. Additional assessment is required to model the impact of the growth on DWF and determine if changes in occupancy rates or household demand would enable higher growth levels to be accommodated within the existing planned upgrade at Crawley WwTW. It is advised that the sub-regional authorities continue to liaise with Thames Water to monitor the impact of growth at the works, in case increased levels of growth are delivered;

- The Environment Agency has advised that there is flow capacity at Horsham WwTW to accommodate the planned growth under all scenarios. It is advised that the sub-regional authorities continue to liaise with Southern Water to monitor the impact of growth at the works, in case increased levels of growth are delivered;

- Goddards Green WwTW will potentially reach the flow capacity during the growth period. An upgrade will be required to provide capacity for new development in excess of 2,600 new houses. The WwTW is currently at BAT and cannot treat waste to higher BOD standards. Environmental constraints may require additional flows to be discharged at an alternative location agreed by the Environment Agency;

- Eden Vale WwTW may require an increase in flow consent to accommodate planned growth in East Grinstead;

- Eden Vale, Felbridge, Handcross and Horsted Keynes WwTWs are also forecast to potentially exceed their flow capacity during the growth period, based on potential housing numbers and locations. The capacity for process treatment is dependent on the ability of the receiving watercourses to accept increased flows without affecting WFD targets, combined with the economic level of process treatment available. These works are currently operating at BAT. Additional work is required to determine if increased flows and loads can be accommodated;

- SuDS should be implemented where possible on strategic sites. The capacity for infiltration techniques appears limited based on a high level assessment of groundwater vulnerability, however infiltration potential can be a localised issue and site specific tests should be undertaken; and

- Plans to include and retrofit SuDS techniques can also provide improvements to water quality and amenity value, reductions in storm overflows and surface water flooding as well as contributing to Green Infrastructure targets and creation of important habitats.

6. Climate Change

6.1 Background

Climate change is likely to have major direct impacts on the water cycle as a result of changes in rainfall patterns and temperature/ evaporation that will affect water resources, flood risks and dilution capacity of water bodies. Current climate change modelling broadly indicates that there will be wetter, warmer winters and drier, hotter summers, and that some of these impacts will become evident within the timescale of the growth period up to 2026. Some of the preceding sections discuss the impacts of climate change on flood risks and water resources. This section presents a summary of the wider impacts on the water cycle and what it means for development.

6.2 Climate Change Modelling and UKCP09

Assessment of climate change impacts is based on global climate models which take account of land use, air circulation, ocean systems, ice volumes and extent, the hydrological cycle and the carbon cycle. Detailed scenarios for the UK are generated using a regional climate model, a high resolution model which is part of the full global climate model. This model produces the output that forms the basis of the climate change predictions produced by the UK Climate Programme (UKCP). The climate range models have been run for a range of scenarios to account for uncertainty regarding future carbon emissions.

The latest output from the UK model (UKCP09) uses the same climate change models to previous outputs, but in contrast also produced probabilistic output based on a range of model set ups and referencing output from other climate change models. The output is also at a higher 25km resolution. This provides much greater spatial detail but also means that topographic features should be more accurate.

6.3 Climate Change and the Study Area

Figure 6.1 to 6.3 show predicted changes in average annual temperature, summer precipitation and winter precipitation for the Medium Emissions scenario as shown on the UKCP09 website.

The key findings for the South East in the 2020s under the medium emissions scenario are listed below and are taken from the UKCP website (http://ukclimateprojections.defra.gov.uk/content/view/2259/499/):

- The central estimate of increase in **winter mean temperature** is 1.3ºC; it is very unlikely to be less than 0.6ºC and is very unlikely to be more than 2.2ºC;
- The central estimate of increase in **summer mean temperature** is 1.6ºC; it is very unlikely to be less than 0.6ºC and is very unlikely to be more than 2.7ºC;

- The central estimate of change in **winter mean precipitation** is 6%; it is very unlikely to be less than -4% and is very unlikely to be more than 19%; and
- The central estimate of change in **summer mean precipitation** is –8%; it is very unlikely to be less than –26% and is very unlikely to be more than 14%.

Figure 6.1 Change in Annual Average Daily Temperature for the 2020's under the Medium Emissions Scenario (UKCP09)

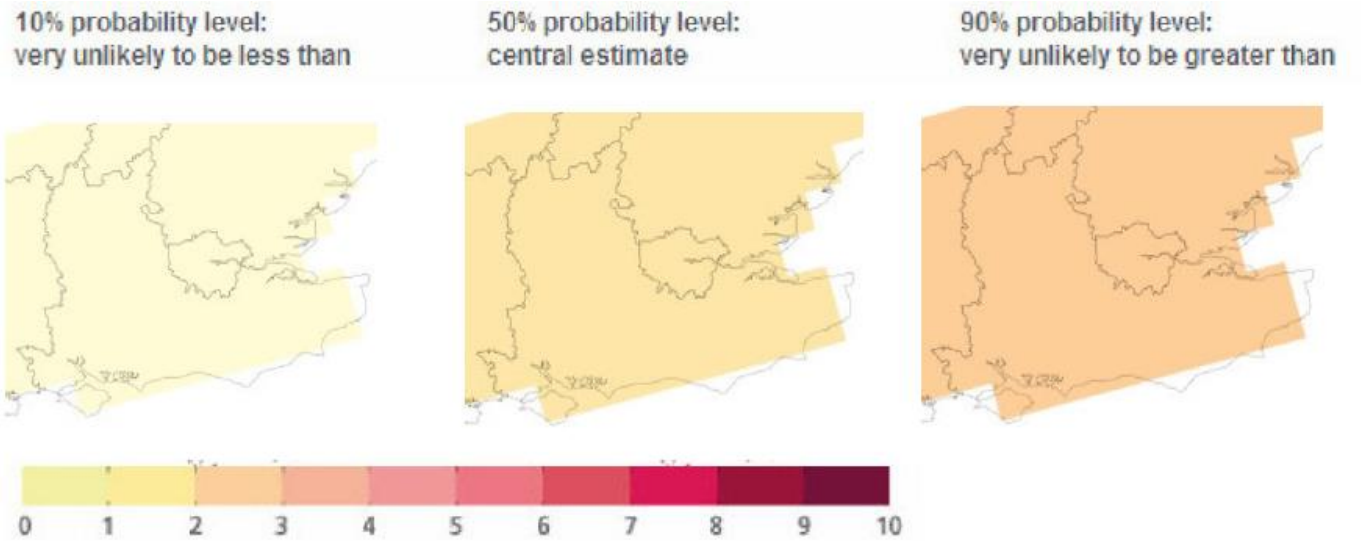


Figure 6.2 Change in Winter Mean Precipitation for the 2020's under the Medium Emissions Scenario (UKCP09)

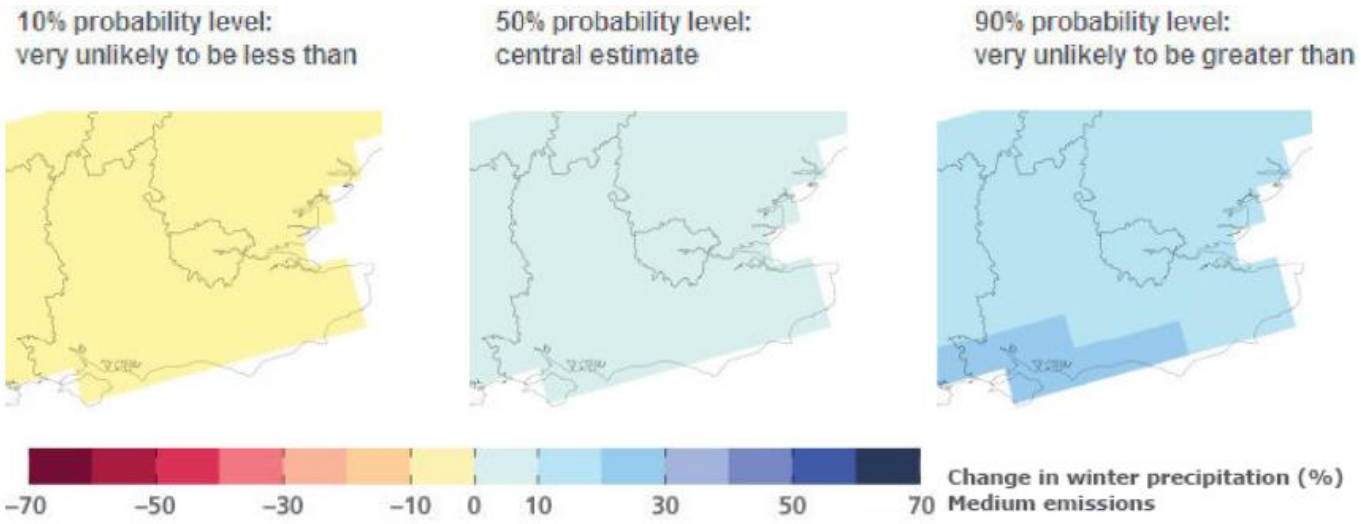
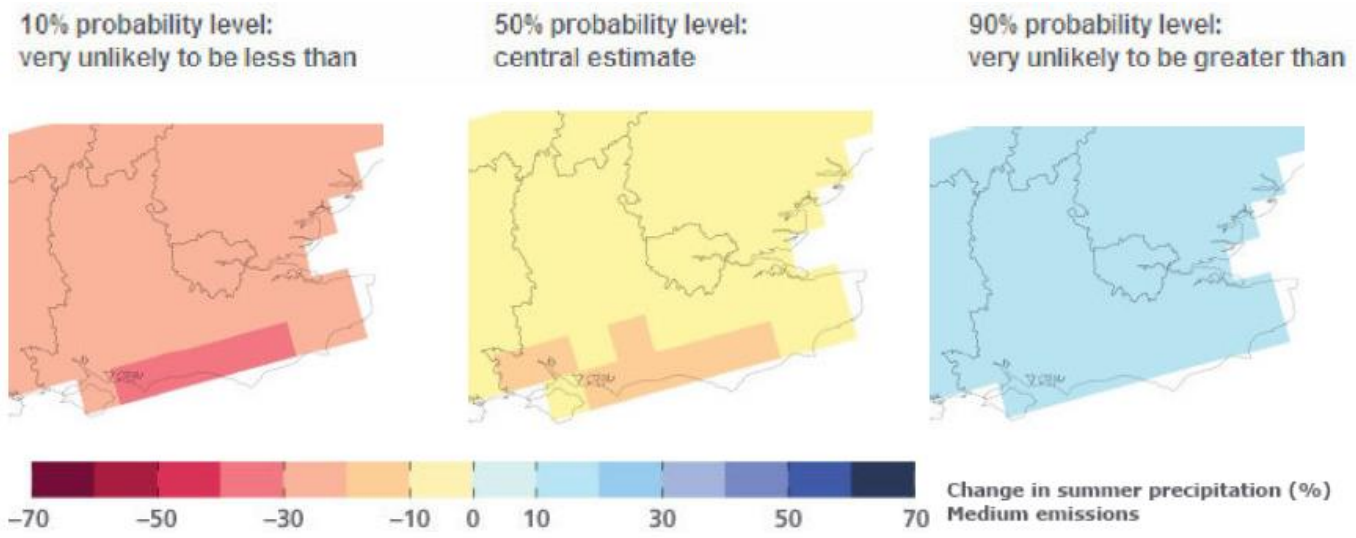


Figure 6.3 Change in Summer Mean Precipitation for the 2020's under the Medium Emissions Scenario (UKCP09)



The result of increased winter rainfall and decreased summer rainfall will lead to water companies considering winter storage in order to conserve water when it becomes available, for use during dry periods in the summer months. The water companies' WRMPs take account of climate change predictions to plan for resource management.

Increased rainfall during the winter should be considered with regard to fluvial and surface water flood risk, and the impacts on potential sewer overflows. Whilst overall rainfall is predicted to decrease during the summer months, there is potential for increased frequency of storms which could result in flash flooding during summer months.

PPS25 states that the following allowances should be considered when assessing flood risks:

Table 6.1 Table B.2 of PPS25 of Recommended National Precautionary Sensitivity Ranges

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
Peak river flow	+10%	+20%		
Offshore wind speed	+5%		+10%	
Extreme wave height	+5%		+10%	

These are based on the previous UK climate change modelling outputs (UKCIP02), however the EA has assessed the UKCP09 forecasts and has advised that developers and planners should continue to use the values in Table B.2 of PPS25.

6.4 Assessment of Environmental Capacity and Water Infrastructure Provision

The environmental capacity of the South East may change over the growth period as a result of climate change impacts. Areas of potential changes to capacity are listed below:

- Reduced summer rainfall will result in lower river flows which would reduce dilution of wastewater discharges. Compliance with environmental quality standards is, in some cases, based on 90 percentile values which tend to occur during the summer period; reduced river flows may have a magnified impact on compliance;
- Changes to rainfall patterns and increased temperatures may also compound water resource availability and reduce groundwater recharge;
- Changes in water table levels may also affect infiltration and leakage of water from the sewerage system;
- Increased winter rainfall and storm frequency has the potential to increase surface drainage flow into combined sewerage systems and therefore increase the hydraulic loading on these systems. This increases the risk of sewer overflows and their impact on receiving waters, particularly following long dry spells when sediments accumulate in the sewers and are flushed out by the intense rainfall, which could further reduce water quality on an event basis; and
- Increased winter rainfall and storm frequency has the potential to increase the intensity and frequency of fluvial flooding and urban drainage related flood events. The SFRAs have mapped potential climate change fluvial flood zones for the study area.

6.5 Implications of Climate Change and Mitigation

The Outline Study has identified that many of the rivers in the study area are at Moderate or Poor ecological status. Although no major constraints to growth have been identified with regard to environmental water quality, there is potential for constraints to be realised in the future. High levels of growth could potentially compact the effect of wastewater flows on river water quality, if additional treatment cannot be delivered, for example as a result of limited footprints. The sewerage providers and the EA have advised that water quality should not constrain development. The impact of climate change in reducing rainfall over the summer months has the potential to reduce dilution in the rivers during the summer months, therefore increasing the concentration of certain elements.

Fluvial flood zones across the study area are generally limited and closely follow the channel alignments. The Level 1 SFRAs have confirmed that Level 2 assessments are not required. PPS25 requires that developments take into account the impacts of climate change, therefore any site specific Flood Risk Assessments should assess the site against the climate change flood zones from the SFRAs.

Surface water flooding events often have the potential to cause more damage than fluvial flooding as they tend to occur in urban areas. With the potential for increased winter rainfall and storm events, combined with the increase

in urbanisation, surface water flooding could become more frequent and more widespread than indicated on the EA's susceptibility to surface water flooding maps. PPS25 requires all new developments requiring Flood Risk Assessments to control surface run-off to the existing rates, reducing run-off where possible, in order to prevent increased surface water flooding. The use of Sustainable Drainage Systems can further offset the impact of increased run-off. Table B2 from PPS25 should be used to determine potential increases in rainfall arising from climate change.

The Catchment Flood Management Plans advise that the Surface Water Management Plans should be undertaken for Horsham, Burgess Hill and Haywards Heath. These plans comprise a framework through which key local partners with responsibility for surface water and drainage in their area work together to understand the causes of surface water flooding, and agree the most cost effective way of managing surface water flood risk. These plans can build on SFRA work and provide the vehicle for local organisations to develop a shared understanding of local flood risk, setting out priorities for action, maintenance needs and links to LDF and emerging plans. Surface Water Management Plans can also be used to coordinate and strategically plan the drainage provision in large new developments where piecemeal actions are inefficient and do not support consistent ownership and maintenance regimes for SuDS. As such they would be extremely beneficial to mitigate both climate change impacts and the impact of growth in surface water flood risks.

The pressure on water resources in the study area and wider supply zones could be increased as a result of climate change and reduction in water availability, particularly during summer months. The water company plans include an allowance for climate change, therefore the assessments, which identify that supply will not constrain growth, remain valid for consideration of climate change impacts. This is however still based on resource development and demand management schemed. The analysis of water efficiency scenarios shows that a saving of 4Ml/d could be achieved in a water efficient scenario compared to a 'business as usual' scenario. Through recommended policies for new homes to be water efficient, the sub-regional authorities will be supporting the water companies demand management schemes and contributing to reducing pressure on water resources both now and in the future.

7. Development Strategy

The Outline Water Cycle Study has assessed the potential impacts of four growth scenarios on the water environment. It should be remembered that the housing numbers and capacities for the strategic sites that have been assessed are indicative only, and the capacity assessments for water resources and wastewater treatment are undertaken at a high level. Information for the assessments is provided by third parties and Entec cannot be responsible for the validity or accuracy of third party data. The results therefore provide a strategic overview of issues in the Gatwick Sub-Region and do not constitute detailed assessments.

This section discusses the growth scenarios with regard to the water cycle, and presents a high level assessment of constraints for each strategic site to help inform the development of the sub-regional authorities preferred options. Section 7.2 presents a discussion over the impact of a new market town on the water cycle elements post 2026. An indicative "Development Strategy" is presented in Figure 7.1 to 7.4 for each scenario.

7.1 Identified Growth Scenarios

The four growth scenarios assessed all assume for existing Core Strategy allocations and the development of a 2,500 dwelling neighbourhood West of Bewbush, and are based on the following assumptions:

- **Scenario 1**: Strategic Development at Crawley's North East Sector (2500 homes at NE Sector, no development at Crabbet Park or West of Ifield). 1725 homes each at North Horsham and Southwater;
- **Scenario 2**: Strategic Development adjoining Crawley at Crabbet Park in Mid Sussex (2500 homes at Crabbet Park, no development at NE Sector or West of Ifield). 1725 homes each at North Horsham and Southwater;
- **Scenario 3a**: Strategic Development adjoining Crawley at West of Ifield in Horsham (no development at NE Sector or Crabbet Park, 2500 at West of Ifield, 2300 homes at North Horsham);
- **Scenario 3b**: Strategic Development adjoining Crawley at West of Ifield in Horsham (no development at NE Sector or Crabbet Park, 2500 at West of Ifield, 2300 homes at Southwater).

Further information and breakdown of the four scenarios is provided in Section 2.2.3.

Scenario 1 assumes strategic neighbourhood development at the North East Sector site in Crawley. Based on the distribution of homes between the three companies' water resource zones and the differing water companies' planned occupancy rates and per capita consumption, this option would result in the largest increase in demand of the four options (refer to Figure 5.1). Water efficiency measures however could reduce the increase in demand by approximately 4 Ml/d. Scenarios 3a and 3b have the same impact on water demand and overall result in approximately 1 Ml/d less demand compared to Scenario 1. Based on this narrow difference in impact between

scenarios and the previous conclusions that water resourcing does not pose a constraint to development, any of the four scenarios could be accommodated based on water supply issues.

The assessments of the scenarios are based on only one strategic neighbourhood development coming forward in addition to West of Bewbush, prior to 2021. With regard to wastewater treatment, all potential scenarios would exceed the capacity of the Crawley works based on the indicative housing scenarios modelled in this report. Thames Water has advised that growth upgrades will be undertaken, allowing the works to accommodate a total of approximately 167,000 population equivalent (PE) by 2021. Based on current PE of 148,600 and an occupancy rate of 2.4 this is approximately equal to an increase of 7,666 new homes. Additional assessment is required to model the impact of the potential growth on DWF and determine if changes in occupancy rates or household demand would enable higher growth levels to be accommodated within the existing planned upgrade at Crawley WwTW. For example, if the average occupancy rate of 2.1 is applied to the planned upgrade, then 8,761 homes could be accommodated at the works. It is advised that the sub-regional authorities continue to liaise with Thames Water, to review the proposed growth levels and the capacity at the works as growth progresses. Capacity at the works could be constrained further if potential growth levels were to increase above that assumed in this study, for example from windfall development or from the expansion of Gatwick airport, if the airport was to permit increased passenger numbers beyond 40 million passengers per annum.

The phasing under each scenario varies. Scenario 1 would see the maximum capacity almost reached at Crawley WwTW by approximately 2021, which is earlier than the other scenarios. This is a result of the proposed phasing of development. Under scenario 2, phasing of development takes place over a longer period of time, with the strategic neighbourhood at Crabbet Park not starting until 2021. Therefore maximum flow to the works is reached later in the planning period. However, there is a risk that the Crabbet Park site, if developed, might be developed sooner than modelled in this report which would means that capacity of the treatment works would be reached sooner.

Scenarios 1 and 2 would result in increased flow volume to Horsham WwTW compared to Scenarios 3a and 3b, however all scenarios would be accommodated by the current headroom available.

Under all scenarios the North and North West of Burgess Hill development increases pressure on the Goddards Green works. An increase in flow consent will be required by approximately 2015 / 2016 to accommodate the planned growth. Environmental constraints and finite wastewater treatment technology may prevent this and require additional flows to be diverted to an alternative discharge point, which cannot be implemented by 2016.

This study has considered the potential impact of planned employment growth on the water cycle where appropriate. In comparison to the planned housing growth, increased demand from employment does not have a significant impact on the water cycle elements. Nevertheless, water efficiency will help to reduce pressure on both water resources, and to some degree in conjunction with SuDS, reduce impacts on wastewater flows. Chapter 8 presents recommendations for policies in the sub-regional authorities' Core Strategies and Development Plan Documents that would require water efficiency measures in all new homes.

It is acknowledged that other constraints outside the water cycle may dominate the sub-regional authorities' decisions on growth locations and phasing. From the high level assessments in this study, there are no current constraints to development, however a number of future major constraints have been identified surrounding wastewater treatment for potential growth in Crawley WwTW (above the 167,000 population equivalent), at Goddards Green WwTW (if/when growth in the catchment exceeds 2,600) and at Eden Vale, Horsted Keynes and Handcross WwTW catchments. In order to progress the final preferred development options, it is advised that a Detailed WCS is prepared and continued discussions with the sewerage and water providers and regulators take place to monitor growth rates and the water environment capacity.

Tables 7.1 to 7.4 present an assessment of the various water cycle elements for each of the strategic sites in the four Councils' administrative areas, to further assist the authorities in identifying preferred options for development.

Table 7.1 Crawley Borough Council Strategic Sites Constraints Matrix

Strategic Site (potential housing capacity)	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
North East Sector (2500)	Stream at outlet is currently moderate status under WFD; downstream is currently poor status, predicted to remain poor by 2015. Capacity of watercourse for additional flows is potentially limited due to high P levels. However, no constraint at treatment works with regard to process and effluent quality	No constraints identified, based on implementing WRMP measures for metering and reduced household usage	Parts of River Mole and Flood Zone 2 and 3 run through site. Site specific FRA required	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed trajectory Scenario 1 in this study, total houses will exceed this level post 2021.	No constraint identified. Assessment required for new infrastructure. Dedicated strategic network upgrades for the NE Sector are likely to be required.	Growth upgrade planned at Crawley Works during AMP5 to accommodate approx 7,600 more homes	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
Leisure Centre Site, Haslett Avenue (784)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required

Table 7.1 (continued) Crawley Borough Council Strategic Sites Constraints Matrix

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Lucerne Drive (107)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
Ifield Community College (170)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required

Table 7.1 (continued) **Crawley Borough Council Strategic Sites Constraints Matrix**

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Thomas Bennett School (200)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
Dorsten Square, Bewbush (143)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required

Table 7.1 (continued) Crawley Borough Council Strategic Sites Constraints Matrix

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Haslett Avenue/Telford Place (100)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
West of Pegler Way (Southern Counties Site) (218)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required

Table 7.1 (continued) **Crawley Borough Council Strategic Sites Constraints Matrix**

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Station Way (Crawley Station) (100)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
Land East of Tinsley Lane (150)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required

Table 7.1 (continued) **Crawley Borough Council Strategic Sites Constraints Matrix**

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Three Bridges Station (100)	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
Town Centre North (400)	As above	As above	Very low fluvial flood zones identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required

Table 7.1 (continued) Crawley Borough Council Strategic Sites Constraints Matrix

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Land East of Brighton Road*	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above Additional upgrade unlikely to come forward in consecutive planning period (AMP6)	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
Russell Way, ** Three Bridges	As above	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 based on an occupancy rate of 2.4. Based on assumed scenarios in this study, total houses will exceed this level post 2021.	No constraint identified. Local infrastructure upgrades likely to be required.	As above Additional upgrade unlikely to come forward in consecutive planning period (AMP6)	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required

* The site has been identified in the emerging SHLAA as having potential for the development of up to 600 dwellings, though does not form part of the Crawley Borough Council housing trajectory at the time of writing.

** Planning permission for 237 homes at Russell Way has expired. At the time of writing the site is not therefore included on Crawley's housing trajectory.

Table 7.2 Horsham District Council Strategic Sites Constraints Matrix

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
West of Ifield (1150 / 1917)	As above	No constraints identified, based on implementing WRMP measures for metering and reduced household usage	Parts of River Mole and Flood Zone 2 and 3 run through site. Site specific FRA required	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021 assuming an occupancy rate of 2.4. Based on assumed Scenario 3a and 3b in this study, potential growth numbers will exceed the works capacity by the end of the planning period.	No constraint identified. Assessment required for new infrastructure	Growth upgrade planned at Crawley Works during AMP5 to accommodate approx 7,000 more homes	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
North Horsham (1150 / 1917)	Upstream of the WwTW outlet is currently moderate ecological status; downstream is currently moderate status, predicted to remain by 2015. Capacity of watercourse for additional flows is limited due to high P levels.	As above	Parts of River Arun run through site. Site specific FRA may be required	**Horsham New WwTW** Capacity within current flow consent to accommodate growth within planned trajectory for all scenarios. Any increase in growth would potentially erode headroom at works.	No constraint identified.	Abstraction within tidal River Arun	Main limiting factor is the River Arun water quality. EA advised growth ok up to WwTW flow consent. Development ok within planned housing density. Any increase would be constrained by works flow consent and quality consent.

Table 7.2 (continued) Horsham District Council Strategic Sites Constraints Matrix

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Southwater (1150 / 1917)	As above	As above	Very low fluvial flood risks present. Site in Flood Zone 1	**Horsham New WwTW** Capacity within current flow consent to accommodate growth within planned trajectory for all scenarios. Any increase in growth would potentially erode headroom at works. WTW is at BAT for P removal	No sewer network in place and investment is required to connect the site to Horsham Wastewater Treatment works	Abstraction within tidal River Arun	Main limiting factor is the River Arun water quality. EA advised growth ok up to WwTW flow consent. Development ok within planned housing density. Any increase would be constrained by works being at BAT and unable to meet higher quality consent set by EA.
West of Bewbush	Stream at outlet is currently moderate status; downstream is currently poor status, predicted to remain poor by 2015. Capacity of watercourse for additional flows is potentially limited due to high P levels.	As above	Minor area of flood zone 2 and 3 present Site specific FRA required due to size of development	**Crawley WwTW** Planned upgrade will alleviate pressure on growth plans for all assumed scenarios but additional growth beyond assumed trajectories likely to exceed the capacity of the works. This site is included in all scenarios and therefore considered within capacity of planned upgrade.	Ongoing assessment over required infrastructure. Investment needed to connect to Crawley works. Dedicated strategic network upgrades likely to be required.	Sewerage infrastructure required	Development ok within current planned housing density.

Table 7.3 Mid Sussex District Borough Council Strategic Sites Constraints Matrix

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Crabbet Park (2500)	Stream at outlet is currently moderate status; downstream is currently poor status, predicted to remain poor by 2015. Capacity of watercourse for additional flows is limited due to high P levels.	No constraints identified, based on implementing WRMP measures for metering and reduced household usage	Minor area of flood zone 2 and 3 present	**Crawley WwTW** Planned upgrade during AMP5 (2010-2015) at works to accommodate approx 7,600 more homes up to 2021. Based on assumed Scenario 2 in this study, growth levels by the end of the planning period will exceed the works capacity.	No detailed assessment of infrastructure requirement. Investment in dedicated strategic network upgrade likely to be required.	Growth upgrade planned at Crawley Works during AMP5 to accommodate approx 7,000 more homes	Main limiting factor is capacity of Crawley WwTW flow consent. Capacity exists at the works for approximately 7,666 homes (assuming an occupancy rate of 2.4). If capacity at works is eroded before this site is developed, additional upgrades will be required
Land East of Burgess Hill (700)	Upstream and downstream of the outlet are currently poor status, predicted to remain poor by 2015. Capacity of watercourse for additional flows is limited due to high P levels.	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Goddards Green WwTW** Capacity of inlet works, secondary Treatment etc would need to be upgraded to meet planned growth at this and other planned sites. WwTW is at BAT for BOD removal.	No constraint identified.	None planned	Main limiting factor is flow capacity at Goddards Green. Increase in DWF consent required to meet growth. Tightening of quality consent likely to occur also which be beyond BAT. Southern Water may be required to discharge additional flows to an alternatibve location. Feasability studies would be undertaken in AMP6.

Table 7.3 (continued) **Mid Sussex District Borough Council Strategic Sites Constraints Matrix**

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Land West of East Grinstead (570)	Receiving watercourse for the outlet is currently moderate status, predicted to remain moderate by 2015. Capacity of watercourse for additional flows is limited due to high P levels.	As above	Minor area of flood zone 2 and 3 present. Masterplan could avoid flood zones.	**Felbridge WwTW** Capacity of inlet works, secondary Treatment etc would need to be upgraded to meet planned growth at this WwTW beyond 2016. **Luxford Lane WwTW** could accommodate growth	No constraint identified. New infrastructure required, with potential to connect direct to works	None planned	Main limiting factor is wastewater treatment works. Site could drain to Luxfords Lane WwTW if developer requisitions new sewer. Flow consent would be breached at Felbridge WwTW without further investment/upgrades
Land North and Northwest of Burgess Hill (3800)	Upstream and downstream of the outlet are currently poor status, predicted to remain poor by 2015. Capacity of watercourse for additional flows is limited due to high P levels.	As above	Parts of River Adur and Flood Zone 2 and 3 run through site. Site specific FRA may be required	**Goddards Green WwTW** Capacity of inlet works, secondary Treatment etc would need to be upgraded to meet planned growth at this and other planned sites. WwTW is at BAT for BOD removal.	No constraint identified. New infrastructure required, with potential to connect direct to works	None planned	Main limiting factor is flow capacity at Goddards Green. Increase in DWF consent required to meet growth. Tightening of quality consent likely to occur also which be beyond BAT. Southern Water may be required to discharge additional flows to an alternatibve location. Feasability studies would be undertaken in AMP6.

Table 7.3 (continued) **Mid Sussex District Borough Council Strategic Sites Constraints Matrix**

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Land East of Gravelye Lane (528)	Upstream and downstream of the outlet are currently poor status, predicted to remain poor by 2015. Capacity of watercourse for additional flows is limited due to high P levels.	As above	Very low fluvial flood risks identified. Site in Flood Zone 1.	**Scaynes Hill WwTW** Inlet has capacity to accommodate growth.	No constraint identified.	None planned	No limiting factor to growth

Table 7.4 Reigate and Banstead Borough Council Strategic Sites Constraints Matrix

Strategic Site	Receiving Water Capacity	Water Resources	Flood Risk	Waste Water Treatment Capacity	Sewerage Infrastructure	Planned Investment	Overall score post investment and main limiting factor
Horley Northeast (710)	Upstream of the outlet is currently moderate status; downstream is currently poor status, predicted to remain poor by 2015. Capacity of watercourse for additional flows is limited due to high P levels.	No constraints identified, based on implementing WRMP measures for metering and reduced household usage	Parts of River Mole Flood Zones 2 and 3 border site. Site Specific FRA required due to size of development	**Horley WwTW** DWF consent has capacity to accommodate significant growth. Minor upgrades may be required at works.	No constraint identified.	None planned	No limiting factor to growth. FRAs required. The future protection of the floodplain areas is imperative to retain essential flood storage away from the built-up areas of the Borough, and the Council's Riverside Green Chain policy is an important contributor to this goal.
Horley Northwest (1570)	As above	As above	Parts of Burstow Stream (River Mole tributary) Flood Zones 2 and 3 on site. Site Specific FRA required	**Horley WwTW** DWF consent has capacity to accommodate significant growth. Minor upgrades may be required at works.	No constraint identified.	None planned	No limiting factor to growth. FRAs required. As above regarding protection of the flood zone areas.
Horley Town Centre (371)	As above	As above		**Horley WwTW** DWF consent has capacity to accommodate significant growth. Minor upgrades may be required at works.	No constraint identified.	None planned	No limiting factor to growth. FRAs required. As above regarding protection of the flood zone areas.

7.2 New Market Town Development

The possibility of a new market town is being considered by Crawley Borough Council, Horsham District Council and Mid Sussex District Council to help meet the longer-term need for housing and employment. The potential location for the new settlement would be within the A23 corridor area. It has been indicated that a town of 10,000 + homes would be needed in order to make a possible new market town genuinely sustainable.

The increase in new homes would affect water resources demands and wastewater treatment requirements. Additional modelling of the impact of this settlement would be needed, to determine what infrastructure would be required. An increase in population will in turn increase pressure on water resources further. Consideration should be given to develop the town as an eco-town. Currently proposed eco-towns are investigating the potential to be "water neutral", where the net demand for water in an area of significant development is the same after development is completed as it was before the increase in new homes. Implementation of meters in all new households and homes constructed with water efficient appliances would reduce pressure on water resources to some degree. Water neutral developments would require additional strategic investment including rainwater harvesting and/or greywater recycling for example.

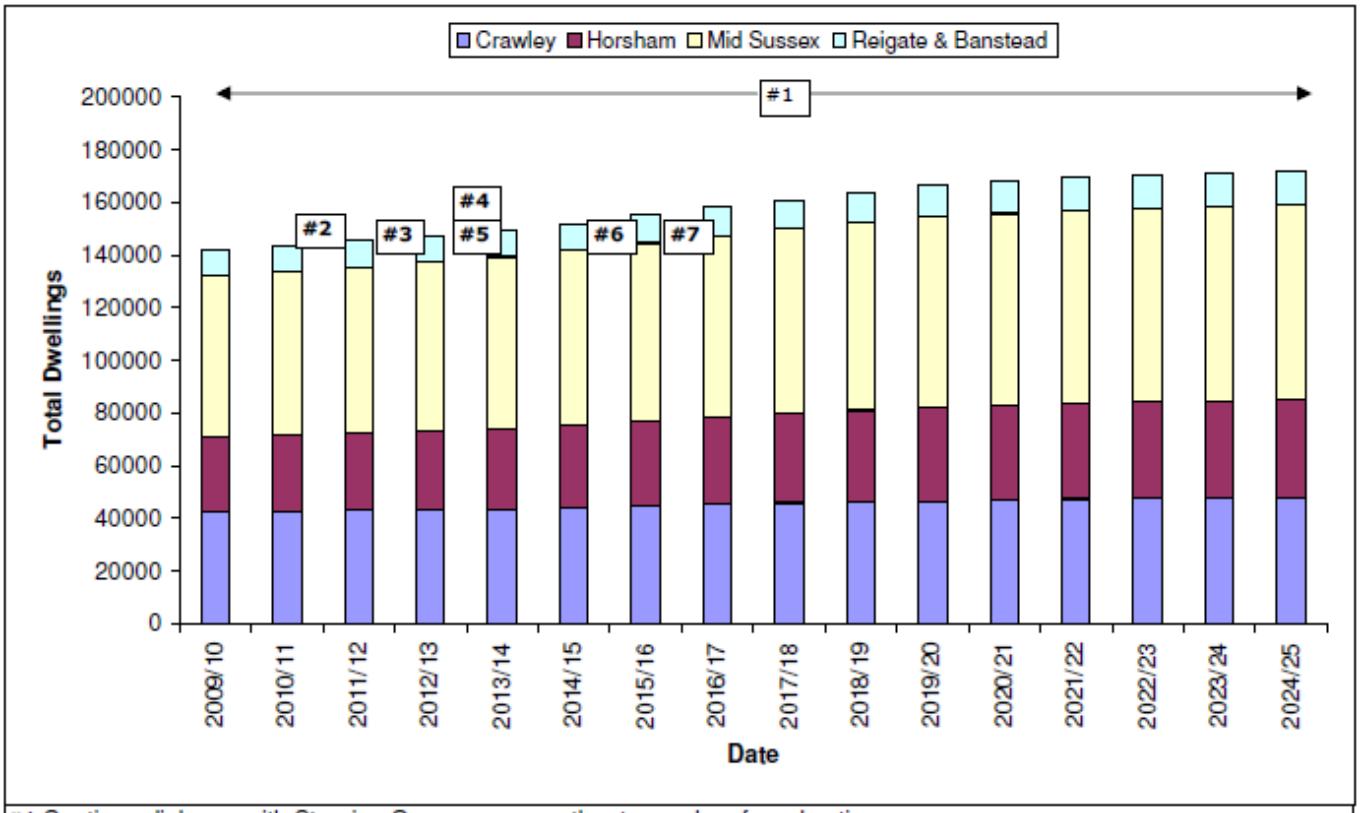
Wastewater treatment could be a major constraint and the Environment Agency should advise where a new effluent discharge can be made to serve this proposed development. A new wastewater treatment works will be required to accommodate the new town as the closest works to the search area for the new town is at Cowfold, which currently serves only 500 properties. In planning for a new settlement, early consideration must be given to environmental constraints and the most appropriate solution for wastewater treatment and surface water drainage. These should contribute also to provision of green infrastructure amongst the urban setting, to increase the amenity value whilst contributing to flood risk management, water quality improvements and provision of biodiversity habitats. The floodplain of the River Adur will also require protection from the new town.

The sub-regional authorities should consult the Environment Agency, water company and sewerage providers on their proposed strategy for a new town so that sufficient planning and advice can be given on the most sustainable option to deliver water and sewerage infrastructure for 10,000+ homes. Adopted development plans that have been tested via public examination will provide evidence for the water industry investment planning process from 2015 onwards.

7.3 Indicative Development Strategy

Figures 7.1 to 7.4 present indicative Development Strategy for all four scenarios using the assumed housing trajectories for this assessment. In each scenario the strategic development around Crawley would contribute to the Crawley WwTW. The Horsham WwTW would receive slightly less development under Scenarios 3a and 3b. All other works have been assumed to be subject to the same levels of growth, hence each strategy includes the same recommendations at the same time periods.

Figure 7.1 Indicative Development Strategy (Water Related Infrastructure) Scenario 1: Strategic Development at North East Sector



#1 Continue dialogue with Steering Group over growth rates and preferred options
Monitor capacity of WwTW, watercourses and growth rates in Crawley, Horsham and Eden Vale sewer catchments
Policies in Core Strategy to ensure new development meets 105 l/h/d and implement SuDS
Promote awareness and education of conserving water

#2 Undertake Detailed WCS to review potential infrastructure soltuions for development in the Crawley, Goddards Green (Burgess Hill), Felbridge (East Grinstead), Horsted Keynes and Handcross sewer catchments and impacts on water quality to determine most sustainable options. Review water efficiency procurement (WRAP review) and Environment Agency's position of WFD and future status

#3 Southern Water to review upgrade requirements at Goddards Green and Felbridge WwTW in advance of planned development during AMP6, in liaison with Environment Agency

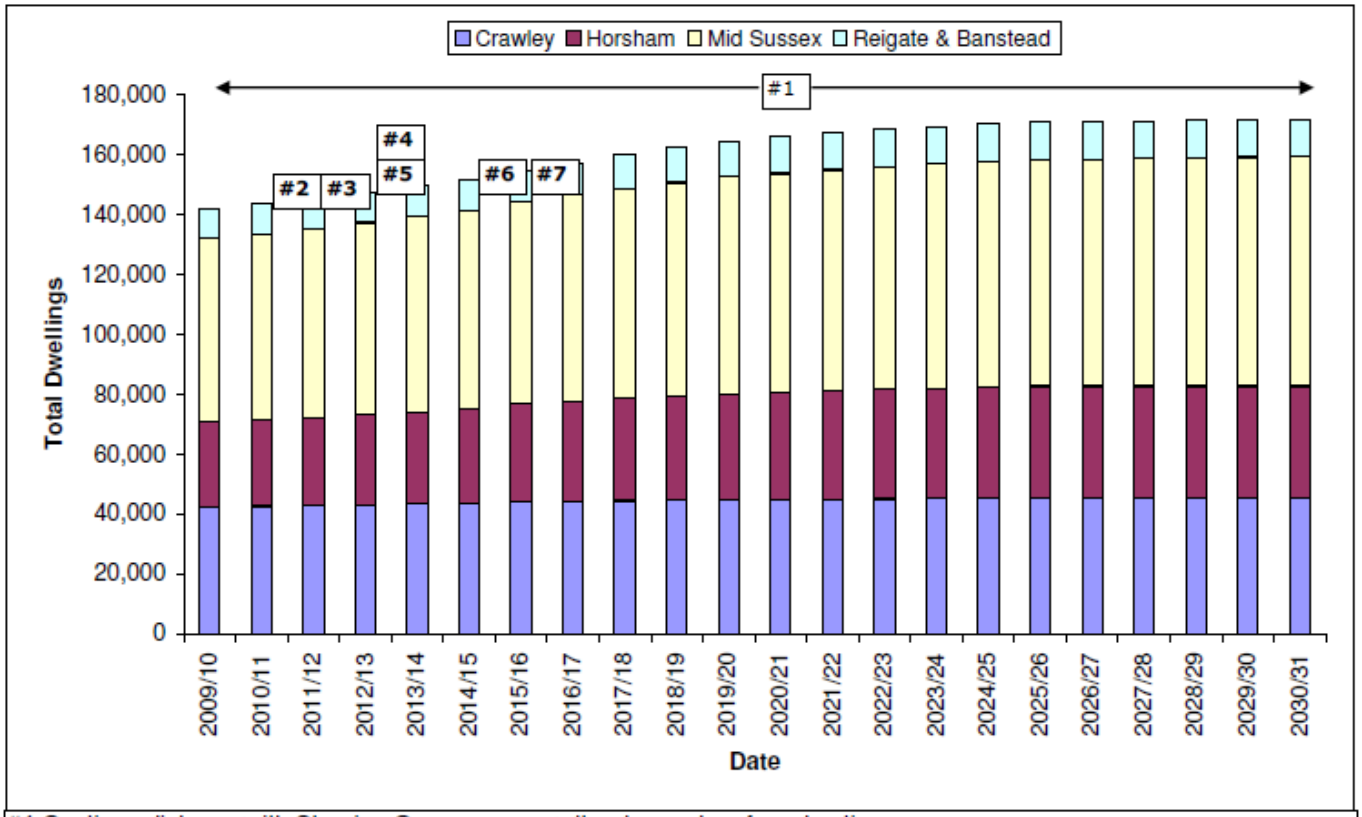
#4 Southern Water to review upgrade requirements at Eden Vale during AMP6 for potential breach of flow capacity by 2026. Thames Water to review potential upgrade to Crawley WwTW during AMP6 to manage flows post 2021

#5 Review potential impact of Gatwick airport development on Crawley WwTW flow capacity

#6 Assessment of infrastructure requirements for potential new market town from 2026 onwards. Solutions may require early planning consideration and allow for construction period

#7 Review revised River Basin Management Plans

Figure 7.2 Indicative Development Strategy (Water Related Infrastructure) Scenario 2: Strategic Development at Crabbet Park



#1 Continue dialogue with Steering Group over growth rates and preferred options
Monitor capacity of WwTW, watercourses and growth rates in Crawley, Horsham and Eden Vale sewer catchments
Policies in Core Strategy to ensure new development meets 105 l/h/d and implement SuDS
Promote awareness and education of conserving water

#2 Undertake Detailed WCS to review potential infrastructure soltuions for development in the Crawley, Goddards Green (Burgess Hill), Felbridge (East Grinstead), Horsted Keynes and Handcross sewer catchments and impacts on water quality to determine most sustainable options. Review water efficiency procurement (WRAP review) and Environment Agency's position of WFD and future status

Review trajectory if this option is progressed. Risk that strategic sites will come forward earlier than assumed in Outline Study, with subsequent risks of reaching capacity at Crawley WwTW before 2021

#3 Southern Water to review upgrade requirements at Goddards Green and Felbridge WwTW in advance of planned development during AMP6, in liaison with Environment Agency

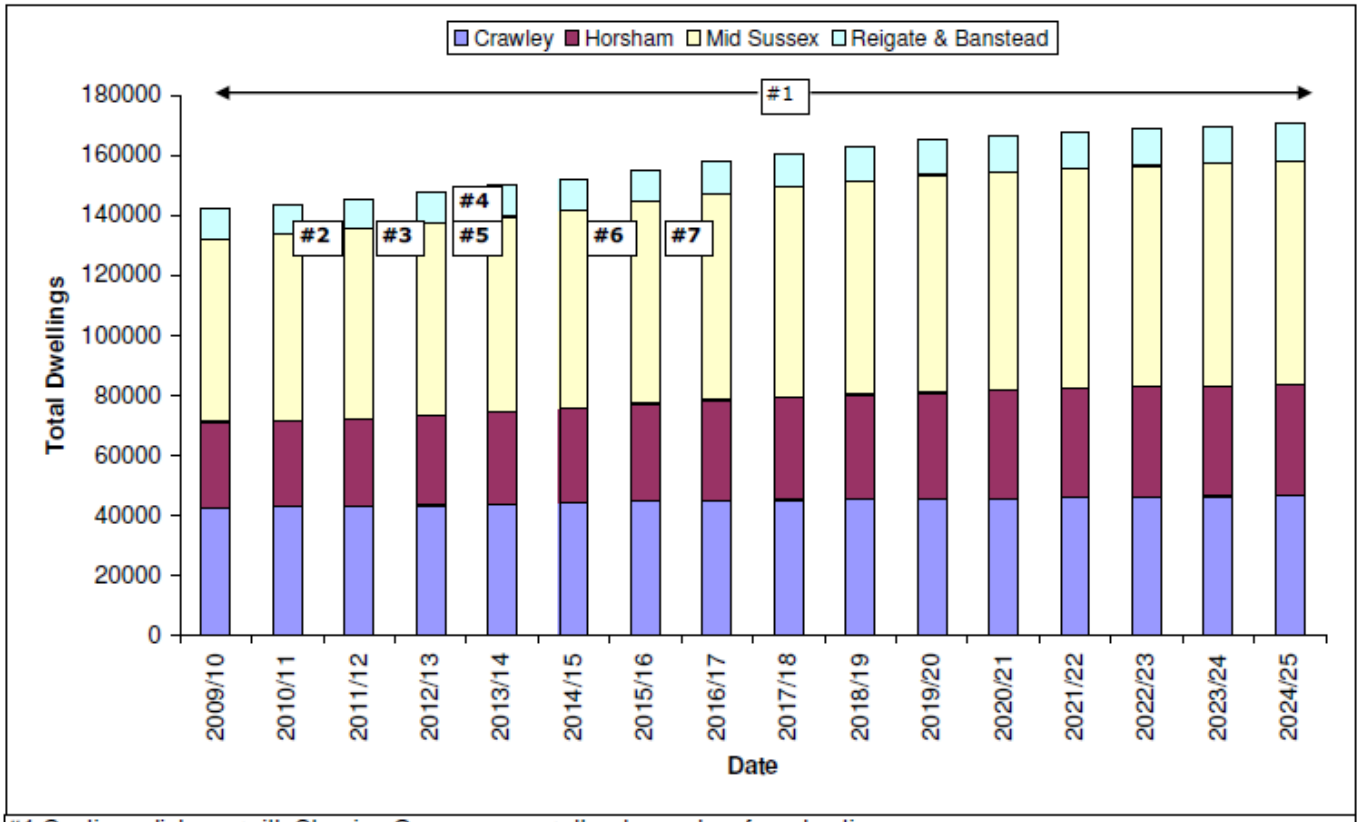
#4 Southern Water to review upgrade requirements at Eden Vale during AMP6 for potential breach of flow capacity by 2026. Thames Water to review potential upgrade to Crawley WwTW during AMP6 to manage flows post 2021

#5 Review potential impact of Gatwick airport development on Crawley WwTW flow capacity

#6 Assessment of infrastructure requirements for potential new market town from 2026 onwards. Solutions may require early planning consideration and allow for construction period

#7 Review revised River Basin Management Plans

Figure 7.3 Indicative Development Strategy (Water Related Infrastructure) Scenario 3: Strategic Development at West of Ifield and North Horsham



#1 Continue dialogue with Steering Group over growth rates and preferred options
Monitor capacity of WwTW, watercourses and growth rates in Crawley and Eden Vale sewer catchments
Policies in Core Strategy to ensure new development meets 105 l/h/d and implement SuDS
Promote awareness and education of conserving water

#2 Undertake Detailed WCS to review potential infrastructure soltuions for development in the Crawley, Goddards Green (Burgess Hill), Felbridge (East Grinstead), Horsted Keynes and Handcross sewer catchments and impacts on water quality to determine most sustainable options. Review water efficiency procurement (WRAP review) and Environment Agency's position of WFD and future status

#3 Southern Water to review upgrade requirements at Goddards Green and Felbridge WwTW in advance of planned development during AMP6, in liaison with Environment Agency

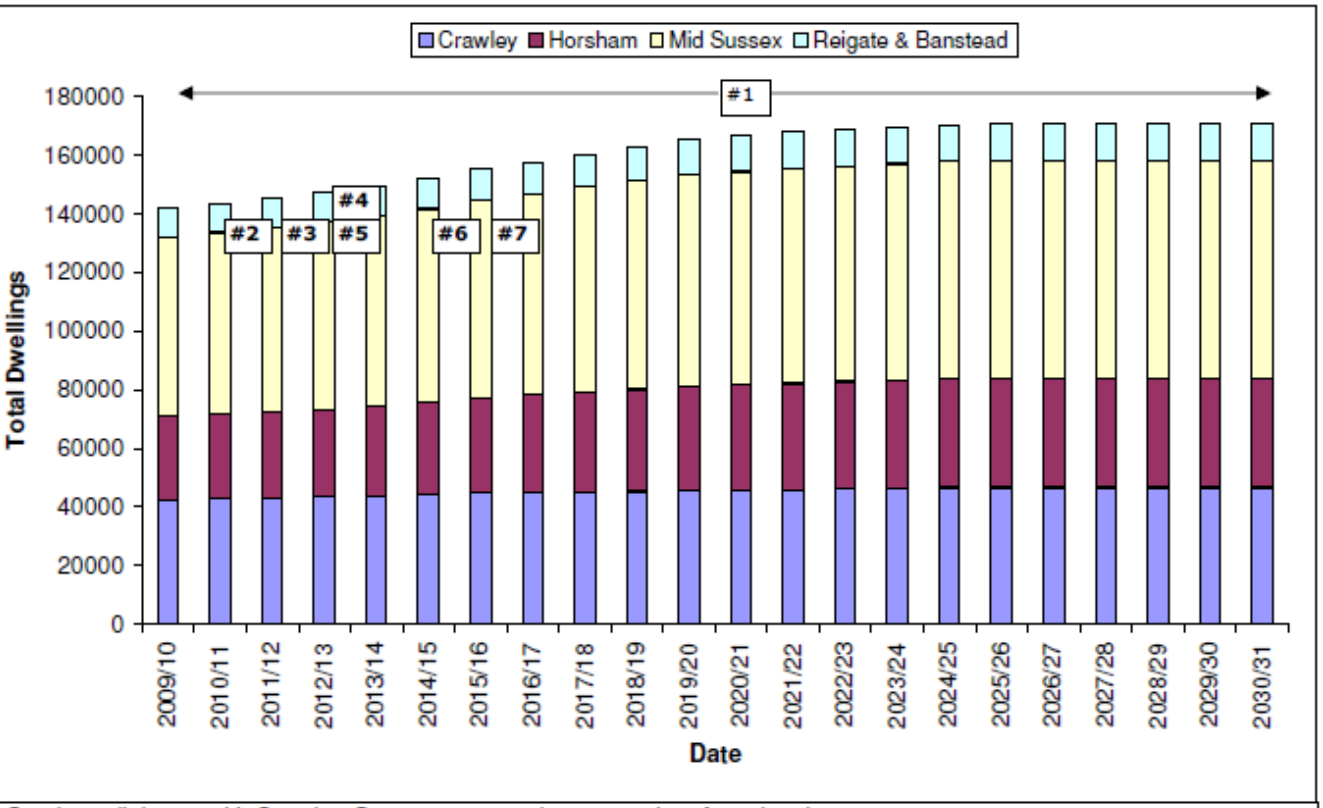
#4 Southern Water to review upgrade requirements at Eden Vale during AMP6 for potential breach of flow capacity by 2026. Thames Water to review potential upgrade to Crawley WwTW during AMP6 to manage flows post 2021

#5 Review potential impact of Gatwick airport development on Crawley WwTW flow capacity

#6 Assessment of infrastructure requirements for potential new market town from 2026 onwards. Solutions may require early planning consideration and allow for construction period

#7 Review revised River Basin Management Plans

Figure 7.4 Indicative Development Strategy (Water Related Infrastructure) Scenario 4: Strategic Development at West of Ifield and Southwater



#1 Continue dialogue with Steering Group over growth rates and preferred options
Monitor capacity of WwTW, watercourses and growth rates in Crawley and Eden Vale sewer catchments
Policies in Core Strategy to ensure new development meets 105 l/h/d and implement SuDS
Promote awareness and education of conserving water

#2 Undertake Detailed WCS to review potential infrastructure soltuions for development in the Crawley, Goddards Green (Burgess Hill), Felbridge (East Grinstead), Horsted Keynes and Handcross sewer catchments and impacts on water quality to determine most sustainable options. Review water efficiency procurement (WRAP review) and Environment Agency's position of WFD and future status

#3 Southern Water to review upgrade requirements at Goddards Green and Felbridge WwTW in advance of planned development during AMP6, in liaison with Environment Agency

#4 Southern Water to review upgrade requirements at Eden Vale during AMP6 for potential breach of flow capacity by 2026. Thames Water to review potential upgrade to Crawley WwTW during AMP6 to manage flows post 2021

#5 Review potential impact of Gatwick airport development on Crawley WwTW flow capacity

#6 Assessment of infrastructure requirements for potential new market town from 2026 onwards. Solutions may require early planning consideration and allow for construction period

#7 Review revised River Basin Management Plans

8. Future Recommendations

The Outline Water Cycle Study has reviewed where there are likely to be constraints upon the deliverability of development from both the water environment and water services infrastructure. Potential phasing and capacity issues have been identified in the study, using the predicted growth for the four scenarios provided by the sub-regional authorities. This section provides recommendations for policies in the sub-regional authorities' Development Plan Documents (DPDs) and for further assessment in some technical areas. Box 8.1 summarises the recommended policies and actions.

8.1 Include Policies for Water Efficiency Measures

The capacity assessment in this study has shown that even with a higher growth scenario, a saving of approximately 4 Ml/d could be achieved if all new homes were built to water efficient levels and maintained these consumption rates through promotion and education in water conservation.

The three water companies have forecast that there will be a surplus in supply over the growth period, dependent on a combination of demand management (achieving an efficient level of consumption per head) and increasing abstraction where available. To reduce the pressure on water resources in the region and to support the water company's management plans, it is essential that the sub-regional authorities bring forward recommendations for all new homes to be water efficient in their Core Strategies.

Annex C of the South East RBMP advises Local Authorities to include the recommendations from water cycle studies within Local Development Documents by 2012. Specifically it suggests consideration of the reduction in demand through specification of water efficient fittings in new and refurbished homes under Building Regulations and to ensure that local spatial planning policies for new development set out strong requirements for water efficiency measures.

Recommendations in the Thames RBMP (covering Crawley, East Grinstead, and Horley) include the encouragement of all rural businesses to adopt water efficiency measures, such as rainwater harvesting and recycling and use of storage reservoirs to support summer irrigation.

It is therefore recommended that requirements for water efficiency are embedded in new development planning applications. All new houses should be built as a minimum to the water efficiency requirements of the Level 3/4 of the Code for Sustainable Homes (105 litres per head per day internal / indoor water usage). Currently all social housing is required to be built to CSH Level 3/4, but this would ensure that all privately funded homes would be built to a more efficient level that the standard Building Regulations of 125 litres per head per day including external water usage. This would support the recommendations made in the Thames and South East RBMPs and in Government policies such as Defra's Future Water.

Policy recommendation 1 relates to CSH levels of water consumption in new homes, in Box 8.1. This could be covered under a wider sustainable design policy within the DPDs which may expect homes to meet a certain minimum level of the Code for Sustainable Homes. This would therefore need to be level 3 or above to meet the water efficiency standard discussed.

BREEAM standards exist for different building types, from industrial and commercial to buildings used for office, retail or education, for example. It is also recommended that for non-household development, the sub-regional authorities' policies include a mandatory assessment by a BREEAM assessor for non-household developments, with the expectation that the developments meet the Good standard, as a minimum, with regard to the water consumption targets for the development type.

A recent review on water efficiency through procurement has been prepared for WRAP, the Waste and Resources Action Programme. The output is a draft guide and model clauses to help clients and developers ask for water-efficient practice when procuring design, construction and facilities management services in commercial buildings. The draft guide is currently out for consultation (http://www.wrap.org.uk/construction/tools_and_guidance/water_efficient_proc.html). It is recommended that the sub-regional authorities review the final outputs to be aware of the latest guidance on water efficiency in procurement and non-household developments, to potentially inform future policy.

Local Authorities have an important role supporting the efforts of the water companies to raise awareness of the need to use water wisely, and for helping to distribute information to customers explaining how they can use water more efficiently and what the benefits are to them. The Environment Agency has highlighted that the planning authorities have a key role in managing water resources via spatial plans that contain policies promoting the efficient use of water resources.

A recent study completed by Entec UK Ltd for the London Development Agency has demonstrated that basic water efficiency measures (6/4 litre dual flush toilets, standard rather than power showers, restrained flow bathroom taps etc) are feasible in terms of performance and customer satisfaction, and are sufficient to enable all types of new households to reach Level 3/4 of the Code for Sustainable Homes.

It is recommended that in addition to policies for water efficiency in new buildings, the sub-regional authorities promote awareness in the communities of the need to save water, for example through hosting or co-sponsoring annual events to promote water conservation. The annual Water Festival co-sponsored by Hampshire County Council is a good example. For information and ideas see the Hampshire Water Festival website[8]. Other options include schemes to undertake water audits of existing households and to support retrofitting of water efficient appliances such as showerheads, taps and flow controllers. The sub-regional authorities may choose to lead by example by employing policies to minimise the unnecessary use of resources in its own buildings, vehicles and in all its activities.

[8] http://www.hampshireswater.org.uk/festival.html

8.2 Consider Policies for SuDS

Surface water flooding should be a material planning consideration. New developments should apply sustainable drainage techniques to control flood risk, whilst also providing benefit in terms of water quality, amenity value and green infrastructure targets. A high level assessment of infiltration potential, the preferred method of SuDS by the EA, has been prepared for the study area and has indicated that most sites have medium to low potential. However this is based on large scale groundwater vulnerability and aquifer classification, and it is recommended that all new developments undertake more detailed assessments to consider the most appropriate SuDS method for each site.

The sub-regional authorities may wish to investigate further a specific policy for SuDs in their Core Strategies. Suggested policy wording is provided below and includes a recommended hierarchy of preferred SuDS, in line with Policy 4A.14 of the London Plan. This advises that surface water should be managed as close to its source as possible in line with the following drainage hierarchy:

- Store rainwater for later use;
- Use infiltration techniques, such as porous surfaces in non-clay areas;
- Attenuate rainwater in ponds or open water features for gradual release to a watercourse;
- Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse;
- Discharge rainwater direct to a watercourse;
- Discharge rainwater to a surface water drain;
- Discharge rainwater to the combined sewer.

It is recommended that new development in the study area does not discharge surface water into combined sewers. It is also recommended that the sub-regional authorities adopt a policy that surface water and / or highway drainage is disconnected from foul or combined sewers when brownfield sites are redeveloped. In this way the flow volume entering the foul sewer can be decreased from the existing arrangement where surface water run-off is discharged to the foul sewer network.

All developers should make contact with the relevant sewerage provider at the earliest opportunity so that the foul network can be assessed and if necessary developer contributions identified for new infrastructure to connect to existing mains.

Suggested policy wording for a SuDS Policy could be:

SuDS Recommendation
All development should include appropriate sustainable drainage systems (SuDs) for the disposal of surface water, in order to avoid any increase in flood risk or adverse impact on water quality.
For brownfield developments SuDs features shall be required so as to achieve a reduction from the existing runoff rate but must at least, result in no net additional increase in runoff rates.
SuDs features should normally be provided on-site. If this cannot be achieved, then more strategic forms of SuDs may be appropriate. In such circumstances, developers will need to contribute toward the costs of provision via Section 106 Agreements or the strategic tariff. In all cases, applicants will need to demonstrate that appropriate long term management arrangements are funded and in place so that the infrastructure is properly maintained in future.
SuDs should be sensitively designed and located to promote improved bio-diversity, an enhanced landscape and good quality spaces that improve public amenities in the area.
The preferred hierarchy of managing surface water drainage from any development is through first infiltration measures, secondly attenuation and discharge to watercourses, and if these cannot be met, through discharge to surface water only sewers.

The Council may wish to consider producing a SuDs and Green Infrastructure SPD which provides design guidance for the delivery of SuDS on strategic sites.

A new guidance document *Planning for SUDS – making it happen* is currently being prepared by CIRIA, focussing on delivery of SuDS within the planning and development process to ensure successful sustainable drainage is effectively specified by planners and delivered by developers. The sub-regional authorities should take account of this guidance when developing their SuDS policies.

8.3 Consider Policy Requirement for Water Sustainability and Drainage Assessment

This study makes recommendations that new developments aim to meet water efficiency standards and provide SuDS to manage surface water run-off and prevent increases in flooding. In order to manage this process as well as to facilitate infrastructure planning for new developments both on and off site, it is recommended that a policy is adopted that requires developments of 10 dwellings or more and commercial developments demonstrate that water supply and efficiency, sewerage and flood risk has been considered during the planning application. Where a Flood Risk Assessment is required if the development is greater than 1 hectare or within Flood Zone 2 or 3, this additional information could be combined with the FRA. The information that should be included is listed below under Recommendation 4 and it is advised this is submitted to show that water sustainability and drainage has been considered.

8.4 Undertake Surface Water Management Plans

It is recommended that Surface Water Management Plans (SWMP) are prepared, particularly for Horsham, Burgess Hill and Haywards Heath, in order to build on the work done in the Level 1 SFRA and this Outline WCS. These

plans provide the vehicle for local organisations to develop a shared understanding of local surface water flood risk in line with the sewerage providers' planned improvements. This will include setting out priorities for action, maintenance needs and links to the LDF and emerging plans.

The SWMPs can be used to coordinate and strategically plan the drainage provision where piecemeal actions would be inefficient and do not support consistent ownership and maintenance regimes for SuDS. Furthermore, through new development, there are opportunities to reduce existing surface water flood risk and the proportion of storm water that enters the sewerage system. Therefore an advantage of the SWMP would include potential increase in capacity at the Horsham and Goddards Green wastewater treatment works, by planning for more sustainable management of storm water.

SWMPs can also inform Green Infrastructure Strategies. Green Infrastructure is an important method of providing flood storage and SuDS whilst also maximising potential benefits for water resources, water quality and amenity value.

The Floods and Water Management Act (April 2010) also sets out a duty for lead local flood authorities to establish and maintain a register of assets that will have a significant impact on flood risk. The Flood Risk Regulations (2009) require that flood risk and flood hazard maps in areas of significant risk are produced. The SWMP will also contribute to these tasks contributing to development of an asset register capturing information on the relevant assets, their ownership and condition and through mapping surface water flood risk and associated flood hazard.

8.5 Undertake a Detailed Water Cycle Study

The primary aim of the Outline Phase is to identify potential environmental and water infrastructure constraints to development in order to provide an evidence base that supports the DPDs and identification of preferred sites for development. Areas of uncertainty that may require further detailed studies should also be identified. Detailed WCSs aim to resolve areas of uncertainty and identify water cycle management measures and infrastructure needed, where and when they are needed, who is responsible for providing the systems, and by what deadline.

This Outline WCS has identified that environmental constraints and the current limit on wastewater treatment technology presents potential constraints to development within the sewer catchments to Goddards Green, Eden Vale, Felbridge, Handcross and Horsted Keynes WwTW. Additional flows from Goddards Green wastewater treatment works may need to be discharged to a new discharge point to prevent deterioration of the River Adur. Planning for potential solutions to treat wastewater could take up to two AMP cycles (i.e. 10 years) to resolve. This could affect the timing of planned growth in Burgess Hill, Mid Sussex beyond 2,600 additional properties. When development plans are confirmed by adopted LDFs Southern Water will plan investment to accommodate planned growth in this area. Parts of East Grinstead that drain to Eden Vale WwTW could also potentially be constrained by the flow consent at the treatment works.

Additional modelling of waste flows and water quality are required to determine the impacts of growth on water quality against WFD targets, and review potential infrastructure solutions. It is therefore recommended that a

Detailed Water Cycle Study is prepared, covering the study area, to resolve the current uncertainties surrounding wastewater treatment process and environmental quality. It is likely that the Environment Agency and Southern Water may have a more updated view on capacity issues at these locations where capacity issues have been identified, following a review of this study, and may have confirmed if future quality standards are likely to be tightened to contribute to WFD Good Status. For this reason it is advised that the whole study area is included, in case additional investment, treatment or solutions are required for Horsham or parts of Mid Sussex, even where constraints are not currently identified.

The Crawley WwTW is undergoing a growth upgrade during AMP5 (2010-2015) that will enable approximately 7,600 more homes to be delivered up to 2021 assuming an occupancy rate of 2.4. The four housing scenarios reviewed would deliver approximately 7,970 new homes between 2010 and 2026, therefore capacity at the works based would be exceeded between 2021 and 2026. If other developments were to come forward over and above those in the trajectory, such as the East of Brighton Road site or Russell Way or from windfall development, the capacity at the works would be constrained even further. A Detailed WCS is recommended to review in more detail the capacity at the works following the planned upgrade. During a detailed study, modelling could take account of population movement, water efficiency campaigns and occupancy rates to assist in the planning of required sewerage infrastructure.

The Outline WCS has been prepared during a period of uncertainty with regard to the water resource management area covered by South East Water. During the preparation of this study, the Final South East Water Resource Management Plan has been subject to public inquiry and the outcome of the inquiry is still pending at the time of writing. A decision is expected around late 2010. The Draft WRMP has therefore been used as the latest available information to prepare the Outline WCS. A Detailed WCS would involve a review of the Final WRMP compared to the planned resource schemes and demand management set out in this report to ensure that the conclusions regarding water resources are correct.

It has been identified that the potential strategic sites will require local infrastructure and strategic infrastructure to connect the sites to the WwTWs. It is recommended that the Detailed WCS also reviews the network capacity in relation to supply pipes and foul sewers in partnership with the utilities providers, to inform in more detail the development strategy for the proposed strategic development sites.

8.6 Continued Liaison with Steering Group

Based on the potential for growth to erode capacity at Crawley and Goddards Green wastewater treatment works (and Eden Vale WwTW) toward the end of the growth period due to potential housing levels being close to the capacity, or from windfall developments using up capacity ahead of sites on the trajectory, it is recommended that the sub-regional authorities continue to liaise with the Steering Group members to monitor and assess the impacts of growth on the wastewater capacity beyond completion of the water cycle strategy. In this manner potential changes to growth projections, or impacts from development not considered in detail in this study, such as expansion to Gatwick Airport, can be tracked. This ongoing dialogue will also facilitate a regular review of

recommended water efficiency policies on water resources management in the study area. The delivery of a Detailed WCS and Surface Water Management Plan for various settlements in the study area will facilitate this communication in the short term. Following these studies it is recommended that a longer term structured arrangement is set up, such as annual updates to Steering Group members with the latest information on growth rates and environmental and infrastructure capacity. This will enable the sub-regional authorities and the water and sewerage providers to continue to inform each others plans for investment.

Box 8.1 Summary of Outline WCS Recommendations

Recommendation 1: Policy for water efficiency

The DPDs should require developers of private homes to design new homes to meet the minimum water use standard in Level 3/4 of the Code for Sustainable Homes (105 l/p/d) or ensure any wider sustainable design policy or policies provided meets this standard for water use.

The sub-regional authorities should consider a policy for non-household development making it mandatory for commercial buildings to be assessed by a BREEAM assessor, with the expectation that buildings meet Good standard for water consumption targets for the building type (industrial/commercial/office/retail/education etc).

Recommendation 2: Water efficiency campaign

It is recommended that in addition to policies for water efficiency in new buildings, the sub-regional authorities promote awareness in the communities of the need to save water, for example through hosting or co-sponsoring annual events to promote water conservation. The sub-regional authorities may choose to lead by example by employing policies to minimise the unnecessary use of resources in its own buildings, vehicles and in all its activities.

Recommendation 3: Consider policies for SuDS

The WCS recommends that the DPDs include policies that promote sustainable drainage techniques (SuDS) that mimic natural drainage, rather than using traditional piped systems in all new developments. Suggest wording is provided above in Section 8.2. As part of suggested policies for SuDS it is suggested that a policy is adopted to ensure redeveloped brownfield sites disconnect any surface water drainage from the foul network. These issues should be assessed during the planning application (see Recommendation 4)

Recommendation 4: Water sustainability and drainage assessment for all new developments of more than 10 dwellings

It is suggested that the sub-regional authorities each consider a policy which makes it compulsory for all new developments for more than 10 dwellings to submit a Water Sustainability and Drainage Assessment as part of their planning application. This would enable developers to demonstrate:

1. the development will meet the water consumption level 3/4 from the Code for Sustainable Homes for all residential developments
2. non-residential developments should demonstrate that they have been assessed by a BREEAM assessor, with the expectation that buildings meet Good standard for water consumption targets for the building type
3. for all developments SuDS have been incorporated to control surface water run-off
4. for the redevelopment of brownfield sites, any surface water draining to the foul sewer network has been disconnected and is managed through SuDS
5. a Flood Risk Assessment has been completed where required. This should be approved by the Environment Agency and in line with the requirements of Planning Policy Statement 25
6. the developer has contacted the sewerage provider to determine if capacity exists offsite for foul and surface water provision. Where capacity off site is not available plans are in place for it provision ahead of the development's occupation of the receiving foul sewer network and the need to contribute to any additional off site connections for the development
7. the developer has contacted the water supply provider to assess the requirements for supply infrastructure to the development

Recommendation 5: Undertake Surface Water Management Plans

Potential constraints to development exist in the sewerage network as well as wastewater treatment works flow capacity, especially in Horsham, Burgess Hill and Haywards Heath. Sewerage providers consider SWMPs a valuable tool in alleviating network capacity issues, by addressing surface water management and reducing storm overflows into the combined sewer system.

In line with CFMP recommendations, the Outline WCS recommends that SWMPs are considered for Horsham, Burgess Hill and Haywards Heath to determine where improvements in the drainage can be delivered.

Recommendation 6: Detailed WCS

It is recommended that a Detailed Outline WCS is prepared in order to:

- review the Final WRMP for South East Water and confirm plans can accommodate growth;

- undertake water quality modelling to review impacts of growth on receiving waters and potential solutions for wastewater treatment within the Goddards Green, Eden Vale, Felbridge, Handscross and Horsted Keynes WwTW catchments, assessed in this Outline study as reaching flow capacity within the growth period;

- undertake detailed modelling to assess requirements for upgrades at Crawley WwTW;

- review supply and sewerage network capacity and solutions for strategic sites across the study area

- prepare a Water Cycle Strategy for provision of infrastructure solutions to potential growth over the planned period; and

- facilitate ongoing communication between Steering Group members

Recommendation 7: Continue liaison with Steering Group

The Outline WCS has identified potential constraints at Horsham and Crawley WwTW. Although the planned housing trajectories can be accommodated at the works, any increase in growth in particular as a result of phasing could potentially erode current headroom in the flow consent. Through monitoring growth rates and increased flows at the works, informed decisions can be made on future investment and planning permissions. The Outline WCS provides a starting point to arrange regular updates between Steering Group members, for example through ongoing SWMPs/WCS update or through agreed meeting dates at suitable intervals.

Appendix A
Data Log

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