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Harlow-Gilston Garden Town Water Cycle Study Update

Final Report

September 2018

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Revision history

Revision Ref/Date	Amendments	Issued to
Draft Report (v1.0) / 11/04/2018	Draft Report	Harlow Council Affinity Water Environment Agency Thames Water
Final Draft Report (v3.0) / 25/05/2018	Edits following consultation with stakeholders	Harlow Council
Final Report (v4.0) / 30/08/2018	Comments from Harlow Council and additional site assessments by Thames Water	Harlow Council
Final Report (5.0) / 19/09/2018	Inclusion of updated text from Affinity Water on dWRMP.	Harlow Council

Contract

This report describes work commissioned by Paul MacBride of Harlow Council in December 2017. Harlow Council's representative for the contract was Wendy Hague. Fiona Hartland, Richard Pardoe, Anna Beasley and Paul Eccleston of JBA Consulting carried out this work.

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Purpose

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JBA Consulting has no liability regarding the use of this report except to Harlow Council, as Lead Authority for the contract.

Acknowledgements

JBA Consulting would like to thank Paul MacBride, Wendy Hague, Vicky Forgione and Diane Cooper of Harlow Council, the Environment Agency, Natural England, Affinity Water and Thames Water for their assistance in preparing this report.

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Executive summary

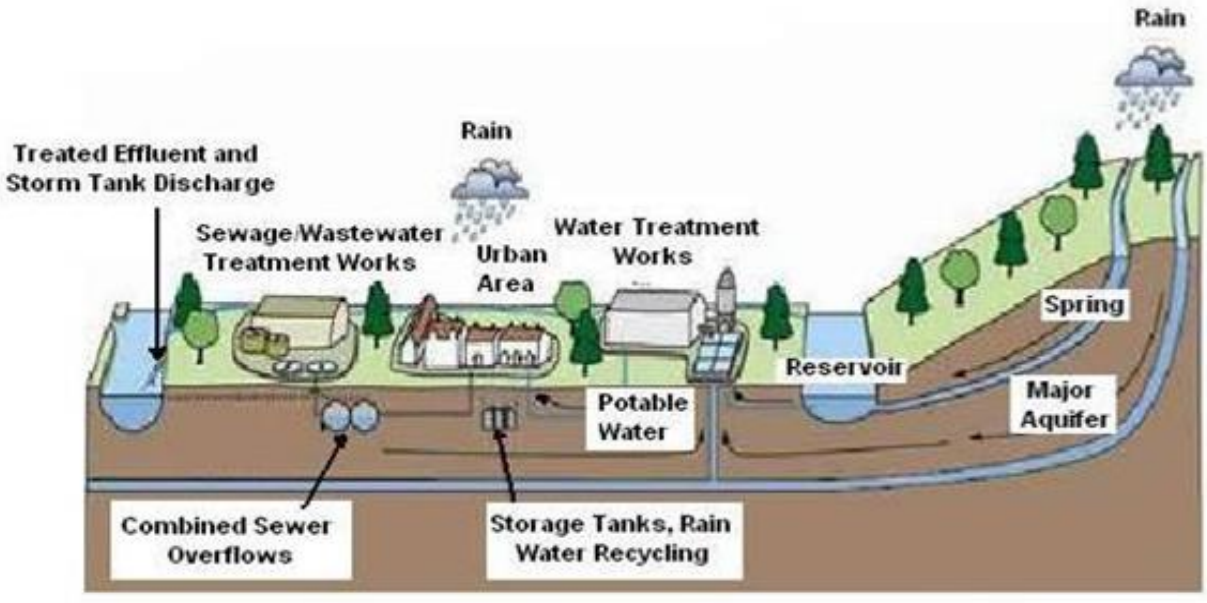
In December 2017, JBA Consulting was commissioned by Harlow Council (HC) to update the existing Phase 1 Water Cycle Study (WCS), to assess sites within Harlow District, and those within East Hertfordshire District Council (EHDC) and Epping Forest District Council (EFDC) which will form the proposed Harlow-Gilston Garden Town.

This study assesses the potential issues relating to future development within the Harlow-Gilston Garden Town study area, and the impacts on water supply, wastewater collection and waste water treatment. The Water Cycle Study is required to assess the constraints and requirements that will arise from potential growth on the water infrastructure.

New homes require the provision of clean water, safe disposal of wastewater and protection from flooding. The allocation of large numbers of new homes in certain locations may result in the capacity of existing available infrastructure being exceeded, a situation that could potentially cause service failures to water and wastewater customers, adverse impacts to the environment, or high costs for the upgrade of water and wastewater assets being passed on to the bill payers.

In addition to increased housing demand, future climate change presents further challenges to pressures on the existing water infrastructure network, including increased intensive rainfall events and a higher frequency of drought events. Sustainable planning for water must now take this into account. The water cycle can be seen in Figure 1-1 below and shows how the natural and man-made processes and systems interact to collect, store or transport water in the environment.

Figure 1-1: The Water Cycle



Source: Environment Agency – Water Cycle Study Guidance

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

The WCS has been carried out in co-operation with the Environment Agency, Thames Water and Affinity Water. Whilst there are no anticipated issues which indicate that the planned scale, location, and timing of planned development within Harlow-Gilston Garden Town is unachievable from the perspective of supplying water, restricted capacity in the surface water and waste water sewerage infrastructure has been identified. It is anticipated that upgrades to the foul sewer infrastructure will support the expected growth, while the use of Surface Water Drainage Systems (SuDS) to manage surface water on new developments, will alleviate pressure on the existing surface water systems.

Early developer engagement will, as in all major developments, be essential to ensure that sufficient time is available to build capacity upgrades prior to the development connecting to the network.

This Water Cycle Study also identified whether infrastructure upgrades are expected to be required to accommodate planned growth. Sufficient capacity is available within Rye Meads Wastewater Treatment Works (WwTW) and the majority of the foul sewer network. However, several sites were identified as requiring upgrades in the foul sewerage network, and there is very limited capacity available within the surface water sewer systems, highlighting the need to use SuDS to manage surface water.

Timely planning and provision of infrastructure upgrades will be undertaken through cooperation between Harlow Council, Thames Water, the Environment Agency, and specific developers.

Development Scenarios and Policy Issues

This Water Cycle Study is an assessment of the impacts of planned development within the Harlow-Gilston Garden Town.

The Preferred Spatial Option for allocating required housing growth across West Essex and East Hertfordshire is the development of six strategic sites within Harlow and the bordering authorities of Epping Forest and East Hertfordshire, which will provide up to 16,100 homes. Due to variance in the projected housing growth requirements, this assessment is based on current best estimates of growth within the Rye Meads WwTW catchment, which serves the three local authorities forming the Harlow-Gilston Garden Town.

The forecast provided by Thames Water estimates growth of 9,428 dwellings within Harlow District by 2033, with a further 9,484 new dwellings expected in East Hertfordshire District, and 4,516 dwellings in Epping Forest District (a proportion of which will lie within the Harlow-Gilston Garden Town). The use of these growth estimates will ensure consistency with Thames Water modelling and planning of Rye Meads WwTW.

Legal agreements under the Town and Country Planning Act Section 106 agreement, and Community Infrastructure Levy agreements are not intended to be used to obtain funding for water or wastewater infrastructure. It is not therefore necessary for East Hertfordshire District Council, Epping Forest District Council and Harlow Council to identify requirements for developers to contribute towards the cost of upgrades in its Local Plan.

The Water Industry Act sets out arrangements for connections to public sewers and water supply networks, and developers should ensure that they engage at an early stage with Affinity Water, and Thames Water to ensure that site specific capacity checks can be undertaken, and where necessary, additional

infrastructure is constructed to accommodate the development. Where permitted, Affinity Water and Thames Water may seek developer contributions towards infrastructure upgrades. Upgrades to water resources and wastewater treatment works are funded through the company's business plans.

Water Resources

Harlow District and the proposed Harlow-Gilston Garden Town are located within the Environment Agency Abstraction Licensing Strategies (ALS) for the Upper Lee. The ALS has restricted water available for licensing and all sites have been considered under serious water stress by the Environment Agency.

The draft Water Resource Management Plan (dWRMP) demonstrates the pressures on water resources within the Affinity Water supply zone with increasing demand, population growth, resource uncertainty, the impacts of climate change and the need to reduce some abstractions to reduce their impacts on the environment.

The latest DCLG baseline number of households within Affinity Water's Water Resource Zone 5 (WRZ5) were 8% higher than the dWRMP draft forecast figures, although the forecast percentage growth up to 2025 and 2045 was higher within the dWRMP. This reflects the difference in method used by Affinity Water within the dWRMP, which involves re-basing figures to reflect billed customers within WRZs, and is not considered to be cause for concern.

The Affinity Water dWRMP does not rely on new homes being more water-efficient than existing metered homes. However, the opportunity to ensure new homes meet the higher standard of 110l/person/day, through the planning system, and at nominal additional cost to the developer, would be in line with general principles of sustainable development, and reducing energy consumed in the treatment and supply of water.

The overall Red-Amber-Green (RAG) assessment for water resources in Harlow District and the Harlow-Gilston Garden Town area is green, on the basis that there is sufficient time to address the supply demand issues identified in the next WRMP.

The difference between DCLG and Affinity Water baseline and growth scenarios for households in WRZ5 is to be resolved in the final WRMP. No further assessment is required.

Water Supply Infrastructure

All sites within Harlow District and the Harlow-Gilston Garden Town area would be served by Affinity Water. The additional demand of these developments would require some reinforcement of the water supply network, although no significant constraints to the provision of this infrastructure have been identified.

No further assessments of water supply infrastructure are required.

Wastewater Collection and Treatment

The Thames Water RAG assessment prepared for this scoping stage has considered all potential Local Plan allocations within the Harlow-Gilston Garden Town study area. The assessment indicates that, for several of the sites, foul sewer infrastructure upgrades are required to serve proposed growth, however no significant constraints to the provision of infrastructure have been identified. The exception to this is the site at Latton Priory, where Thames Water has recommended that early implementation of foul sewerage is required. In addition, a Statement of Common Ground is being prepared between Harlow Council and Thames Water, to set out areas of joint interest between the two parties, including the agreements on wastewater network and treatment

capacity to support the delivery of growth within the Harlow-Gilston Garden Town area.

In terms of surface water sewer capacity, all but one site is identified as being located in an area of limited or very limited surface water network capacity. This highlights the significant constraints, and need to limit the volumes of surface water runoff entering the sewer network in new developments, through the use of Sustainable Drainage Systems (SuDS) and restricting new drainage connections into the existing sewer network, wherever possible.

Thames Water's preferred method of surface water disposal is using a sustainable drainage system (SuDS) discharging to ground or open watercourses, with connection to the sewerage system seen as the last option. The Harlow-Gilston Garden Town study area is predominantly situated on clay and therefore widespread infiltration is unlikely to be feasible. However, this does not preclude the incorporation of SuDS to manage surface water within developments. Instead, rainwater harvesting and discharge to watercourse are likely to be the recommended means of draining most sites.

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

No further assessment of wastewater collection is required.

Wastewater Treatment Works (WwTW) Flow Permit Assessment

The assessment indicates that Rye Meads WwTW has sufficient capacity to accommodate all planned growth from Harlow District and the Harlow-Gilston Garden Town, as well as contributing areas of the six neighbouring Local Planning Authorities of Broxbourne, East Herefordshire, Epping Forest, North Hertfordshire, Stevenage and Welwyn Hatfield, up to 2036.

Thames Water classified Rye Meads WwTW as a "green" assessment, indicating that the works have sufficient capacity for planned levels of growth within the Harlow-Gilston Garden Town study area over the plan period. This assessment takes into account current upgrades to the WwTW, as well as the potential for further proposed refurbishments of the WwTW within the AMP Cycle 7 (2020 to 2025) and potential upgrades to increase capacity in AMP Cycle 8 (2025 to 2030), dependent on business planning and growth requirements.

No further assessment of wastewater treatment capacity is required.

Water Quality Impact Assessment

A water quality assessment was carried out on Rye Meads WwTW, which serves the entire Harlow-Gilston Garden Town, as well as areas of the neighbouring LPAs, to determine the likely effect of proposed development on water quality.

It was identified that the expected level of growth within the Rye Meads WwTW catchment has the potential to cause a deterioration in Ammonia, BOD and Phosphate within the River Lee. However, it was determined that proposed growth is unlikely to prevent the receiving waterbody from achieving its target WFD status. In addition, planned works to Rye Meads WwTW may allow improvements in water quality of the River Lee.

No further assessment of water quality is required.

Wastewater Treatment Works Odour Assessment

An odour screening assessment was completed to identify sites that are in close proximity to Rye Meads WwTW, where odour may be a cause of nuisance and complaints. Results concluded that no sites were at risk of experiencing odour due to their proximity to the WwTW.

No further assessment of odour impact is required.

Flood Risk

A detailed assessment of flood risk can be found within the Harlow (2016), East Hertfordshire (2016) and Epping Forest (2015) Strategic Flood Risk Assessments.

An assessment was carried out to determine whether increased discharges of treated effluent from Rye WwTW due to the additional development within the Harlow-Gilston Garden Town study area and neighbouring LPAs could lead to an increase in fluvial flood risk from the receiving watercourse. The results showed that the impact of increased effluent flows is not predicted to have a significant impact upon flood risk in the River Lee.

No further assessment of flood risk from wastewater effluent discharges is required.

Surface Water and SuDS

Greenfield runoff rates were calculated for the major catchments draining the Harlow-Gilston Garden Town study area, to provide an initial indication of discharge rates for development sites. Due to water scarcity, surface water re-use through rainwater harvesting should be promoted within new developments.

Due to the identified pressures on the Thames Water surface water sewer network, management of surface water through SuDS is of particular importance within the Harlow-Gilston Garden Town sites. The Green Wedge network should be utilised, where possible, to deliver blue-green infrastructure and exemplar SuDS which contribute to the flood risk, water quality and water resources targets of the WCS, Harlow SFRA and Harlow SWMP.

Environment Constraints and Opportunities

Open source data from the Environment Agency was used to create a map showing sites with environmental designations within the study area, in order to identify sites likely to be impacted by additional discharge from Rye Meads WwTW. The impact of untreated surface water runoff from development sites on designated environmental sites was also considered. The map should be used in conjunction with Sustainability Appraisals (SA) and evidence studies, where these are available.

No further assessment of impact upon designated sites is required.

Climate Change

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made within this Water Cycle Study. The assessment used a matrix which considers both the potential impact of climate change on the assessment in question, and the degree to which climate change has been considered in the information used to make the assessments contained within the WCS.

The capacity of the sewerage system stands out as one element of the assessment where the consequences of climate change are expected to be high, but no account has been made of climate impacts in the assessment by Thames Water.

Where feasible, these should be taken into account in future planning and modelling by Thames Water, however it is not considered necessary to undertake further assessments to address this aspect.

Conclusion

This Phase 1 Water Cycle Study has not identified any issues which require further assessment by a Phase 2 study.

Environment Agency guidance recommends a series of questions to be addressed as part of a WCS[1]. A summary of the WCS findings against these questions is provided in Table 1-1.

Table 1-1: Findings of the WCS against the questions posed within Environment Agency WCS guidance.

Outline WCS Question	Conclusion	Sections Addressed
Is there enough water?	Harlow District and the Harlow-Gilston Garden Town are located in the Upper Lee catchment, which is an area of serious water stress, with restricted water abstraction licencing. The Affinity Water dWRMP identifies a series of measures for managing the pressures on water resources, including universal metering and leakage reduction. This will be aided by introducing a policy of 110l/p/day for water consumption in new homes, as proposed within the draft Local Plans. As a result, it is considered there is sufficient time to address the water supply and demand issues for Harlow District and the Harlow-Gilston Garden Town.	Section 4.2 Section 4.3
Will there be a water quality impact?	Proposed growth in Harlow District and the Harlow-Gilston Garden Town is predicted to lead to a deterioration of 11% in Ammonia and of less than 10% in BOD and Phosphate on the River Lee at Rye Meads WwTW. However, this is unlikely to affect the waterbody achieving target WFD status in the future.	Section 6.5

[1] Environment Agency (2014) Water Cycle Study Guidance. Available at: https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality#water-cycle-studies

Outline WCS Question	Conclusion	Sections Addressed
Can development be accommodated without increasing flood risk?	The flood risk impact on the River Lee due to the expected increase in treated effluent discharge from Rye WwTW was assessed. There is not predicted to be a significant impact on flood risk, with growth of Harlow District and the Harlow-Gilston Garden Town.	Section 7.1 Section 7.2
Are there other location specific environmental risks that need to be considered?	The designated environmental sites with potential to be affected by additional discharge from Rye Meads WwTW were assessed. Rye Meads SPA and Lea Valley Ramsar are located close to Rye Meads WwTW, and the combined sewer network runs beneath Hunsdon Mead SSSI. Risks and opportunities have been identified within these areas. However, continued careful management of wastewater assets in these locations will mitigate environmental risks.	Section 8.1
What constraints are there on increasing capacity?	Responses from Thames Water did not identify any constraints in wastewater flow capacity. However, restrictions in capacity were identified in areas of the foul and surface water sewerage networks. In particular, the Latton Priory site will require early foul infrastructure implementation. No new connections are permitted to the surface water sewer network. The feasibility of alternative surface water discharge methods for each site is provided in the accompanying site spreadsheet.	Appendix B
What opportunities are there for changing proposed development location?	It is considered that the proposed development locations support the proposed growth, and change is not required.	N/A
Are there outstanding concerns about infrastructure provision?	Affinity Water and Thames Water have been consulted on the feasibility of foul and surface water infrastructure provision. With the exception of foul sewerage provision at the Latton Priory site, which requires early implementation, correspondence has not identified any outstanding concerns on infrastructure provision.	Section 5.1

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Abbreviations

AW	Affinity Water
ALS	Abstraction Licensing Strategy
AMP	Asset Management Plan
AMR	Automatic Meter Reading
AONB	Area of Outstanding Natural Beauty
AP	Assessment Point
ASNW	Ancient Semi-Natural Woodland
BERR	Department for Business Enterprise and Regulatory Reform
BIDS	Business, Industrial, Distribution and Storage
BOD	Biochemical Oxygen Demand
BREEAM	Building Research Establishment Environmental Assessment Methodology
CAMS	Catchment Abstraction Management Strategies
CAPEX	Capital Expenditure
CE	Cambridge Econometrics
CED	Common End Date
CFMP	Catchment Flood Management Plan
CfSH	Code for Sustainable Homes
CLP	Comprehensive Local Plan
CSO	Combined Sewer Overflow
DCLG	Department of Communities and Local Government
DWF	Dry Weather Flow
DWI	Drinking Water Inspectorate

DYAA	Dry Year Annual Average
DYCP	Dry Year Critical Period
EA	Environment Agency
EC	European Community
ECA	European Communities Act
EDNA	Economic Development Needs Assessment
EFI	Ecological Flow Indicator
EFDC	Epping Forest District Council
EHDC	East Hertfordshire District Council
EP	Environmental Permit
EU	European Union
FEH	Flood Estimation Handbook
FFT	Flow to Full Treatment
FWMA	Flood and Water Management Act
FZ	Flood Zone
GES	Good Ecological Status
GIS	Geographic Information Systems
HC	Harlow Council
HOF	Hands-Off Flow
HOL	Hands-off Level
IDB	Internal Drainage Board
IDP	Infrastructure Delivery Plan
JBA	Jeremy Benn Associates
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
l/p/d	Litres per person per day
Ml/d	Mega (Million) litres per day
NH_4	Ammonia
NPPF	National Planning Policy Framework
NYAA	Normal Year Average Annual
OAN	Objectively Assessed Need
OfWAT	Water Service Regulation Authority
ONS	Office of National Statistics
OPEX	Operational Expenditure
OS	Ordnance Survey
P	Phosphorous
PDL	Previously Developed Land
PE	Population Equivalent
p/h	Person per house
PPS	Planning Policy Statement
RAG	Red / Amber / Green assessment
RBD	River Basin District
RBMP	River Basin Management Plan
ReFH	Revitalised Flood Hydrograph

RNAG	Reason for Not Achieving Good (Status)
RQP	River Quality Planning tool
RZ	Resource Zone
SA	Sustainability Appraisals
SAC	Special Area of Conservation
SANGS	Suitable Accessible Natural Green Space
SBP	Strategic Business Plan
SEA	Strategic Environmental Assessment
SEPA	Scottish Environmental Protection Agency
SFRA	Strategic Flood Risk Assessment
SHELAA	Strategic Housing and Economic Land Availability Assessment
SHMA	Strategic Housing Market Assessment
SPA	Special Protection Area
SPD	Supplementary Planning Document
SPZ	Source Protection Zone
SS	Suspended Solids
SSSI	Site of Special Scientific Interest
SU	Sewerage Undertaker
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TAL	Technically Achievable Limits
TCAMS	Thames Catchment Abstraction Management Strategy
TW	Thames Water
uFMfSW	Updated Flood Map for Surface Water
UWWTD	Urban Waste Water Treatment Directive
WaSC	Water and Sewerage Company
WCS	Water Cycle Study
WFD	Water Framework Directive
WRC	Water Recycling Centre
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone
WQA	Water Quality Assessment
WSZ	Water Supply Zone
WTW	Water Treatment Works
WwTW	Wastewater Treatment Works

1 Introduction

1.1 Terms of Reference

JBA Consulting was commissioned by Harlow Council to undertake a Water Cycle Study (WCS) for Harlow District and the Harlow-Gilston Garden Town, to inform Local Plans. The purpose of the WCS is to form part of a comprehensive and robust evidence base for the Local Plan which will set out a vision and framework for development in the area up to 2033 and will be used to inform decisions on the location of future development.

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

1.2 The Water Cycle

National Planning Policy Framework (NPPF) Planning Practice Guidance (NPPG) on Water Supply, Wastewater and Water Quality[2] describes a water cycle study as:

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

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

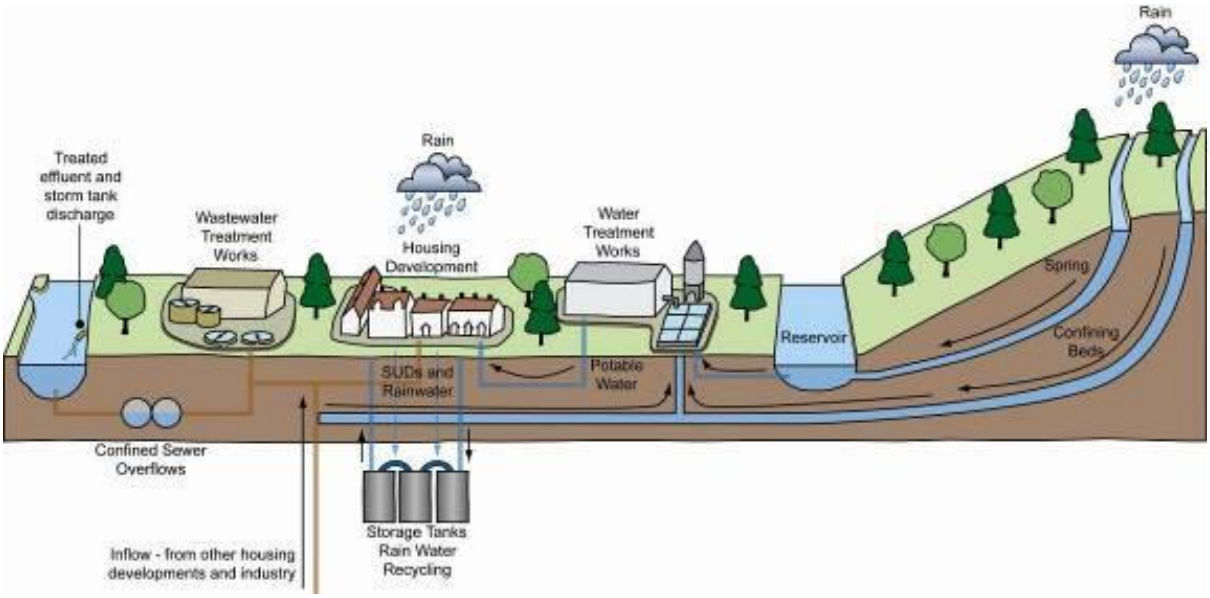
The Environment Agency's guidance on WCS[3] recommends a phased approach:

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

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

2 Planning Practice Guidance: Water supply, wastewater and water quality, Department for Communities and Local Government (2014). Accessed online at: http://planningguidance.planningportal.gov.uk/blog/guidance/ on: 09/03/2018
3 Water Cycle Study Guidance, Environment Agency (2009). Accessed online at: http://webarchive.nationalarchives.gov.uk/20140328084622/http://cdn.environment-agency.gov.uk/geho0109bpff-e-e.pdf on: 09/03/2018

Figure 1-1:The Water Cycle



1.3 Impacts of Development on the Water Cycle

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

1.4 Objectives

As a WCS is not a statutory instrument, Local Planning Authorities are advised to prioritise the different stages of the WCS to integrate with their Local Plan programme. This scoping report is written as an interim report to support the development of the East Hertfordshire, Epping Forest and Harlow Local Plans, and to identify whether a detailed WCS is required. Specific requirements, specified by the project brief, were to:

- Provide a scoping report, taking into account guidance in the NPPF, NPPG, The Water Framework Directive, The Thames River Basin Management Plan and the Environment Agency Water Cycle Study Requirements and Guidance – Thames Area (September 2016);
- Produce an effective water cycle study in the context of the scoping stage so that:
    - New development takes place only within environmental constraints;
    - New development occurs in the most sustainable location, in relation to the water environment;
    - Water cycle infrastructure is in place before new development is occupied; and
    - Opportunities for more sustainable infrastructure options are realised.

- Quantify growth within the study area;
- Include the outcomes of stakeholder engagement within the scoping study;
- Gather, assess and use existing data and evidence available, in order to prepare the scoping report and address specific questions;
- Determine any gaps in knowledge/evidence;
- Identify any environmental and major infrastructure constraints;
- Where relevant, cross reference with the replacement Strategic Flood Risk Assessment currently being prepared and its outcomes;
- Identification of the issues and questions to be considered with regards to water resources and water quality; and
- Establish whether an outline study is required and define its required scope.

1.5 Study Area

This WCS scoping report assesses the sites identified for allocation within Harlow District and the Harlow-Gilston Garden Town (hereafter referred to as the 'study area'). This includes sites within the administrative area of Harlow, the village of Gilston in East Hertfordshire District, as well as sites bordering the east, south and west of Harlow, located within Epping Forest District (see Figure 1-2).

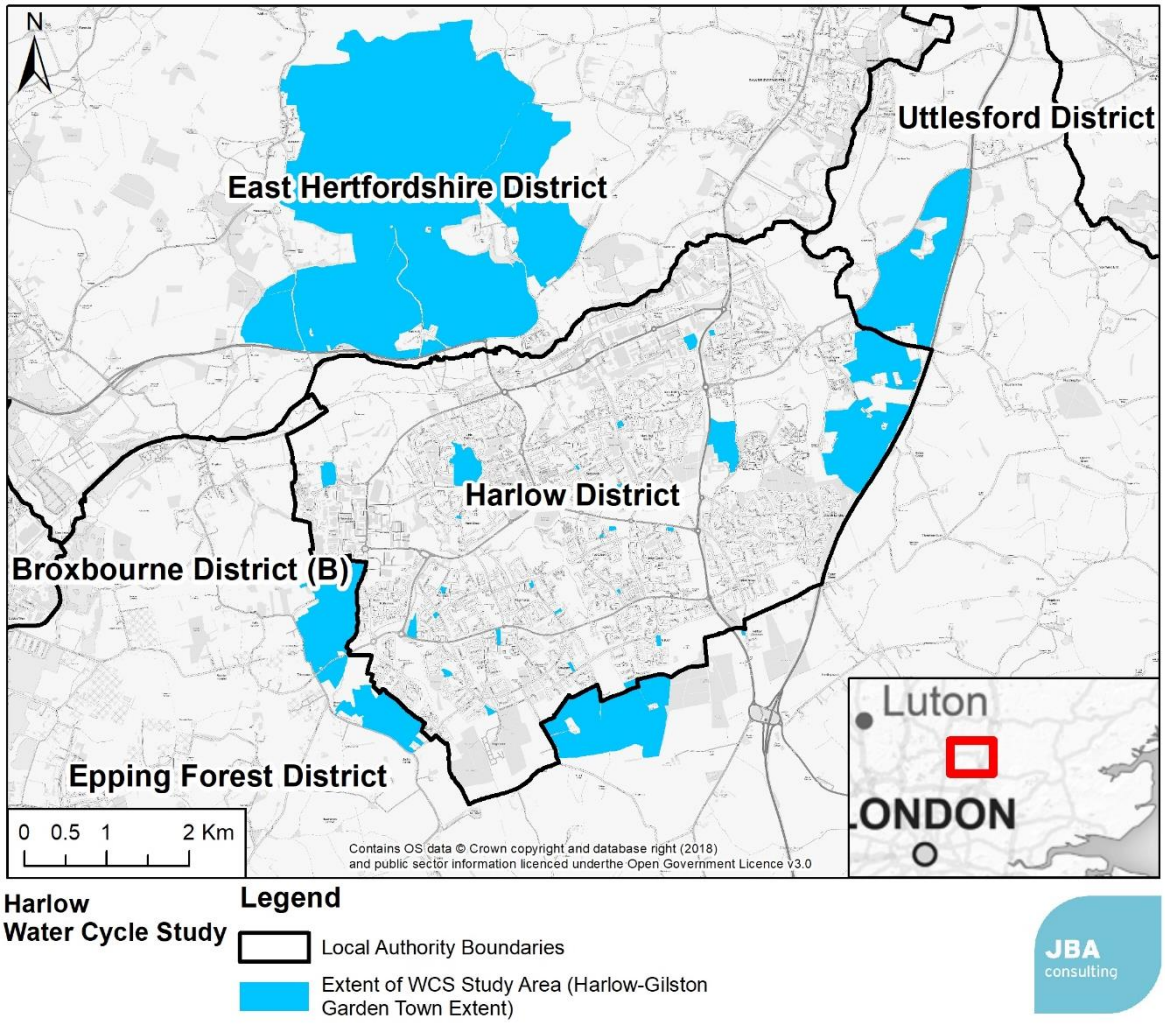
In assessing the capacity of Rye Meads Wastewater Treatment Works (WwTW), which serves the study area, growth within its extensive wastewater treatment catchment is also taken into account. This includes areas of the administrative boundaries of Broxbourne, East Hertfordshire, Epping Forest, Harlow, North Hertfordshire, Stevenage and Welwyn Hatfield (further details are provided in Sections 2.1 and 6.4.3).

The study area is located within the River Lee catchment. The River Stort, a tributary of the Lee, flows along the northern border of Harlow District, and is canalised in sections for navigation purposes.

Water supply services for the study area are provided by Affinity Water, and wastewater services are provided by Thames Water.

In order to assess the full impact of development within the study area, the WCS assessment extends beyond the Local Plan period, up to 2035. This encompasses the end of AMP Cycle 8, from a Water Company resource planning perspective, and aligns with the planned growth timescale of the Harlow-Gilston Garden Town development.

Figure 1-2: Extent of the WCS study area, covering the proposed Harlow-Gilston Garden Town



1.6 Record of Engagement

1.6.1 Introduction

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

1.6.2 Scoping Study Engagement

The preparation of the scoping study was supported by the following engagement:

Project Inception Meeting

Date	03/01/2018
Engaged Parties	Harlow Council
Details	Background to the project, the previous WCS covering Harlow, and further details of the updated WCS scope.

Stakeholder workshop

Date	17/01/2018
Engaged Parties	Harlow Council Epping Forest District Council Affinity Water Thames Water and Savills Natural England (comments via email 16/01/2018)
Details	Discussion of scope of works, and data collection requirements reviewed. Input to WCS approach from stakeholders in terms of water resources, water supply infrastructure and wastewater.

Consultation on draft WCS report

Date	18/04/2018 - 18/05/2018
Engaged Parties	Harlow Council (telecon of 18/04/2018, 02/05/2018) Epping Forest District Council Thames Water (via email 26/04/2018) Environment Agency (via email and telecon 03/05/2018, 18/05/2018)
Details	Stakeholder responses to the draft WCS (recorded in separate consultation table).

Harlow Council teleconference

Date	02/05/2018
Engaged Parties	Harlow Council
Details	Discussion of consultation comments received so far, and amendments required from a planning perspective.

Water Quality methodology teleconference

Date	18/05/2018
Engaged Parties	Thames Water Environment Agency
Details	Discussion and clarification over the Environment Agency consultation response to the draft water quality assessment. Final methodology agreed, and water quality assessment amended accordingly.

2 Future Growth in Harlow District and the Harlow-Gilston Garden Town

2.1 Housing

The NPPF indicates that the growth targets should be informed by need. The 'objectively assessed need' for housing, including, market, affordable, and other tenures has been determined by Harlow Council, Epping Forest District Council, East Hertfordshire Council and neighbouring authorities, within the West Essex and East Hertfordshire Strategic Housing Market Assessment (SHMA)[4].

The SHMA report identified a need for 46,100 dwellings across West Essex and East Hertfordshire over the 2011-2033 period, at an average of 2,095 dwellings per year. Over the 22-year period, Harlow Council is required to provide growth of 5,900 dwellings, averaging 268 dwellings per year. East Hertfordshire Council and Epping Forest District Council are expected to provide 18,000 and 11,400 new dwellings, respectively.

In comparison, the 2014-based household projections prepared by Department for Communities and Local Government[5] estimates that the number of households in Harlow will grow by 368 per annum, over a similar plan period (2014 – 2039). The forecast predicts Epping Forest District to see growth of 686 households per annum, with 751 households per annum expected within East Hertfordshire District, over the same period.

Following release of the latest growth forecasts, the Co-operation for Sustainable Development Member Board for West Essex and East Hertfordshire identified a Preferred Spatial Option, summarised in Table 2-1. This included the allocation of up to 16,100 homes within Harlow and the bordering authorities of Epping Forest and East Hertfordshire.

Table 2-1: Allocation of housing growth within Preferred Spatial Option for Harlow, East Hertfordshire, Epping Forest and neighbouring authorities.

Local Authority	Net new dwellings 2011 - 2033
East Hertfordshire Council	c. 18,000
Epping Forest District Council	c. 11,400
Harlow District Council	c.9,200
Uttlesford District Council	c.12,500
Total across the HMA	**c. 51,100**
Total provided in and around Harlow	**c. 16,100**

Since the 2009 Harlow WCS, the method of assessing housing growth and allocations has evolved, from the Regional Spatial Strategy (RSS) approach used up until 2010, to the currently adopted Objectively Assessed Housing Need (OAHN). The change in methodology has led to marked differences in estimated total housing projections within the even local authorities which drain into Rye Meads WwTW (Table 2-2). These Local Authorities are displayed in Figure 2-1.

[4] Opinion Research Services (2015) West Essex and East Hertfordshire Strategic Housing Market Assessment; Report of Findings. Available at: http://www.harlow.gov.uk/strategic-housing-market-assessment-2015pdf.
5 Department for Communities and Local Government (2016) The 2014-based Household Projections for England. Accessed online at https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections.

- Broxbourne Borough Council
- East Hertfordshire Council
- Epping Forest District Council
- Harlow Council
- North Hertfordshire District Council
- Stevenage Borough Council
- Welwyn Hatfield Borough Council

Due to the significant change in housing growth scenarios since the 2009 WCS, the decision was made for this WCS water quality assessment to use current best estimates of growth within the Rye Meads WwTW catchment, as provided by Thames Water[6] (see Section 2.4.2 and Figure 2-3). This will provide a more comparative assessment with the previous WCS, and ensure consistency with Thames Water modelling and planning of Rye Meads WwTW.

[6] JBA Consulting (2018) Harlow Water Cycle Study - Preliminary Report.

Figure 2-1: Map of Local Authorities draining into Rye Meads WwTW.

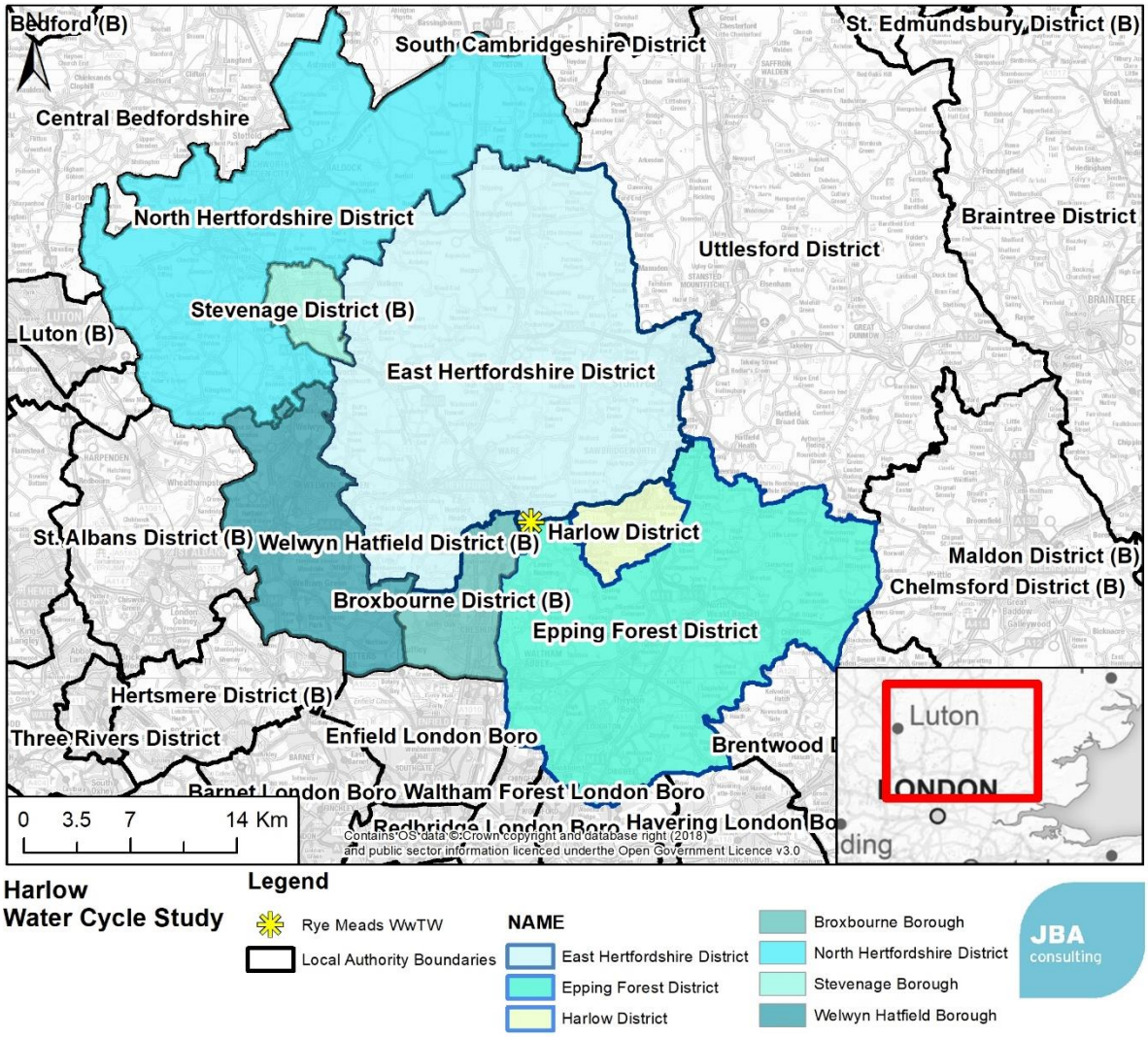


Table 2-2: Comparison between Regional Spatial Strategy (RSS) and Objectively Assessed Housing Need (OAHN) forecasts by local authority.

Authority	Estimate of total dwellings 2011-2031 from RSS (nearest 100)	Net new dwellings 2011-2033 from OAHN
East Hertfordshire	12,200	18,458
Epping Forest	3,100	12,573
Harlow	18,500	7,409
Stevenage	19,500	7,600
North Hertfordshire	5,400	13,800
Welwyn Hatfield	9,700	15,200
Broxbourne	5,200	7,100
Total	**73,500**	**82,140**

2.1.1 Availability of Land for Housing

2.1.1.1 Harlow District

The Harlow Strategic Housing Land Availability Assessment (SHLAA) (2014)[7] presents a strategic picture of the availability and suitability of land for development, providing a key component of the evidence base to inform the preparation of the Harlow Local Plan. It also contains an assessment of development potential, suitability and likelihood, as well as the timing of development. It does not determine whether a site should be allocated; this decision remains part of the local planning process.

The SHLAA study identified availability for 6,875 dwellings from new sites, commitments and completions. The Call for Sites consultation identified several sites east of Newhall, which have been combined to create a 'broad location for growth', providing up to 2,011 dwellings. With the addition of this optional growth area at Newhall, there is a total potential capacity of 8,886 dwellings within Harlow, across 59 sites.

Taking into account sites already committed or under construction, the SHLAA estimates that around 2,500 dwellings could be provided across 27 sites in Harlow, within five years of adopting the Local Plan (Table 2-3).

Table 2-3: Potential dwelling supply in Harlow District.

Source of available housing land	Number of Potential Dwellings Identified
Total new dwellings identified by the SHLAA study	2,307
SHLAA Study sites which were already committed (with planning permission or under construction)	3,637
Commitments Not in SHLAA	390
Completions from 1/4/11-31/3/13	541
Broad Location for Growth Potential Option	2,011
Total Potential Dwellings	**8,886**

Following revision of the OAHN in 2015 and 2016, the number of houses required within the West Essex and East Hertfordshire Housing Market Area (HMA) is now estimated to range from between 48,300 to 56,250 dwellings. Areas in and around Harlow have been identified as requiring growth, in order to accommodate sites within the wider HMA.

Using existing Housing and Economic Land Availability Assessment (HELAA) sites within Harlow, Epping Forest and East Hertfordshire, the Harlow Strategic Site Assessment[8] (September 2016) identified that up to 16,100 units could be accommodated in and around Harlow (formally known as the Harlow-Gilston Garden Town). Approximately

[7] Harlow Council (2014) Harlow Strategic Housing Land Availability Assessment. Available at: http://www.harlow.gov.uk/sites/harlow-cms/files/files/Strategic%20Housing%20Land%20Availability%20Assessment%202014.pdf

[8] AECOM (2016) Harlow Strategic Site Assessment. Available at: http://www.efdclocalplan.org/wp-content/uploads/2017/12/Harlow-Strategic-Site-Assessment-AECOM-2016-EB1500.pdf

9,550 of these units can be provided by six strategic sites, located within the three authority borders.

2.1.1.2 Epping Forest District

The 2014 Strategic Lane Availability Assessment (SLAA) for Epping Forest[9] identified that the District has capacity for 83,249 dwellings, in the unlikely event that all suitable sites are built. An additional 1,230 dwellings are expected to be supplied by windfall developments (sites of less than 10 homes) across the District, over the 15-year Local Plan period.

Extension of Harlow was discussed in the SHLAA, with the strategic sites in the following areas of Epping Forest expected to contribute up to 10,000 dwellings:

- Sites west of Harlow, near Roydon
- Sites to the south of Harlow
- Sites to the east of Harlow

The assessment concluded that the identification of further broad areas was not required to accommodate expected levels of growth within Epping Forest.

2.1.1.3 East Hertfordshire District

The available housing supply in East Hertfordshire District is deemed to exceed the housing need, by approximately 450 dwellings[10].

The East Hertfordshire 2017 Strategic Land Availability Assessment (SLAA)[11] identifies that housing growth will largely be accommodated by brownfield sites, and sites located within or forming an extension to, urban areas. This includes the settlements of Bishop's Stortford, Hertford, Sawbridge, Ware and the Gilston Area.

The Gilston Area of the Harlow-Gilston Garden Town is expected to deliver approximately 3,050 dwellings within the Local Plan period of 2011 - 2033, with a further 6,950 homes provided after 2033[12].

Based on analysis of past windfall growth, a windfall allowance of 75 dwellings per annum has also been made for the district.

2.2 Employment

Additional land will also be required to provide new employment within the study area. The proposed relocation of Public Health England to Harlow and growth of Stanstead Airport, are key drivers for higher employment growth within the area.

The West Essex and East Herts Assessment of Employment Needs[13] (October 2017) Preferred Scenario identifies that there will be growth of up to 10,800 jobs within East Hertfordshire, a further 10,800 in Epping Forest, and 13,400 within Harlow, between 2011 – 2033.

The estimated employment land requirements to accommodate this growth, as assessed within the West Essex and East Herts Assessment of Employment Needs, are provided in **Table 2-4.**

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[9] Epping Forest District Council (2012) Strategic Land Availability Assessment: Main Report. Available at: http://rds.eppingforestdc.gov.uk/documents/s42539/SLAA%20App%20II.pdf

[10] East Hertfordshire Council (2018) Emerging District Plan - Chapter 3; The Development Strategy.

[11] East Hertfordshire District Council (2017) East Herts District Plan Strategic Land Availability Assessment. Available at: https://www.eastherts.gov.uk/evidencebase

[12] East Hertfordshire Council (2016) Gilston Area Settlement Appraisal. Available at: https://www.eastherts.gov.uk/evidencebase

[13] Hardisty Jones Associates (2017) West Essex and East Herts Assessment of Employment Needs. Available at: http://www.harlow.gov.uk/evidence.

Table 2-4: Estimated Future Requirements for Employment Sites 2016 – 2033 (Source: HJA (2017) West Essex and East Herts Assessment of Employment Needs)

	Office Space Requirements (Ha)	Industrial Space Requirements (Ha)	Total Employment Land Requirements (Ha)
East Hertfordshire	3 – 7	13	**16 - 20**
Epping Forest District	2 – 5	14	**16 - 19**
Harlow	2 – 4	16	**18 - 20**

2.2.1 Employment Capacity in Harlow District and the Harlow-Gilston Garden Town

It is understood that all required employment land for Harlow District will be provided within the administrative boundary of Harlow. The Harlow Enterprise Zone has been designated to accommodate employment requirements within Harlow, with sites at Harlow Science Park, KAO Park and Templefields providing up to 20Ha of employment land.

Elsewhere in the Harlow-Gilston Garden Town, approximately 5Ha of the Gilston Allocation in East Hertfordshire is allocated for employment land, which is expected to be accommodated within the 2015 – 2035 WCS assessment period. A further 1Ha of employment land within Epping Forest District is proposed within the mixed land use site at Latton Priory site, south of Harlow.

Within the WCS, an assumption has been made that 50% of each employment land allocation area will be available as potential employment space. This accounts for approximately half of each site being used for non-employment land uses, such as access, car parking and open space.

Table 2-5 identifies that the employment land allocated within the study area will provide sufficient capacity to support growth expected in Harlow within the Assessment of Employment Needs[14].

The estimated potential available employment space for Harlow is lower than the identified employment land requirements, however this reflects the relatively conservative assumption of available space used within the WCS.

The majority of employment land requirements for East Hertfordshire and Epping Forest will be accommodated outside the boundary of the Harlow-Gilston Garden Town.

[14] Hardisty Jones Associates (2017) West Essex and East Hertfordshire Assessment of Employment Needs. Available at: http://www.harlow.gov.uk/sites/harlow-cms/files/files/documents/files/West%20Essex%20And%20East%20Herts%20Assessment%20of%20Employment%20Needs.pdf

Table 2-5: Capacity of potential Local Plan employment sites within Harlow District and the Harlow-Gilston Garden Town.

Usage	Site Reference	LPA	Land available for employment use (Ha)	Potential employment space 2015 – 2035 (Ha)
B1a	ED1-01 – Harlow Business Park	Harlow	4.7	2.3
	ED1-02 - London Road	Harlow	15.7	7.1
	ED1-03 - East Road, Templefields	Harlow	2.2	1.1
TOTAL FOR HARLOW			**22.2Ha**	**10.5Ha**
B1a	GA1 – Gilston Allocation	East Herts District	5.0	2.5
B1a	SP 5.1 – Latton Priory	Epping Forest District	1.0	0.5
TOTAL FOR HARLOW-GILSTON GARDEN TOWN			**28.2Ha**	**13.5Ha**

2.3 Summary

Over the period of 2011 – 2035, the areas in and around Harlow (known as the Harlow-Gilston Garden Town) are expected to accommodate up to 16,100 dwellings, as identified in the Preferred Spatial Option for West Essex and East Hertfordshire. This will largely be provided within six strategic sites bordering Harlow, Epping Forest and East Hertfordshire. Due to uncertainty and variance in estimated housing growth, this assessment will use the Thames Water housing growth forecast for the Rye Meads wastewater treatment works (WwTW).

In addition, employment growth within Harlow, Epping Forest and East Hertfordshire will require the allocation of up to 20Ha of employment land over the period. Initial assessment indicates there is sufficient capacity within three sites in the Harlow Enterprise Zone, Latton Priory site and Gilston Allocation, to accommodate 13.5Ha of employment growth.

2.4 Development Scenarios for the Water Cycle Study

2.4.1 Principles

Assessments of the impacts of growth on the hydrological environment and water and wastewater infrastructure are based on the following principles:

- Existing completions and commitments should already be known to the water and wastewater providers, through engagement with the planning system and through developer engagement. However, the impact on future services and the environment are based on a combination of existing commitments and new allocations. Therefore, the WCS focusses on potential future allocations, but also takes into account existing completions and commitments, for example in the

assessment of the future volumetric and environmental capacity at a wastewater treatment works.

- In most cases, residential use puts a higher demand per hectare of developed land on water and wastewater services than employment use. The exception is where high water use employment is planned. Where the likely future use for a site is known to be housing or employment, a suitable water demand is calculated for that use. Where the potential use of the site is unknown, or where the site is likely to be used for mixed use development, yet the split between housing and employment is unknown, the water demand for development sites is based on residential usage. On mixed-use sites, this tends to give an overall conservative assessment of demand.

2.4.2 The Importance of Scale

The Water Cycle Study requires development data at three spatial scales:

1. Water Resource Zone scale

The assessment of water resource capacity will be undertaken at the Water Resource Zone (WRZ) scale. Department for Communities and Local Government (DCLG) housing estimates for East Hertfordshire, Epping Forest, Harlow and neighbouring authorities within the same Water Resource Zone will be compared against the dWRMP household growth forecasts. Neighbouring authorities will be informed of the WCS scoping and asked for confirmation of their growth plans, in accordance with the Council's Duty to Co-operate Framework.

2. Settlement / Wastewater catchment scale

Affinity Water will be asked to assess the capacity of their water supply networks at a settlement scale. Forecasts of growth within the Rye Meads WwTW catchment will be developed using the Thames Water forecasts for the seven local authorities served by the WwTW, which includes 9,428 dwellings for Harlow, 9,484 for East Hertfordshire and 4,516 for Epping Forest (illustrated in Figure 2-3).

Thames Water will be asked to assess treatment capacity at Rye Meads Wastewater Treatment Works (WwTWs), which serves Harlow, using the same Rye Meads WwTW catchment growth forecast.

3. Site scale

Assessment of the impact of growth on water supply networks and sewerage systems is required to be carried out on individual sites. Mapping in Figure 2-2 shows the distribution of sites within the study area, provided to Thames Water and Affinity Water to assist in their assessments.

2.4.3 Collation of development sites for further study

In order to allow the analysis required later in the study, all potential development sites within the study area were added to an Excel spreadsheet, with additional information about their proposed use, area and capacity. This is attached in Appendix B.

Figure 2-2: Sites considered for allocation within the Harlow-Gilston Garden Town

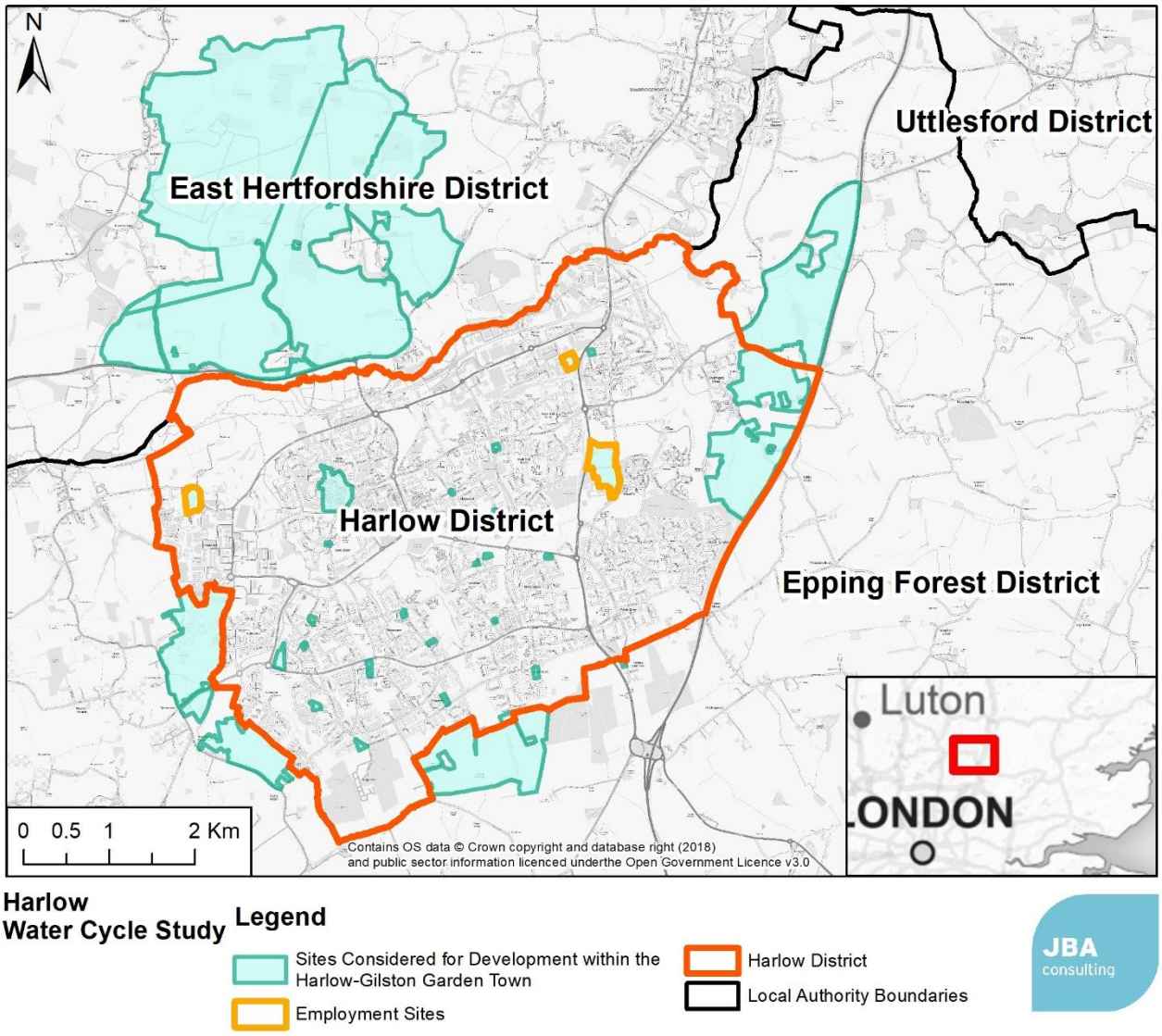
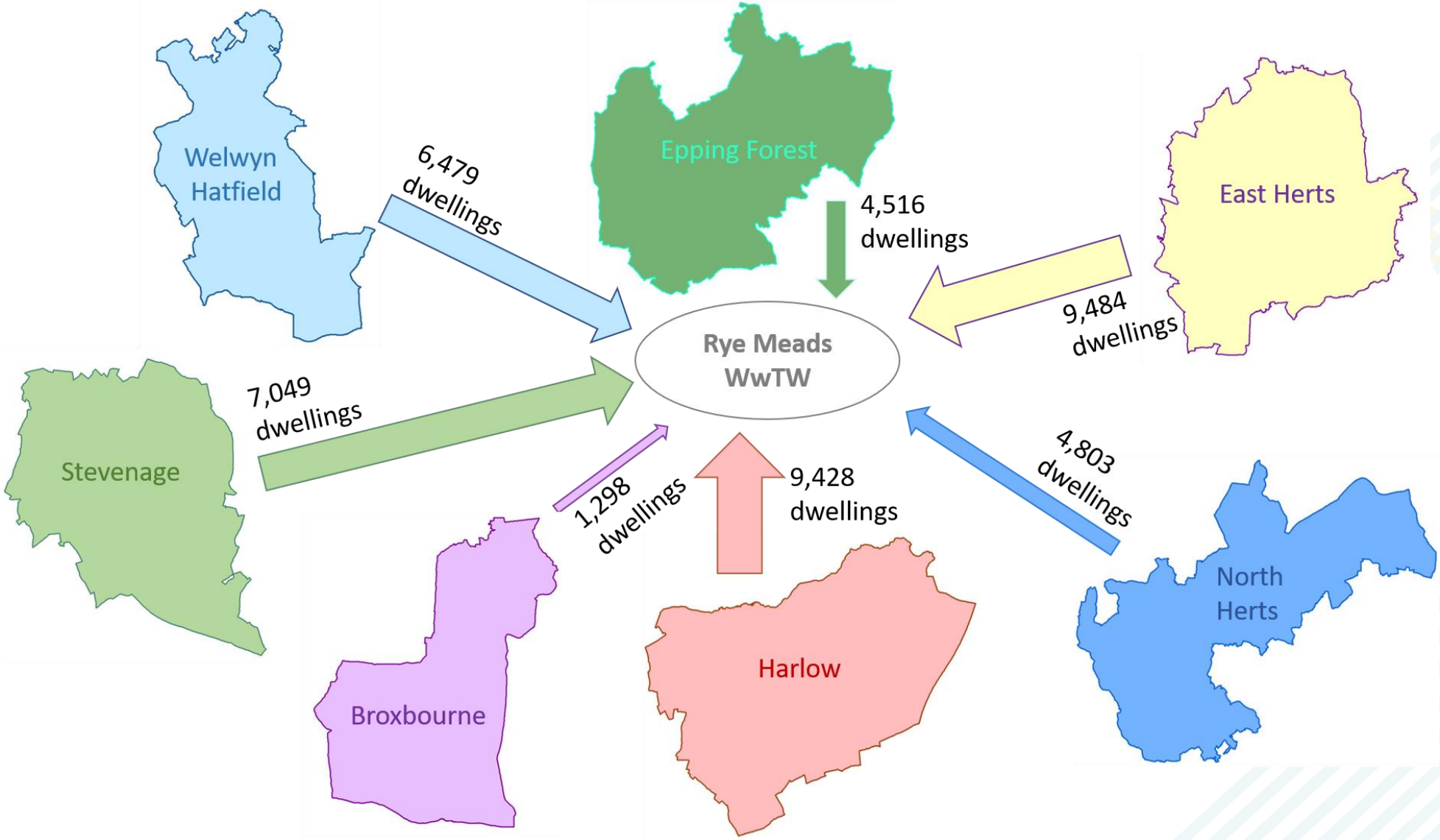


Figure 2-3: Housing growth by Local Authority (2016 – 2033) forecast by Thames Water within the Rye Meads WwTW catchment. This growth forecast has been used within the wastewater treatment capacity assessment.



3 Legislative and Policy Framework

3.1 Introduction

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

3.2 National Policy

3.2.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF)[15] was published on 27th March 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. The NPPF provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans.

Paragraph 94:

> "Local planning authorities should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk, coastal change and water supply and demand considerations"

Paragraph 99:

> "Local Plans should take account of climate change over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. New development should be planned to avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure."

Paragraph 100 states:

> "Local Plans should be supported by a strategic flood risk assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change".

Paragraph 156 states

> "Local planning authorities should set out the strategic priorities for the area in the Local Plan. This should include strategic policies to deliver...the provision of infrastructure for transport, telecommunications, waste management, water supply, wastewater, flood risk and coastal changes management, and the provision of minerals and energy".

In March 2014, the Planning Practice Guidance was issued by the Department for Communities and Local Government, with the intention of providing guidance on the

15 National Planning Policy Framework, Department for Communities and Local Government (2012)

application of the National Planning Policy Framework (NPPF) in England. The following sections are of relevance to this study;

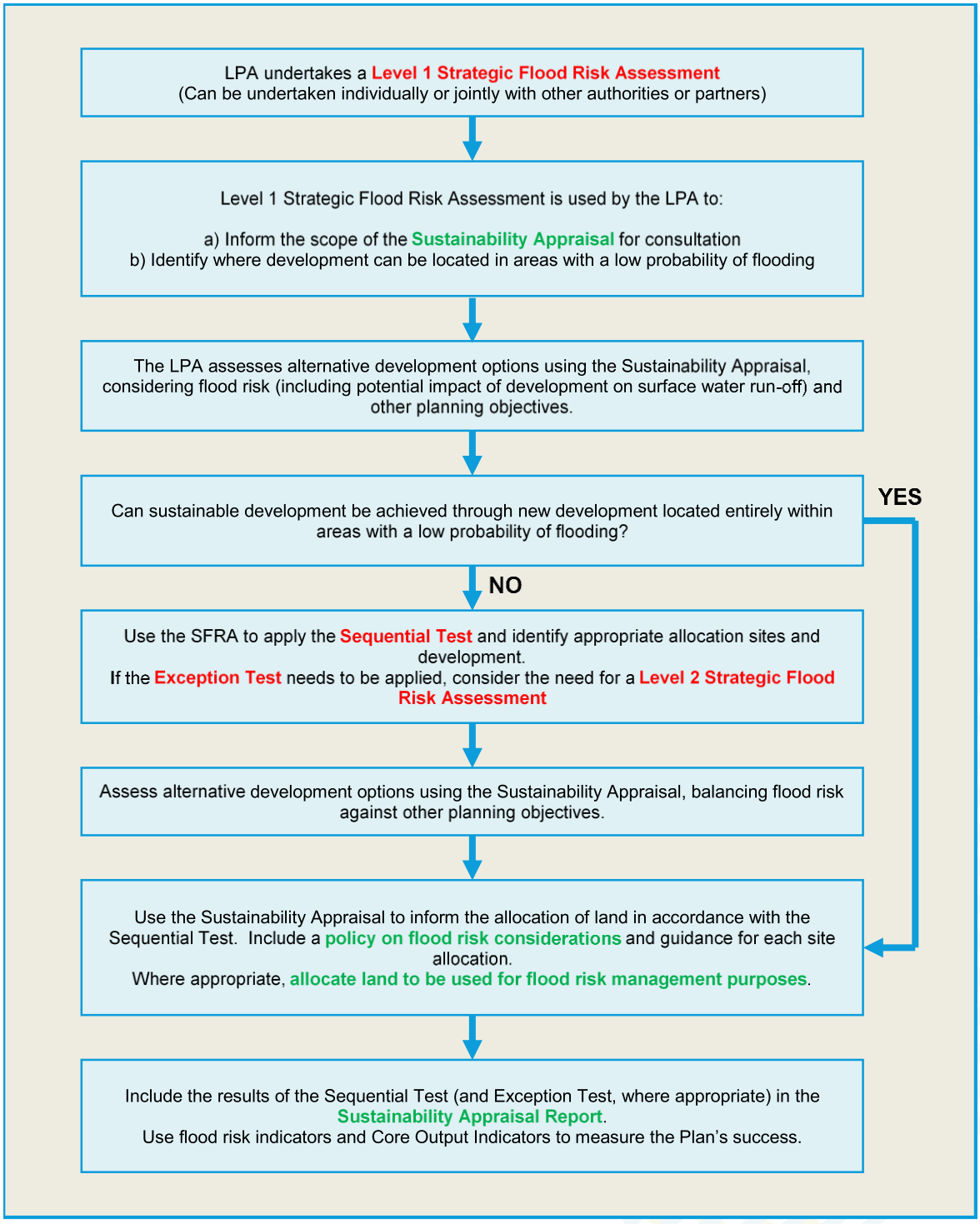
- Flood Risk and Coastal Change[16]
- Water Supply, Wastewater and Water Quality[17].
- Housing - Optional Technical Standards[18].

3.2.2 Planning Practice Guidance: Flood Risk and Coastal Change

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

16 Planning Practice Guidance: Flood Risk and Coastal Change, Department for Communities and Local Government (2014). Accessed online at: http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/ on: 09/03/2018.
17 Planning Practice Guidance: Water supply, wastewater and water quality, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality on: 09/03/2018
18 Planning Practice Guidance: Housing - Optional Technical Standards, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/guidance/housing-optional-technical-standards on: 09/03/2018

Figure 3-1 : Flood Risk and the Preparation of Local Plans[19]



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

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

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

	Plan-making	Planning applications
Infrastructure	Identification of suitable sites for new or enhanced infrastructure. Consider whether new development is appropriate near to water and wastewater infrastructure. Phasing new development so that water and wastewater infrastructure will be in place when needed.	Wastewater considerations include: First presumption is to provide a system of foul drainage discharging into a public sewer. Phasing of development and infrastructure. Circumstances where package sewage treatment plants or septic tanks are applicable.
Water supply	Not Specified	Planning for the necessary water supply would normally be addressed through the Local Plan, exceptions might include: Large developments not identified in Local Plans; Where a Local Plan requires enhanced water efficiency in new developments.
Water quality	How to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage. The type or location of new development where an assessment of the potential impacts on water bodies may be required. Expectations relating to sustainable drainage systems.	Water quality is only likely to be a significant planning concern when a proposal would: Involve physical modifications to a water body; Indirectly affect water bodies, for example as a result of new development such as the redevelopment of land that may be affected by contamination etc. or through a lack of adequate infrastructure to deal with wastewater.
Wastewater	The sufficiency and capacity of wastewater infrastructure. The circumstances where wastewater from new development would not be expected to drain to a public sewer.	If there are concerns arising from a planning application about the capacity of wastewater infrastructure, applicants will be asked to provide information about how the proposed development will be drained and wastewater dealt with.
Cross-boundary concerns	Water supply and water quality concerns often cross local authority boundaries and can be best considered on a catchment basis. Recommends liaison from the outset.	No specific guidance (relevant to some developments).
SEA and Sustainability	Water supply and quality are considerations in strategic environmental assessment and sustainability appraisal … sustainability appraisal objectives could include preventing deterioration of current water body status, taking climate change into account and seeking opportunities to improve water bodies.	No specific guidance (should be considered in applications).

Figure 3-2 : PPG - Water supply, wastewater and water quality considerations for plan-making and planning applications

3.2.4 Planning Practice Guidance: Housing – Optional Technical Standards

This guidance advises planning authorities on how to gather evidence to set optional requirements, including for water efficiency. It states that "all new homes already have to meet the mandatory national standard set out in the Building Regulations (of 125 litres/person/day). Where there is a clear local need, local planning authorities can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day. Planning authorities are advised to consult with the Environment Agency and water companies to determine where there is a clear local need, and also to consider the impact of setting this optional standard on housing viability. A 2014 study[20] into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £9 for a four-bedroom house.

3.2.5 Building Regulations and Code for Sustainable Homes

The Building Regulations (2010) Part G[21] was amended in early 2015 to require that all new dwellings must ensure that the potential water consumption must not exceed 125 litres/person/day, or 110 litres/person/day where required under planning conditions.

The Code for Sustainable Homes (CfSH) was, from 2007 to March 2015, the Government's optional national standard for new housing. It became effective in England in April 2007 and a Code rating for new homes became mandatory in May 2008. The Code included six levels of water efficiency for new homes seeking to simplify the various building codes that house builders must adhere to. The Government withdrew CfSH in March 2015, with the exception of legacy cases.

3.2.6 BREEAM

The Building Research Establishment Environmental Assessment Methodology (BREEAM) is an internationally recognised method for assessing, rating and certifying the sustainability of buildings. BREEAM can be used to assess the environmental performance of any type of building: new and existing. Standard BREEAM schemes exist for assessment of common domestic and non-domestic building types and less common building types can be assessed by developing bespoke criteria.

Using independent, licensed assessors, BREEAM assesses criteria covering a range of issues in categories that evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology and management processes. Buildings are rated and certified on a scale of 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'.

BREEAM has expanded from its original focus on individual new buildings at the construction stage to encompass the whole life cycle of buildings from planning to in-use and refurbishment. The standard is regularly revised to improve sustainability, respond to industry feedback and support sustainability strategies and commitments. BREEAM standard can be applied to virtually any building and location, with versions for new buildings, existing buildings, refurbishment projects and large developments.

For residential development within Harlow-Gilston Garden Town, the tighter Building Regulations optional requirement of 110 litres/person/day enables the Councils to set tighter standards for water consumption without requiring application for BREEAM. For

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20 Housing Standards Review: Cost Impacts, Department for Communities and Local Government (2014). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/353387/021c_Cost_Report_11th_Sept_2014_FINAL.pdf on: 09/03/2018

21 The Building Regulations (2010) Part G - Sanitation, hot water safety and water efficiency, 2015 edition with 2016 amendments. HM Government (2016). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/504207/BR_PDF_AD_G_2015_with_2016_amendments.pdf on: 09/03/2018

non-residential development, BREEAM might offer a useful toolkit for encouraging lower-impact development, including lower water consumption.

Whilst BREEAM contains the flexibility to achieve this in a number of ways, a "Very Good" rating for water resources would typically relate to a 40% improvement over baseline building water consumption[22]. As a minimum, a 12.5% improvement must be demonstrated to obtain BREEAM status. Guidance is provided on how to calculate this. Figure 3-3 shows the BREEAM credits available for percentage improvement over baseline building water consumption in precipitation zone 1, which covers the whole of the UK.

Figure 3-3 BREEAM credits for percentage improvement over baseline water consumption

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

3.2.7 Sustainable Drainage Systems (SuDS)

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

- The National Planning Policy Framework, which requires that development in areas already at risk of flooding should give priority to sustainable drainage systems.
- The House of Commons written statement[23] setting out governments intentions that LPAs should "ensure that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate" and "clear arrangements in place for ongoing maintenance over the lifetime of the development." In practice, this has been implemented by making Lead Local Flood Authorities (LLFAs) statutory consultees on the drainage arrangements of major developments.
- The Defra non-statutory technical standards for sustainable drainage systems[24]. These set out the government's high-level requirements for managing peak flows and runoff volumes, flood risk from drainage systems and the structural integrity and construction of SuDS. This very short document is not a design manual and makes no reference to the other benefits of SuDS, for example water quality, habitat and amenity.

22 BREEAM International New Construction 2016: Technical Manual SD233 2.0, BREEAM (2016). Accessed online at: https://www.breeam.com/discover/technical-standards/newconstruction/ on: 09/03/2018
23 Sustainable drainage systems: Written statement - HCWS161, UK Government (2014). Accessed online at: http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2014-12-18/HCWS161/ on: 09/03/2018
24 Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems, Defra (2015).

- Essex County Council and Hertfordshire County Council are the LLFAs within the study area, and play a key role in ensuring that the proposed drainage schemes for all new developments comply with technical standards and policies in relation to SuDS.
- An updated version of the CIRIA SuDS Manual[25] was published in 2015. The guidance covers the planning, design, construction and maintenance of SuDS for effective implementation within both new and existing developments. The guidance is relevant for a range of roles, with the level of technical detail increasing throughout the manual. The guidance does not include detailed information on planning requirements, SuDS approval and adoption processes and standards, as these vary by region and should be checked early in the planning process.
- Thames Water do not currently have a SuDS adoption manual. In its Addendum to Sewers for Adoption 7th Edition[26], Thames Water states that it "will not adopt geocellular structures, balancing ponds or swales of any type. Where such features are incorporated as part of a drainage design for a site, the developer should arrange for the Local Authority, the SuDS Adopting body or a properly constituted company to maintain them."
- The water industry is currently developing Sewers for Adoption version 8. This is expected to include a significant expansion of what can be considered to be an adoptable surface water sewer, to include some forms of SuDS. If implemented, this could lead to many more SuDS systems being adopted by Thames Water during the plan period.[27]
- SuDS features not adopted by Harlow, East Hertfordshire and Epping Forest Councils or Thames Water need to be maintained by householders (in the case of SuDS on private land) and by management companies for other SuDS on public open spaces and highways.

3.3 Regional Policy

3.3.1 Catchment Flood Management Plans

Catchment Flood Management Plans (CFMP) are high level policy documents covering large river basin catchments. They aim to set policies for sustainable flood risk management for the whole catchment covering the next 50 to 100 years. The Harlow-study area is covered by the Thames CFMP[28].

3.3.2 Surface Water Management Plans (SWMPs)

SWMPs outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water. SWMPs are undertaken when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area.

A SWMP was carried for Harlow in 2013, and identified a number of Local Flood Risk Zones (LFRZs) where surface water affects houses, business and infrastructure. Preferred Options for managing this surface water flood risk were supplied for each of

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25 The SuDS Manual (C753), CIRIA (2015).
26 Addendum to Sewers for Adoption 7th Edition July 2015, Thames Water (2015). Accessed online at: http://sfa.wrcplc.co.uk/Data/Sites/4/media/GalleryImages/WebImages/pdfs/TW%20Addendum%20to%20Sewers%20for%20Adoption%207th%20Edition%20June%20%202016_030117.pdf on: 09/03/2018
27 Water UK (2017) Sewers for Adoption 8: Revised Principles Paper
28 Thames Catchment Flood Management Plan, Environment Agency (2009). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293903/Thames_Catchment_Flood_Management_Plan.pdf on: 09/03/2018

the LFRZs, and ranged from creating attenuation areas, ditches and additional discharge points to increasing property level resilience.

In addition, 13 Critical Drainage Areas (CDAs) were designated within Harlow, placing a requirement for all development within these areas to produce a site-specific Flood Risk Assessment[29].

No SWMPs have been produced which cover the areas of East Hertfordshire District and Epping Forest District located within the Harlow-Gilston Garden Town.

3.3.3 Water Resource Management Plans

Water Resource Management Plans (WRMPs) are 25-year strategies that water companies are required to prepare, with updates every five years, with annual update reports. From 2020, WRMPs will cover a 40-year planning period. WRMPs are required to assess:

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

Where necessary, they set out the requirements for developing additional water resources to meet growing demand.

The Affinity Water draft WRMP (dWRMP) describes how the balance between water supply and demand will be balanced over the period 2020 to 2060.

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

The dWRMP is reviewed in more detail in Section 4.3.

3.4 Local Policy

3.4.1 Localism Act

The Localism Act (2011) changes the powers of local government, by re-distributing the balance of decision making from central government back to councils, communities and individuals. In relation to the planning of sustainable development, provision 110 of the Act places a duty to cooperate on Local Authorities. This duty requires Local Authorities to *"engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter"*[30].

The Localism Act also provides new rights, to allow local communities to shape the development and growth of their area. By preparing Neighbourhood Development Plans, or Neighbourhood Development Orders, the ambition of the neighbourhood is aligned with strategic needs and priorities for the area. This means that local people

[29] Environment Agency (2014) Flood Risk Assessment for Planning Applications. Available at: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment.
30 Localism Act 2011: Section 110, UK Government (2011). Accessed online at: http://www.legislation.gov.uk/ukpga/2011/20/section/110

can decide where new homes and businesses should be located, and what they should look like. As neighbourhoods draw up their proposals, Local Planning Authorities are required to provide technical advice and support.

3.4.2 Local Plan and Local Strategy

East Hertfordshire District Council, Epping Forest District Council and Harlow Council are currently preparing Local Plans.

The East Herts District Plan[31] sets out the planning framework for the district over the period of 2011 – 2033. The plan is currently at independent examination, and once adopted, will replace the Current Adopted Local Plan (2007)[32].

The Epping Forest Local Plan is being prepared and will also cover the planning period up to 2033. The document will supersede the Council's original Local Plan (1998) and adopted Local Plan Alterations (2006)[33].

The Harlow Local Development Plan[34] includes the overall strategy for Harlow up to 2033, including site allocations and development management policies. It replaces the Council's planning policies currently set out in the Adopted Replacement Harlow Local Plan (2006)[35].

3.4.3 Infrastructure Delivery Plan

The purpose of an Infrastructure Delivery Plan (IDP) is to evaluate various services, to determine if there is sufficient infrastructure to support the future levels of housing and employment in the area. The IDP presents sources of funding to assist in the delivery of infrastructure to help upgrade facilities, promote economic growth to ultimately increase the quality of life. The plan aims to sustainably develop towns and districts whilst maintaining a high-quality environment. The provision of infrastructure to support new housing in the study area is essential, and includes roads, schools, water and sewerage provision.

Information on existing and future infrastructure requirements for the study area are assessed within the Infrastructure Delivery Plan for Harlow and the Surrounding Area[36].

3.5 Environmental Policy

3.5.1 Urban Wastewater Treatment Directive (UWWTD)

The UWWTD[37] is an EU Directive that concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of wastewater discharges. More specifically, Annex II A(a) sets out the requirements for discharges from urban wastewater treatment plants to sensitive areas which are subject to eutrophication. The Directive has been transposed into UK legislation through enactment of the Urban Waste Water Treatment (England and Wales) Regulations 1994 and 'The Urban Waste Water Treatment (England and Wales) (Amendments) Regulations 2003'.

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[31] East Hertfordshire District Council (2017) The Emerging East Herts District Plan. Available at: https://www.eastherts.gov.uk/article/34937/Emerging-District-Plan

[32] East Hertfordshire District Council (2007) Current Adopted Local Plan. Available at: https://www.eastherts.gov.uk/localplan

[33] Epping Forest District Council (2008) Combined Policies of Epping Forest District Local Plan (1998) and Alterations (2006). Available at: http://www.efdclocalplan.org/local-plan/adopted-local-plan/

[34] Harlow Council (2018) Harlow Local Development Plan Available at: http://www.harlow.gov.uk/local-plan

[35] Harlow Council (2006) Adopted Replacement Harlow Local Plan. Available at: http://www.harlow.gov.uk/sites/harlow-cms/files/files/documents/files/Adopted%20Replacement%20Harlow%20Local%20Plan_0.pdf

[36] Harlow Council (2018) Delivery Study for Harlow and Surrounding Area: Infrastructure Delivery Plan. Available at: http://www.harlow.gov.uk/sites/harlow-cms/files/files/documents/files/18-03-08%20FINAL%20Infrastructure%20Delivery%20Study%20for%20Harlow%20and%20Surrounding%20Area.pdf

37 UWWTD. Accessed online at http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31991L0271.

3.5.2 Habitats Directive

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

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

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

3.5.3 The Water Framework Directive

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

River Basin Management Plans (RBMP) are required under the WFD and document the baseline classification of each waterbody in the plan area, the objectives, and a programme of measures to achieve those objectives. The study area falls into the Thames River Basin District (RBD)[38]. Under the WFD the RBMPs, which were originally published in December 2009, were reviewed and updated in December 2015. A primary WFD objective is to ensure 'no deterioration' in environmental status, therefore all water bodies must meet the class limits for their status class, as declared in the Final Thames RBMP. Another equally important objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment which compromise WFD objectives. The WFD objectives outlined in the updated RBMPs are summarised below:

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

38 Thames River Basin District River Basin Management Plan: 2015, Environment Agency (2015). Accessed at: https://www.gov.uk/government/publications/thames-river-basin-district-river-basin-management-plan on: 09/03/2018

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

3.5.4 Protected Area Objectives

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

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

The types of protected areas are:

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

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

Drinking Water Protected Areas

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

Economically Significant Species (Freshwater Fish Waters)

- To protect or improve the quality of running or standing freshwater to enable them to support fish belonging to indigenous species offering a natural diversity; or species, the presence of which is judged desirable for water management purposes by the competent authorities of the Member States.

Nutrient Sensitive Areas (Nitrate Vulnerable Zones)

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

Nutrient Sensitive Areas (Urban Waste Water Treatment Directive)

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

Natura 2000 Protected Areas (water dependent SACs and SPAs)

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

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

3.5.5 Natural Environment and Rural Communities Act

Section 41 (S41) of the 2006 Natural Environment and Rural Communities Act[39] (NERC) identifies the rarest and most vulnerable species in England. Protecting these species is central to delivering the UK Government's Biodiversity 2020 Strategy, which aims to achieve '*an overall improvement in the status of our wildlife'* and preventing *'further human-induced extinctions of known threatened species.'*

A list of the S41 Priority Species, and the actions required for their recovery, can be viewed on the Natural England website[40].

3.5.6 Groundwater Source Protection Zones

The Environment Agency has a Groundwater Protection Policy to help prevent groundwater pollution. In conjunction with this, the Environment Agency has defined groundwater Source Protection Zones (SPZs) to help identify high risk areas and implement pollution prevention measures. The SPZs show the risk of contamination from activities that may cause pollution in the area. The closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest which is occasionally applied.

Zone 1 (Inner protection zone)

This zone is designed to protect against the transmission of toxic chemicals and waterborne disease. It indicates the area in which pollution can travel to the borehole within 50 days from any point within the zone, and applies at and below the water table. There is also a minimum 50 metre protection radius around the borehole.

Zone 2 (Outer protection zone)

This zone indicates the area in which pollution takes up to 400 days to travel to the borehole, or 25% of the total catchment area, whichever area is the largest. This is the minimum length of time calculated by the Environment Agency for pollutants to become diluted or reduce in strength by the time they reach the borehole.

Zone 3 (Total catchment)

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

Zone of special interest

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

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[39] Natural Environment and Rural Communities Act 2006. Available at: https://www.legislation.gov.uk/ukpga/2006/16/contents

[40] Natural England (2014) Access to Evidence: Section 41 Species - Priority Actions Needed (B2020-008). Available at: http://publications.naturalengland.org.uk/publication/4958719460769792

The Environment Agency's approach to Groundwater protection[41] sets out a series of position statements that detail how the Environment Agency delivers government policy on groundwater and protects the resources from contamination. The position statements that are relevant to this study with regard to discharges to groundwaters, include surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g. lorry parks) and from treated sewage effluent.

3.5.7 Climate Change Act

The Climate Change Act 2008[42] sets out targets for the UK Government to reduce greenhouse gas emissions by at least 80% by 2050, based on 1990 levels.

Under the Act, the UK Government is required to:

- regularly assess the risks of current and predicted climate changes on the UK;
- set out national climate change adaptation objectives; and
- set out proposals and policies for meeting these objectives.

Local Planning Authorities have a statutory duty to provide include Local Plan policies which help to mitigate and adapt to the impacts of climate change, in line with the objectives of the Climate Change Act 2008. Opportunities may include reducing emissions, assessing the increase in flood risk over the lifetime of development, or protecting water resources and water quality.

3.6 Water Industry Policy

3.6.1 The Water Industry in England

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

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

- Non-domestic customers being able to switch their water supplier and/or sewerage undertaker (from April 2017);
- New businesses being able to enter the market to supply these services;
- Measures introduced to promote a national water supply network; and
- Developers being further enabled to make connections to water and sewerage systems.

3.6.2 Regulations of the Water Industry

The water industry is primarily regulated by three regulatory bodies;

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

41 The Environment Agency's approach to groundwater protection, Environment Agency (2017). Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598778/LIT_7660.pdf on: 09/03/2018

42 Climate Change Act 2008. Available at: http://www.legislation.gov.uk/ukpga/2008/27/contents

- Environment Agency - environmental regulation
- Drinking Water Inspectorate (DWI) - drinking water quality

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

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

3.6.3 Developer Contributions and Utility Companies

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

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

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

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

3.6.4 Changes to Charging Rules for New Connections

OfWAT, the water industry's economic regulator, has published new rules covering how water and wastewater companies may charge customers for new connections[43]. These rules apply to all companies in England and will commence on 1st April 2018. Thames Water has now published its charging arrangement which can be found in the footnotes. The key changes include:

- More charges will be fixed and published on water company websites. This will provide greater transparency to developers and will also allow alternative connection providers to offer competitive quotations more easily.
- There will be a fixed infrastructure charge for water and one for wastewater.
- The costs of network reinforcement will no longer be charged directly to the developer in their connection charges. Instead, the combined costs of all of the

43 Charging rules for new connection services (English undertakers), OfWAT (2017). Accessed online at: https://www.ofwat.gov.uk/publication/charging-rules-new-connection-services-english-undertakers/ on: 09/03/2018

works required on a company's networks, over a five-year rolling period, will be covered by the infrastructure charges payed for all new connections.

- The definition of network reinforcement has changed and will now apply only to works required as a direct consequence of the increased demand due to a development. Where the water company has not been notified of a specific development, for example when developing long-term strategic growth schemes, the expenditure cannot be recovered through infrastructure charges.
- Suppliers may consider offering charging incentives to encourage environmentally sustainable development, for example for the provision of rainwater harvesting. Thames Water[44] is not proposing any such incentives in 2018/19 but is proposing further engagement with customers on this issue.

3.6.5 National Policy Statement for Waste Water

The National Policy Statement (NPS)[45] sets out Government policy for providing major wastewater infrastructure in England. It is used as the basis for deciding consents for development classified as Nationally Significant Infrastructure Projects (NSIP), as defined in Chapter 29 of the Planning Act 2008[46].

Within the Act, the following wastewater treatment structures are defined as NSIP:

- *"construction of waste water treatment plants which are expected to have a capacity exceeding a population equivalent of 500,000 when constructed; or*
- *alterations to waste water treatment plants where the effect of the alteration is expected to be to increase by more than a population equivalent of 500,000 the capacity of the plant".*

Factors required to be considered within planning applications for wastewater NSIP include the aesthetics and functionality of design, water quality, odour, flood risk, biodiversity and visual impacts. Consideration of the resilience of the asset to the impacts of climate change is also required.

Rye Meads Wastewater Treatment Works (WwTW) is currently below the threshold size for the NPS requirements to apply. The existing Thames Water position statement[47] indicates that proposed upgrades have the potential to provide a treatment capacity of 447,134 Population Equivalent (PE). However, additional growth which requires the capacity of Rye Meads WwTW to exceed 500,000 PE will require application of the NPS.

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[44] Charging arrangements for new connection services, Thames Water (2018). Accessed online at: https://developers.thameswater.co.uk/-/media/Site-Content/Developer-Services/New-connections-charging/Charging-Arrangements-FINAL.pdf?la=en on:09/03/2018

[45] Department of Environment, Food and Rural Affairs (2012) National Policy Statement for Waste Water: A framework document for planning decisions on nationally significant waste water infrastructure. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69505/pb13709-waste-water-nps.pdf

[46] Planning Act 2008. Available at: http://www.legislation.gov.uk/ukpga/2008/29/pdfs/ukpga_20080029_en.pdf.

[47] Thames Water (2017) Thames Water – Greater Harlow Position Statement. Available at: http://www.harlow.gov.uk/evidence-base-thames-water-greater-harlow-position-statement-june-2017pdf.

4 Water Resources and Water Supply

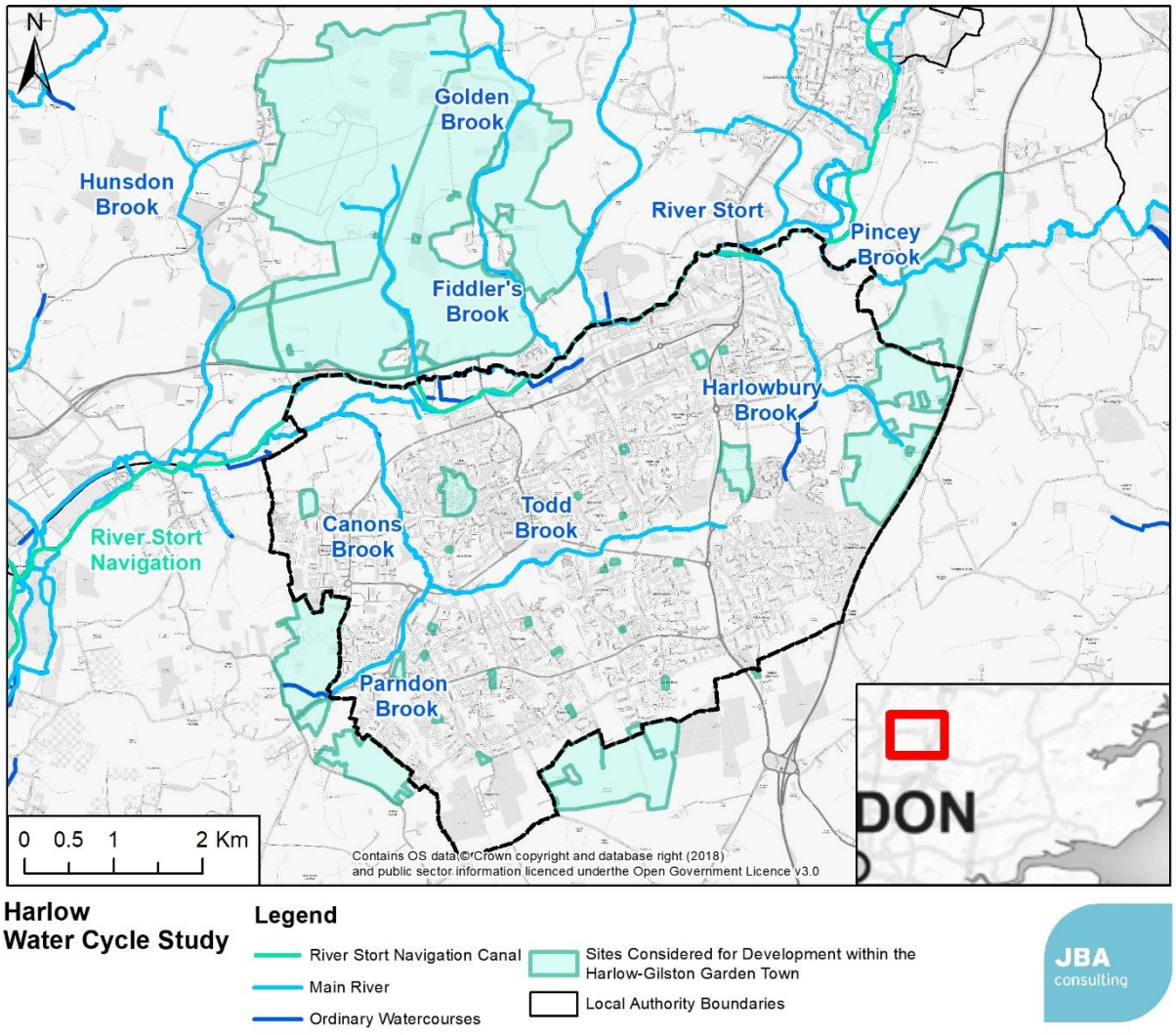
4.1 Introduction

4.1.1 Surface Waters

The study area is drained by several Main Rivers. The River Stort forms the northern boundary between Harlow and East Hertfordshire Districts, and is canalised along much of its length, for navigation purposes. Canons Brook, and its tributaries the Todd Brook and Parndon Brook, drain the western portion of the study area, while Harlowbury Brook and Pincey Brook drain the eastern side. To the north, Golden Brook, Hunsdon Brook and Fiddlers' Brook drain the area from Harlow to Gilston. Several ordinary watercourses are also located the study area, notably the tributaries of Todd Brook and Harlowbury Brook.

Figure 4-1 below shows the Main Rivers present in the study area.

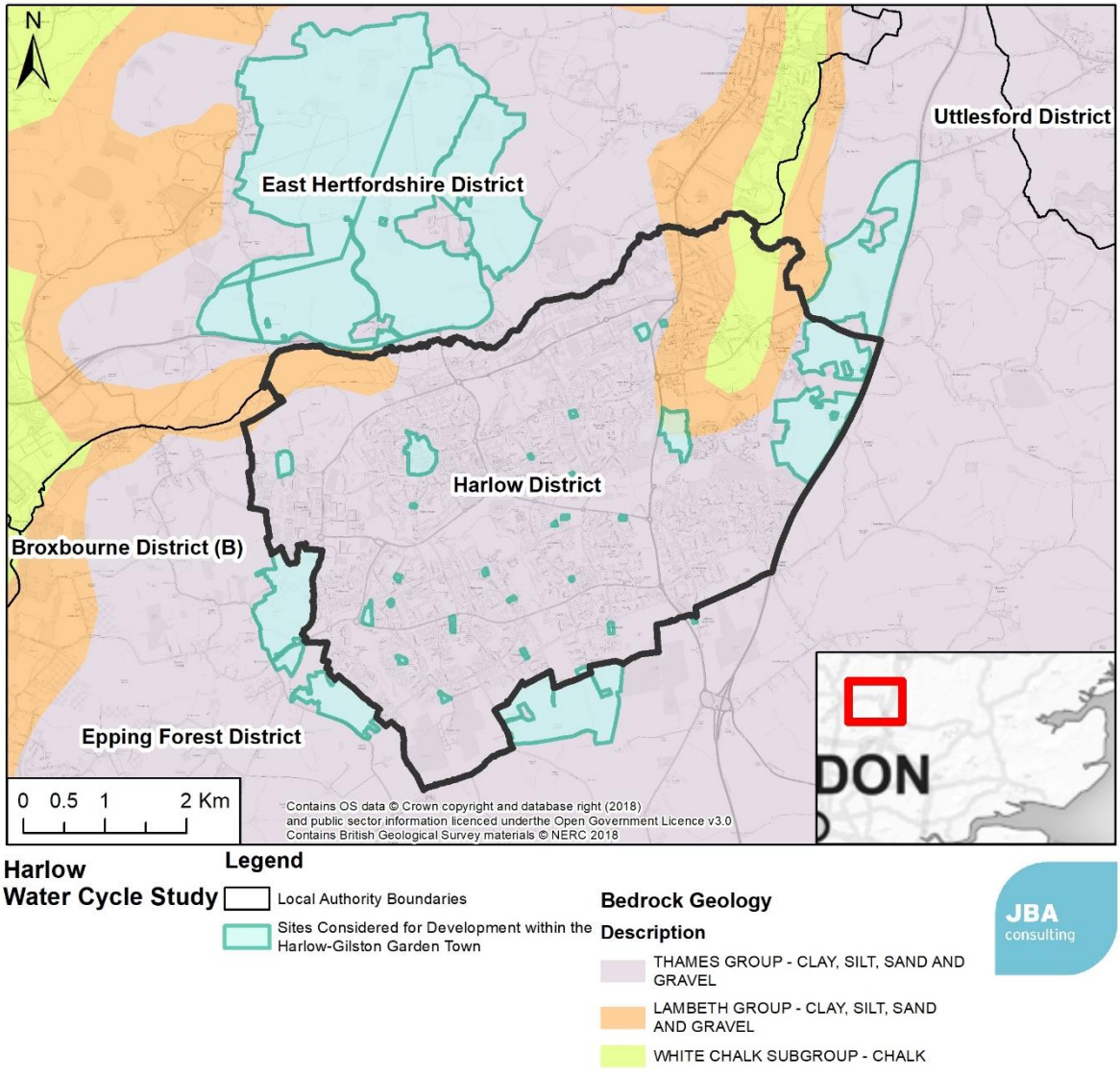
Figure 4-1: Watercourses in the Study Area.



4.1.2 Geology

Figure 4-2 shows the bedrock geology for the study area. This is largely comprised of Thames Group clay, silt, sand and gravel. To the north west and north east, the geology is interspersed with Lambeth Group clay, silt, sand and gravel. In addition, White Chalk underlies the northeast of the study area.

Figure 4-2: Bedrock Geology in the Study Area



4.2 Availability of Water Resources

4.2.1 Overview of Water Resource Management

The 2018 overview of water resources within England by the Environment Agency[48] highlights the trends across the country of rainfall, the impacts on groundwater and river flows. The ongoing pressures of unsustainable water abstraction, climate change, energy generation and land use change are identified as some of the key risks to water resources, with the potential to cause damaging impacts on water quality, drought and the survival of wetland habitats.

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

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

The ALS is important in terms of the Water Resource Management Plan (WRMP) as this helps to determine the current and future pressures on water resources and how the supply and demand will be managed by the relevant water companies[49]. The Thames Basin catchment is too large to consider as one ALS region and is therefore split into 14 smaller sub-catchments. The study area is covered by the Upper Lee ALS.

Reforms are proposed within the water abstraction system, with Defra and the Environment Agency publishing the new Water Abstraction Plan[50] in December 2017. The reforms aim to make water abstraction more consistent with other Environmental Permitting Regulations by modernising the service, revoking unused licences, and removing exemptions, to create a fairer and better-regulated system. As part of this process, each ALS will be updated by 2020.

4.2.2 Resource Availability Assessment

In order to abstract surface water, it is important to understand which water resources are available within a catchment and where abstraction for consumptive purposes will not pose a risk to resources or the environment. The Environment Agency has developed a classification system which shows:

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[48] Environment Agency (2018) The state of the environment: water resources. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/709924/State_of_the_environment_water_resources_report.pdf

49 Environment Agency (2013) Managing Water Abstraction. Accessed Online at: https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process (20/04/2017)

[50] Defra (2017) Water abstraction plan. Available at: https://www.gov.uk/government/publications/water-abstraction-plan-2017

- The relative balance between the environmental requirements for water and how much has been licensed for abstraction;
- whether there is more water available for abstraction in the area; and
- areas where abstraction may need to be reduced.

The availability of water for abstraction is determined by the relationship between the fully licensed (all abstraction licences being used to full capacity) and recent actual flows (amount of water abstracted in the last 6 years) in relation to the Environmental Flow Indicator (EFI). Results are displayed using different water resource availability colours, further explained in Table 4-1 and Table 4-2. In some cases, water may be scarce at low flows, but available for abstraction at higher flows. Licences that protect low flows can be granted, which usually take the form of a "Hands-off Flow" (HOF) or Hands-off Level (HOL) condition on a licence.

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

Table 4-1: Implications of Surface Water Resource Availability Colours

Water Resource Availability Colour	Implications for Licensing
High hydrological regime	There is more water than required to meet the needs of the environment. Due to the need to maintain the near pristine nature of the water body, further abstraction is severely restricted.
Water available for licensing	There is more water than required to meet the needs of the environment. Licences can be considered depending on local/downstream impacts.
Restricted water available for licensing	Fully Licensed flows fall below the Environmental Flow Indicator (EFI). If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted. It may also be appropriate to investigate the possibilities for reducing fully licensed risks. Water may be available via licence trading.
Water not available for licensing	Recent Actual flows are below the Environmental Flow Indicator (EFI). This scenario highlights water bodies where flows are below the indicative flow requirement to help support Good Ecological Status. No further licences will be granted. Water may be available via licence trading.
HMWBs (and /or discharge rich water bodies)	These water bodies have a modified flow that is influenced by reservoir compensation releases or they have flows that are augmented. There may be water available for abstraction in discharge rich catchments.

6.2.2.1 Upper Lee ALS

The Upper Lee Catchment Abstraction Management (CAMS) area extends from the source of the River Lee near Luton, to the confluence of the Rivers Stort and Lee at Feildes Weir, north west of Hoddesdon.

The TCAMS area supports significant abstractions for public water supply and, to a lesser extent, industry and agriculture. The majority of these abstractions are from groundwater.

As many of the watercourses are chalk-fed, low flows are common during dry periods and this can be exacerbated by abstraction. Discharges into the rivers are an important source of flow in these watercourses, with half of consented discharge into the

catchment from WwTWs. In the Upper Lee CAMS area, the main inflow is from East Hyde WwTW serving Luton. Rye Meads WwTW discharges into the London CAMS area, and as a result the Upper Lee area does not benefit from its flows.

There are 13 gauging stations within the Upper Lee CAMS area, with the closest to the study area being AP1 (Rye Bridge gauging station) and AP2 (Lower Stort gauging station). AP1 is identified as of particular importance, due to its vulnerability to low flows. Availability of water within the River Stort is constrained by flow conditions on the Lower Lee, which is located within the London CAMS area.

As the watercourses in the area are fed by groundwater, reliability of consumptive abstraction within the Upper Lee CAMS is low, with water only available to abstract 10-11% of the time at AP1 and AP2. The Environment Agency recommends investment in water storage reservoirs, to prolong the availability of water.

Across the Upper Lee CAMS area, water availability is very low, with abstraction tightly restricted. Recent actual abstractions have resulted in lower water levels than allocated for the environment (as determined by the Ecological Flow Indicator, or EFI).

As a consequence, no further consumptive licences are available. New consumptive surface water abstractions will only be considered at times of very high flows, yet these are infrequent in groundwater-fed watercourses. Trading of water abstraction licences from existing licence holders is an option, however no increase in recent actual abstraction is permitted.

Resource availability for AP1 and AP2 after the application of the licencing strategy is presented in Table 4-2 below.

Table 4-2: Upper Lee ALS resource availability

AP	Name	ALS	Local Resource Availability	HOF Q (1)	Days p.a. (2)	HOF (ML/d) (3)
1	Rye Bridge	Upper Lee	Water not available for licencing	581.8	36	121.8
2	Lower Stort	Upper Lee	Water not available for licencing	240.9	40	256.7

(1) Hands off Flow restriction

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

(3) Approximate volume available at restriction (ML/d)

4.2.3 Recommendations for Better Management Practices

The main options identified in the ALS are to adopt water efficiency and demand management techniques. Methods include:

- Testing the level of water efficiency before granting an abstraction licence;
- Promoting efficient use of water;
- Taking actions to limit the demand;
- Reducing leakage; and
- Embedding policies for low-water consumption design in new buildings into spatial plans.

This would ultimately reduce the demand for abstraction and limit the impacts on flow and ecology.

4.2.4 Water Stress

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

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

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

In the Environment Agency and Natural Resources Wales assessment[51] the Affinity Water supply region was classed as an area of "serious" water stress.

4.3 Water Resource Assessment: Water Resource Management Plans

When new development within a Local Planning Authority is being planned, it is important to ensure that there are sufficient water resources in the area to cover the increase in demand, without risk of shortages in the future or during periods of high demand. It must be ensured that the water supply required will not negatively impact on the waterbodies from which water is abstracted.

The aim of this assessment is to compare the future additional demand resulting from development proposed within the emerging Local Plans, against the demand accounted for by Affinity Water in their draft Water Resource Management Plan (dWRMP).

The water resources assessment has been carried out using two approaches; initially by reviewing the Affinity Water dWRMP, and secondly by providing the water company with growth scenarios for each settlement, allowing them to assess each settlement and the housing yields proposed.

4.3.1 Methodology

Affinity Water's draft Water Resource Management Plan (dWRMP) was reviewed, with focus upon:

- The available water resources and future pressures which may impact upon the supply element of the supply/demand balance
- the allowance within those plans for housing and population growth and its impact upon the demand side of the supply/demand balance

The results were assessed using a red / amber / green traffic light definition to score the water resource zone:

Adopted WRMP has planned for the increase in demand, or sufficient time to address supply demand issues in the next WRMP.	Insufficient evidence in adopted WRMP to confirm that the planned increase in demand can be met.	Adopted WRMP does not take into consideration the planned increase in demand. Additional water resources may be required.

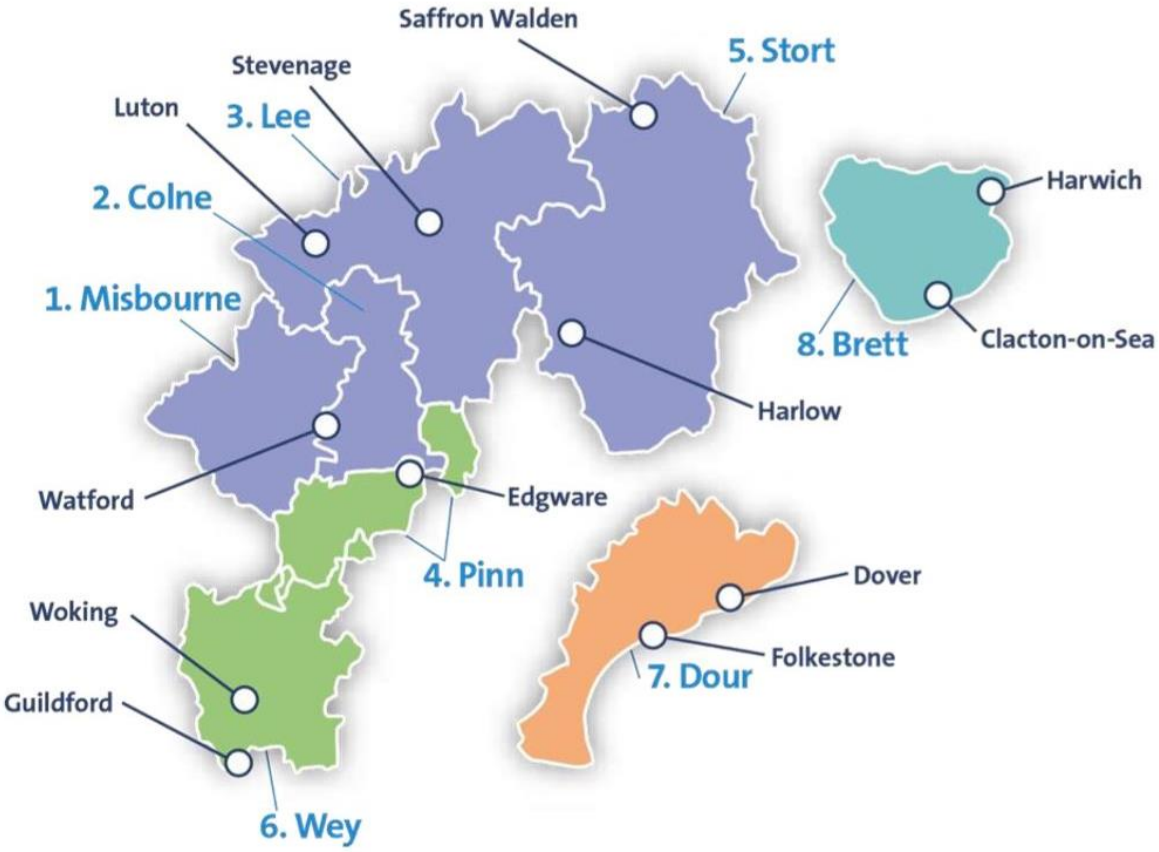
51 Environment Agency and Natural Resources Wales (2013) Water Stressed Areas - Final Classification. Accessed online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf on: 27/02/2017

4.3.2 Data Collection

The datasets used to assess the water resource capacity are:

- Potential development sites within Harlow District and the Harlow-Gilston Garden Town (provided by HDC in GIS format)
- Site details including location, proposed use and housing capacity (provided by HDC)
- Draft Water Resource Management Plan (provided by Affinity Water)
- Water Resource Zone boundaries (provided by Affinity Water)

Figure 4-3: Affinity Water WRZs (Water Resource Zones).



4.3.3 Results

The Affinity Water draft Water Resources Management Plan[52] (dWRMP) covers the period from 2020 – 2080 and builds upon the 'Ten Year Plan' published in June 2014. The dWRMP is undergoing public consultation in Spring 2018, with planned adoption in 2019.

Harlow Council is currently reviewing the Affinity Water dWRMP and will be providing a response to the public consultation.

Affinity Water's Central Region (shown in purple and green) is split into six water resource zones (WRZs). The study area is located in WRZ5 (Figure 4-3), which covers

[52] Affinity Water (2018) Draft Water Resources Management Plan. Available at: https://www.affinitywater.co.uk/docs/Draft_Water_Resources_Management_Plan_2020-2080_March%202018.pdf

the River Stort catchment and serves several other settlements, including Bishop's Stortford and Saffron Walden.

4.3.3.1 The Supply-Demand Balance

A supply / demand deficit is forecast across three of the eight WRZs by 2040 under baseline conditions, including in WRZ5. The WRZ5 baseline Dry-Year Annual Average (DYAA) in 2040 shows a deficit of 43 ML/d and the Dry Year Critical Period (DYCP) shows a deficit of 46 ML/d.

There are not sufficient water resources available under the baseline scenario within the Central region to meet customer demand by 2040, and this deficit in water supply will require substantial planning and investment to address. The plan put forward by Affinity Water will address the deficit identified as part of the baseline analysis.

Affinity Water's preferred plan in the short-term, as outlined in the WRMP, includes savings of 18 ML/d by 2025 from reducing leakage on the distribution network and customer supply pipes, and 14 ML/d through innovative use of existing meters and network data, as well as engaging with customers on their water usage.

Affinity Water is currently preparing a revised draft WRMP19, following receipt of consultation feedback on the draft WRMP19 between March and May 2018. Further consultation on the revised draft WRMP19 will take place in spring 2019, which will contain key changes, incorporating customer and stakeholder feedback on the draft WRMP.

A comparison between Water Companies using Water UK data[53], identified that the leakage rate on the Affinity Water supply network (116 litres per property per day (l/p/d)) is slightly lower than the UK average of 121 l/p/day, based on 2016 – 2017 leakage rates.

In addition, longer-term solutions are proposed, which include securing a new water import within the Thames catchment by 2055, and ensuring greater drought resilience through more thorough assessment of the water supply capacity.

Central to the assessment of supply and demand is the concept of 'water neutrality', which involves making homes and buildings more water efficient, to offset the new demand for water (further details provided below). Water neutrality should be an aspiration for new development within the study area, however it may be challenging to achieve in this area of high growth.

Forecasts within the Affinity Water dWRMP identify that Distribution Input within WRZ5 supply area will decrease up to 2034/35, causing a water neutral trend across the Local Plan period. This forecast reduction is the result of the universal metering scheme and leakage works planned. However, beyond 2034/35, there is an upward growth trend in Distribution Input over the remainder of the dWRMP period (up to 2080).

To meet the dWRMP aim of reducing water usage, Affinity Water have identified ways of managing household water usage, such as supporting customers to adopt new water efficient household technologies, and continuing to provide free water saving devices for homes. However, there are no requirements set for increased water efficiency within new homes.

Water neutrality

The concept of water neutrality is defined as:

'For every new development, the predicted increase in total water demand in the region due to the development should be offset by reducing demand in the existing community.' (Environment Agency, 2009)

Aim

Water neutrality aims to balance the needs of development, water resources and the aquatic environment. Environment Agency guidance suggests that where water stress is identified as a constraint, it should be considered at the Water Resource Zone level, during the planning stages of new development.

4.3.3.2 Population and Household Growth

Affinity Water worked with Experian to produce household and population forecasts for their coverage areas. The dataset produced was based upon local authority plans and adjusted to factor in knowledge of housing trends and billing. This resulted in forecast population growth of 31% in WRZ5 (2015/16 - 2045), and growth in the number of households of 41% (Table 4-3).

Table 4-3: Growth forecasts used by Affinity Water in WRZ5.

Unit	Baseline (2015/16)	Forecast by 2025	% Increase by 2025	Forecast by 2045	% Increase by 2045
Population	293,871	330,742	13%	386,349	31%
Households	116,259	133,770	15%	164,088	41%

The spatial boundaries for the Water Resource Zones were provided by Affinity Water for use in this assessment, to allow a direct comparison of growth forecasts[54]. The Department for Communities and Local Government (DCLG) February 2016 estimates of household growth up to 2039[55] were collated for the seven local authorities which lie in WRZ5. The percentage of the current population of each local authority within the WRZ was estimated from OS Code Point dataset and spatial data provided for WRZ5. The assessment has used DCLG figures, because they are available for all LPAs within the water resource zone, and over a consistent timescale.

[54] Note that the terms of the Affinity Water confidentiality agreement preclude inclusion of a figure showing the WRZ boundary within this report.

55 Department for Communities and Local Government (2016) 2014-Based Household Projections, 2012 - 2039. Accessed online at https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections on 08/08/2016

Table 4-4: Estimated Household Growth in WRZ5, based on DCLG forecasts

Local Planning Authority	Est. % pop. within WRZ	Households in WRZ5		
		2015/16 Baseline	Forecast by 2025	Forecast by 2039
Epping Forest	45%	24,666	27,330 (+2,664)	31,863 (+4,533)
Uttlesford	100%	34,303	39,009 (+4,706)	44,728 (+5,719)
East Hertfordshire	45%	27,404	30,642 (+3,239)	35,184 (+4,542)
Harlow	100%	36,062	38,834 (+2,772)	45,615 (+6,781)
Brentwood	13%	4,167	4,523 (+356)	10,123 (+5,599)
South Cambridgeshire	0.1%	65	73 (+8)	163 (+9)
Total		**126,667**	**140,411**	**167,594**
Percentage change			**+ 11%**	**+ 21%**

The comparison indicates that there is some discrepancy between the DCLG and Affinity Water baseline and forecast number of households. The DCLG figures are 8% higher than the dWRMP figures for 2016 baseline households, and 5% higher for the 2025 forecast scenario.

However, the percentage growth in households within the dWRMP is only slightly greater than the change forecast by DCLG. It should be noted that the DCLG forecasts extend up to 2039, in contrast to the 2045 forecast of the dWRMP, therefore the longer-term growth figures are less directly comparable.

Correspondence with Affinity Water[56] has identified that the baseline household numbers within the dWRMP are 're-based' to match the number of properties registered on the Affinity Water billing system. The predicted household growth trend is then applied to the revised baseline. This is likely to account for much of the identified discrepancy with the DCLG baseline, and the more consistent factors of growth forecast.

The dWRMP identifies that household forecasts were based on Local Plan dwelling targets published by the LPAs in winter 2016. The final WRMP growth estimates will be updated in line with the autumn 2017 updates to calculating housing needs within each LPA, as well as the latest information from published Local Plans. Therefore, it is considered that incorporation of this data will bring the forecasted household numbers for 2025 and 2045 in line with the DCLG figures.

Affinity Water will undertake Annual Reviews within the WRMP, comparing WRMP forecasts of population growth with "actual" population growth, based on the net

[56] A. Farcomini. Email correspondence. 2 May 2018.

increase in properties multiplied by an average household occupancy. Therefore, the WRMP should continue to use the latest household and population figures.

4.3.3.3 Per-Capita Consumption

With the introduction of compulsory metering over the next 8 years within the Water Saving Programme (WSP), Affinity Water has predicted a future reduction in Normal Year Annual Average (NYAA) household per capita consumption (PCC) from 151 litres/person/day in 2015/16 to 135 l/p/d in 2039/40 as an average across measured and unmeasured households. Consumption in new homes compared to existing homes is not separately reported.

Following the introduction of additional optional Building Regulations[57] for housing in 2015, there is an optional standard to reduce water consumption in new dwellings to 110 l/p/d. There is no equivalent standard for new non-residential development, however Local Planning Authorities have the option to use BREEAM targets to manage water consumption.

The draft Local Plan policies of East Hertfordshire District Council, Epping Forest District Council and Harlow Council all require new homes to be designed to limit average household PCC to 110 l/p/d. These policies will therefore contribute to meeting the Affinity Water targeted reductions in household water consumption.

In addition, Epping Forest District Local Plan Policy DM 18[58] requires non-residential development of over 1,000m^2 to achieve an at least 30% improvement on baseline water consumption for the building, which will further contribute to decreasing water demand within the WRZ.

4.3.3.4 The Preferred Plan

The dWRMP has identified the following measures specifically aimed at maintaining the supply-demand balance in WRZ5.

[57] HM Government (2010) The Building Regulations: Sanitation, hot water safety and water efficiency - G2 - Water Efficiency. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504207/BR_PDF_AD_G_2015_with_2016_amendments.pdf

[58] Epping Forest District Council (2017) Epping Forest District Local Plan: Submission Version. Available at: http://www.efdclocalplan.org/wp-content/uploads/2018/03/EB114-Epping-Forest-District-Local-Plan-Submission-Version-2017.pdf

Table 4-5: Options identified in dWRMP for WRZ5.

Option Identified	Option type	Planned Delivery Year
Removal of network/demand constraint.	Existing Groundwater	2021
Installation of meters in non-household premises	Metering	2020
Installation of meters in household premises (automated readings)		2025
Use of existing network data, fast logging and live network hydraulic models to estimate consumption at sub-street level		2020
Considering more points at which to measure leakage and improve how it is measured	Leakage	2074
Associated communication pipe replacement (as part of distribution mains renewal)		2065
Active leakage control, planned increases in manpower and resources to detect leakage		2020
Active leakage control, planned increases in manpower and resources to detect leakage		2025

4.3.4 Conclusions

The dWRMP demonstrates the pressures on water resources within the Affinity Water supply zones, including increasing demand, population growth, resource uncertainty, the impacts of climate change and the need to reduce environmental impacts.

As part of the WCS, Affinity Water reviewed the sites identified for allocation within the study area[59]. The sites had recently been assessed by the water company during a review in January 2018, which did not identify any critical issues posing a constraint on development.

As a result, the overall RAG assessment for the study area water resources is green, on the basis that there is sufficient time to address the supply demand issues identified in the dWRMP.

No further assessment of water resources is recommended.

4.3.5 Recommendations

The recommendations for water resources are provided in Table 4-6.

[59] A. Farcomeni. Email correspondence: Water Resource Impact Assessment. 19 March 2018.

Table 4-6: Water Resource recommendations

Action	Responsibility	Timescale
Compare household numbers between DCLG and the Affinity Water final WRMP, following incorporation of the updated household data.	Affinity Water	Within draft WRMP consultation period
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	Affinity Water	Ongoing
Provide yearly profiles of projected housing growth to water companies to inform the WRMP	HDC and other LPAs in the Affinity WRZ5	Ongoing
Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance for residential development in water-stressed areas, and encourage use of the BREEAM standard to deliver percentage improvement over baseline building water consumption of at least 12.5% in non-residential development.	EHDC, EFDC, HDC	In Emerging Local Plan
Water companies should advise EHDC, EFDC and HDC of any strategic water resource infrastructure developments within the councils' boundaries, where these may require safeguarding of land to prevent other type of development occurring. At present, none have been identified.	Affinity Water	In Emerging Local Plan

4.4 Water Supply Infrastructure Assessment

An increase in water demand adds pressure to the existing supply infrastructure. This is likely to manifest itself as low pressure at times of high demand. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrades will be required. The time required to plan, obtain funding and construct major pipeline works can be considerable and therefore water companies and planners need to work closely together to ensure that the infrastructure is able to meet growing demand.

Water supply companies make a distinction between supply infrastructure, the major pipelines, reservoirs and pumps that transfer water around a WRZ, and distribution systems, smaller scale assets which convey water around settlements to customers. This scoping study is focused on the supply infrastructure. It is expected that developers should engage early with the water company to enable impact assessments and modelling of the distribution systems, to determine requirements for local capacity upgrades to the distribution systems.

Water efficiency

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

Source: The Green Age

A cost-effective solution can be for local authorities to co-ordinate with water supply companies and 'piggy back' on planned leakage or metering schemes, to survey and retrofit water efficient fittings into homes[1]. This is particularly feasible within property owned or managed by the local authorities, such as social housing.

BREEAM can be used to assess the environmental performance of new and existing, domestic and non-domestic buildings. Buildings are rated and certified on a scale of 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'.

BREEAM contains the flexibility to achieve certification in a number of ways, however a "Very Good" rating for water resources would typically relate to a 40% improvement over baseline building water consumption[1]. As a minimum, a 12.5% improvement must be demonstrated to obtain BREEAM status.

4.4.1 Methodology

Affinity Water was provided with a complete list of sites and the potential / equivalent housing numbers for each. Using this information, the company was asked to comment on the impact of the proposed growth on water supply infrastructure in the study area. A RAG assessment was followed using the following definitions to score each site:

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

4.4.2 Data collection

The data sets used to assess the water supply and distribution capacity are the following:

- Potential development sites within the study area (provided by HDC in GIS format)
- A technical note outlining the growth scenario and potential housing numbers for each site
- Site tracker spreadsheet (See Appendix B)

4.4.3 Results

Affinity Water reviewed the list of potential development sites, and has identified those which could be served by their supply network. These included all sites within the study area marked as either "Allocated" or "Emerging Allocation".

All the proposed developments were covered by a strategic assessment carried out by Affinity Water in January 2018, which identified that some network reinforcements will be required to cater for the proposed growth, however no critical areas were identified.

Although Local Plan housing allocations are used to inform resource management proposed within the 2018 dWRMP, comments received from Affinity Water identified that the company: *"will continue to liaise with Harlow DC to better identify the level of future growth and its phasing and will include any required intervention within its capital programme"*[60].

On the basis that some levels of water supply infrastructure reinforcement will be required across the study area, yet the scale and location of works is not yet known, the water supply network in the area supplied by Affinity Water is given an Amber RAG score.

4.4.4 Conclusions

All sites within the study area would be served by Affinity Water. The additional demand of these developments would require some reinforcement of the water supply network, although no significant constraints to the provision of this infrastructure have been identified by Affinity Water.

No further assessment of water supply infrastructure is required.

[60] A. Farcomeni. Email correspondence: Water Resource Impact Assessment. 19 March 2018.

4.4.5 Recommendations

The recommendations from the water supply assessments are shown in Table 4-7.

Table 4-7: Water Supply Recommendations.

Action	Responsibility	Timescale
Undertake technical studies to understand options for providing sufficient bulk and local transfer capacity and communicate results with EHDC, EFDC and HC.	Affinity Water	Ongoing
Developers should seek early consultation with Affinity Water to ensure adequate time is available to provide local distribution mains upgrades to meet additional demand.	Developers Affinity Water	Ongoing
Encourage the use of rainwater harvesting and non-potable water recycling within Harlow-Gilston Garden Town developments, to move closer to achieving water neutrality for the development.	HC EFDC EHDC Affinity Water	In preparation of delivering the Harlow-Gilston Garden Town

5 Wastewater Collection

Thames Water is the sole Sewerage Undertaker (SU) for the study area. The role of sewerage undertaker includes the collection and treatment of wastewater from domestic and commercial premises. In some areas, it also includes the drainage of surface water from building curtilages to combined or surface water sewers. It excludes, unless adopted by Thames Water, systems that do not connect directly to the wastewater network e.g. Sustainable Drainage Systems (SuDS) or highway drainage. At present, Thames Water do not adopt most forms of SuDS, however they will adopt conventional piped surface water drainage systems downstream of private or third-party SuDS, where these drain the building curtilage.

Increased wastewater flows into collection systems, due to growth in population or per-capita consumption can lead to an overloading of the infrastructure. This increases the risk of sewer flooding and, where present, increases the frequency of discharges from Combined Sewer Overflows (CSOs).

Likewise, headroom at Wastewater Treatment Works (WwTW) can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity. As the volumes of treated effluent rises, even if the effluent quality is maintained, the pollutant load discharged to the receiving watercourse will increase. In such circumstances the Environment Agency as the environmental regulator, may tighten consented effluent consents to achieve a "load standstill" i.e. ensuring that as effluent volume increases, the pollutant discharged does not increase. Again, this would require investment by the water company to improve the quality of the treated effluent.

In combined sewerage systems, or foul systems with surface water misconnections, there is potential to create headroom in the system, thus enabling additional growth, by the removal of surface water connections. This can most readily be achieved during the redevelopment of brownfield sites which have combined sewerage systems, where there is potential to discharge surface waters via SuDS to groundwater, watercourses or surface water sewers.

The study area is served by separate foul and surface water sewers, rather than a combined sewer system.

5.1 Sewerage System Capacity Assessment

New residential developments add pressure to the existing sewerage systems. An assessment is required to identify the available capacity within the existing systems, and the potential to upgrade overloaded systems to accommodate future growth. The scale and cost of upgrading works may vary significantly, depending upon the location of the development in relation to the network itself and the receiving WwTW.

It may be the case that an existing sewerage system is already working at its full capacity. In these instances, further investigations must be carried out to define the necessary solution to implement an increase in its capacity. New infrastructure may be required if, for example, a site is not served by an existing system. Such new infrastructure will normally be secured through private third-party agreements between the developer and utility provider.

Sewerage Undertakers must consider the growth in demand for wastewater services when preparing their five-yearly Strategic Business Plans (SBPs) which set out investment for the next Asset Management Plan (AMP) period. Typically, investment is committed to provide new or upgraded sewerage capacity, to support allocated growth with a high certainty of being delivered. Additional sewerage capacity to service windfall sites, smaller infill development or to connect a site to the sewerage network across third party land is usually funded via developer contributions, as third-party arrangements between the developer and utility provider.

5.1.1 Methodology

Thames Water were provided with a list of sites within the study area and potential housing numbers. Using this information, Thames Water assessed each site using the range of datasets they hold.

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

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

5.1.2 Data Collection

The datasets used to assess the sewerage system capacity are the following:

- Potential development sites within Harlow District and the Harlow-Gilston Garden Town (provided by HDC in GIS format).
- Site tracker spreadsheet (see Appendix B).
- Correspondence with Thames Water Infrastructure Planning Team.

5.1.3 Results

Drainage Strategies

Introduction

Sewerage undertakers have been required to undertake long-term planning for management of their sewerage systems, which are usually named Drainage Area Plans (DAPs), but also called Sewerage Management Plans (SMPs). These have traditionally been internal documents, not shared with other Risk Management Authorities (RMAs), and have mainly (though not exclusively), focussed on foul and combined sewerage systems.

In 2013, OfWAT and the Environment Agency issued joint guidance[61] on how water companies should prepare public-facing Drainage Strategies, at a catchment scale, to demonstrate how they will deliver their AMP6 outcomes (for example reduced sewer flooding, reduced pollution incidents, capacity for growth) within each catchment. Drainage strategies should focus on the water company's foul, combined and surface water sewers, but also work with other RMAs to play their part in addressing wider drainage issues, including flooding and water pollution. The guidance describes the six guiding principles of a drainage strategy as:

- Partnership - to be optimal, strategies must be developed in partnership with customers, developers, LLFAs, planners and the Environment Agency.
- Uncertainty - Strategies should acknowledge uncertainty, for example in data and the impacts of climate change, and set out how these uncertainties will be addressed (for example adaptive approaches to climate change).
- Risk-based - Plans should consider the probability and consequence of inadequate drainage, and prioritise operations and investment where the risk is greatest.

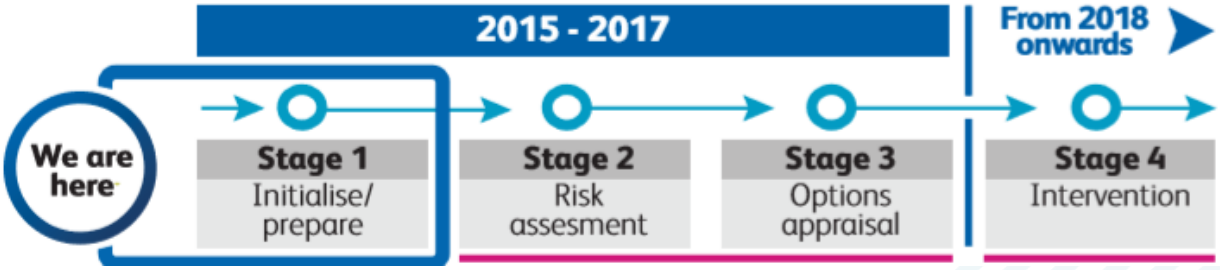
61 OfWAT and the Environment Agency (2013) Drainage Strategy Framework for water and sewerage companies to prepare Drainage Strategies. Available at: http://www.ofwat.gov.uk/wp-content/uploads/2015/12/rpt_com201305drainagestrategy1.pdf.

- Whole-life costs and benefits - strategies should promote interventions which deliver outcomes to customers and the environment at the lowest cost to customers and the community. Wider benefits (for example ecosystem services) should also be valued.
- Live process - strategies should be adaptable and reviewed periodically.
- Innovative and sustainable - Strategies should evaluate alternatives to traditional engineering schemes, considering innovative approaches such as active system control, surface water disconnection, customer engagement and incentivisation.

Thames Water Drainage Strategies

Thames Water has focussed their first batch of Drainage Strategies on catchments where they will be addressing sewer flooding and growth issues during AMP6 (2015-2020). Water companies are also required by the Environment Agency[62] to prepare Infiltration Reduction Plans (IRPs) in catchments where groundwater infiltration may lead to prolonged overflows (either at permitted Combined Sewer Overflows (CSOs) or at temporary overflow points) to watercourses, in order to prevent sewer flooding. Many of the catchments for which Thames Water has prepared strategies fall into this category, and the drainage strategies contain sections on managing infiltration. In line with the framework guidance, their strategies take a four-stage approach:

Figure 5-1: Thames Water's Drainage Strategy framework and estimated delivery and intervention timeline.



Thames Water has not published a drainage strategy for any wastewater catchment within the study area.

Thames Water RAG Assessment

Thames Water completed a RAG assessment of the foul and surface water network capacity for the site allocations proposed within the study area. The results can be found in the site spreadsheet in Appendix B, with the key findings summarised in Table 5-1.

Correspondence with Thames Water[63] identified that modelling of growth impacts on the foul infrastructure network had been completed up to 2026, at the time of preparing the WCS. Arrangements were being made to extend the capacity modelling to cover the entire Harlow Local Plan period, up to 2033, and Thames Water were confident in the available capacity to accommodate approximately 3,000 homes on the Gilston Allocation (GA1). In addition, a Statement of Common Ground is being prepared between Harlow Council and Thames Water, to set out areas of joint interest between the two parties, including the agreements on wastewater network and treatment capacity to support the delivery of growth within the Harlow-Gilston Garden Town area.

62 Environment Agency (2012) Regulatory position statement: discharges made from groundwater surcharged sewers
63 Kasselman, G. Email correspondence on Thames Water infrastructure capacity assessment for Harlow WCS. 9 August 2018.

For all but one site, the surface water network capacity was identified as "limited" or "very limited", with connections from new development unlikely to be permitted. The 'Sites' tab of the site spreadsheet in Appendix B identifies the potential alternative methods of surface water discharge from these sites.

Table 5-1: RAG assessment for foul and surface water sewerage

Site	Location	Local Planning Authority	Foul Sewerage Network Capacity Comments	Surface Water Network Capacity Comments
HS2-5	South of Clifton Hatch	HC	No comment	Discharge unknown but sites located in known very limited sewer capacity area
HS2-6	Riddings Lane	HC	No comment	Discharge unknown but sites located in known very limited sewer capacity area
HS2-8	The Evangelical Lutheran Church, Tawneys Road	HC	No comment	Discharge unknown but sites located in known very limited sewer capacity area
HS2-11	Land between Second Avenue and St. Andrews Meadow	HC	No comment	Discharge unknown but sites located in known very limited sewer capacity area
HS2-14	Elm Hatch and public house	HC	No comment	Discharge unknown but sites located in known very limited sewer capacity area
HS2-18	Garage blocks adjacent to Nicholls Tower	HC	No comment	Discharge unknown but sites located in known very limited sewer capacity area
HS2-19	Stewards Farm	HC	No comment	Discharge unknown but sites located in known very limited sewer capacity area
HS3	Strategic Housing Site East of Harlow	HC	Site modelled up to 2026 only	Discharge unknown but sites located in known limited capacity area
SP 5.3	East of Harlow	EFDC	Site modelled up to 2026 only	Discharge unknown but sites located in known limited capacity area

Site	Location	Local Planning Authority	Foul Sewerage Network Capacity Comments	Surface Water Network Capacity Comments
SP 5.1	Latton Priory	EFDC	Site modelled up to 2026 only. TW comment (04/04/2018): There is lack of capacity in local sewers and solution has to be implemented at a very early stage.	Discharge unknown but sites located in known very limited sewer capacity area

Combined Sewer Overflows

CSOs are designed to discharge excess flow during storm conditions to a watercourse (or occasionally to groundwater) and are present on many combined sewerage systems, to reduce the risk of sewer flooding. CSOs must be permitted by the Environment Agency, and many permits state minimum pass-forward flows, which must be achieved before discharge is allowed. Population growth and development upstream of a CSO will increase the flow of wastewater in the combined sewer, and is therefore likely to increase the frequency and polluting load of a discharge from that CSO.

The Environment Agency publishes details of all consented discharges to controlled waters in a database[64], which was consulted for the study area. No active CSO consents are recorded within the study area, therefore the risk of development increasing the frequency of CSO discharges is low.

5.1.4 Conclusions

The Thames Water RAG assessment prepared for this scoping stage has considered all potential Local Plan allocations within the study area. The assessment indicates that, for the majority of the sites, foul sewer infrastructure upgrades are required to serve proposed growth. However, with the exception of the site at Latton Priory (SP5.1), where early implementation of foul sewerage will be required, no significant constraints to the provision of this infrastructure have been identified.

At the time of preparing the WCS, Thames Water assessments of the impact of growth on infrastructure capacity covered up to 2026, rather than the full Local Plan period. However, plans are being made to extend the assessment up to 2033, and correspondence with Thames Water has identified that wastewater network capacity will not prevent the levels of growth estimated within the Harlow-Gilston Garden Town study area.

In terms of surface water sewer capacity, all but one site is identified as being in an area of limited or very limited surface water network capacity. This highlights the significant constraints, and the need to limit volumes of surface water runoff entering the sewer network in new developments, through the use of Sustainable Drainage Systems (SuDS). In addition, new surface water drainage connections into the existing sewer network should be restricted, wherever possible.

5.1.5 Recommendations

The recommendations from the wastewater collection assessment are shown in Table 5-2.

64 Environment Agency (2016) Consented Discharges to Controlled Waters with Conditions. Accessed online at https://data.gov.uk/dataset/consented-discharges-to-controlled-waters-with-conditions on 06/12/2016

Table 5-2: Wastewater Collection System Assessment Actions

Action	Responsibility	Timescale
Take into account wastewater infrastructure constraints in phasing development in partnership with Thames Water	HC Thames Water	Ongoing
Thames Water and developers to work closely and early in the planning promotion process to develop an outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets / upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use (s104, s98, s106 etc.) The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	TW and Developers	Ongoing
Developers to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed of using sustainable drainage systems (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will not be accepted by the LLFA or Thames Water.	Developers Essex CC and Hertfordshire CC as LLFAs, TW	Ongoing

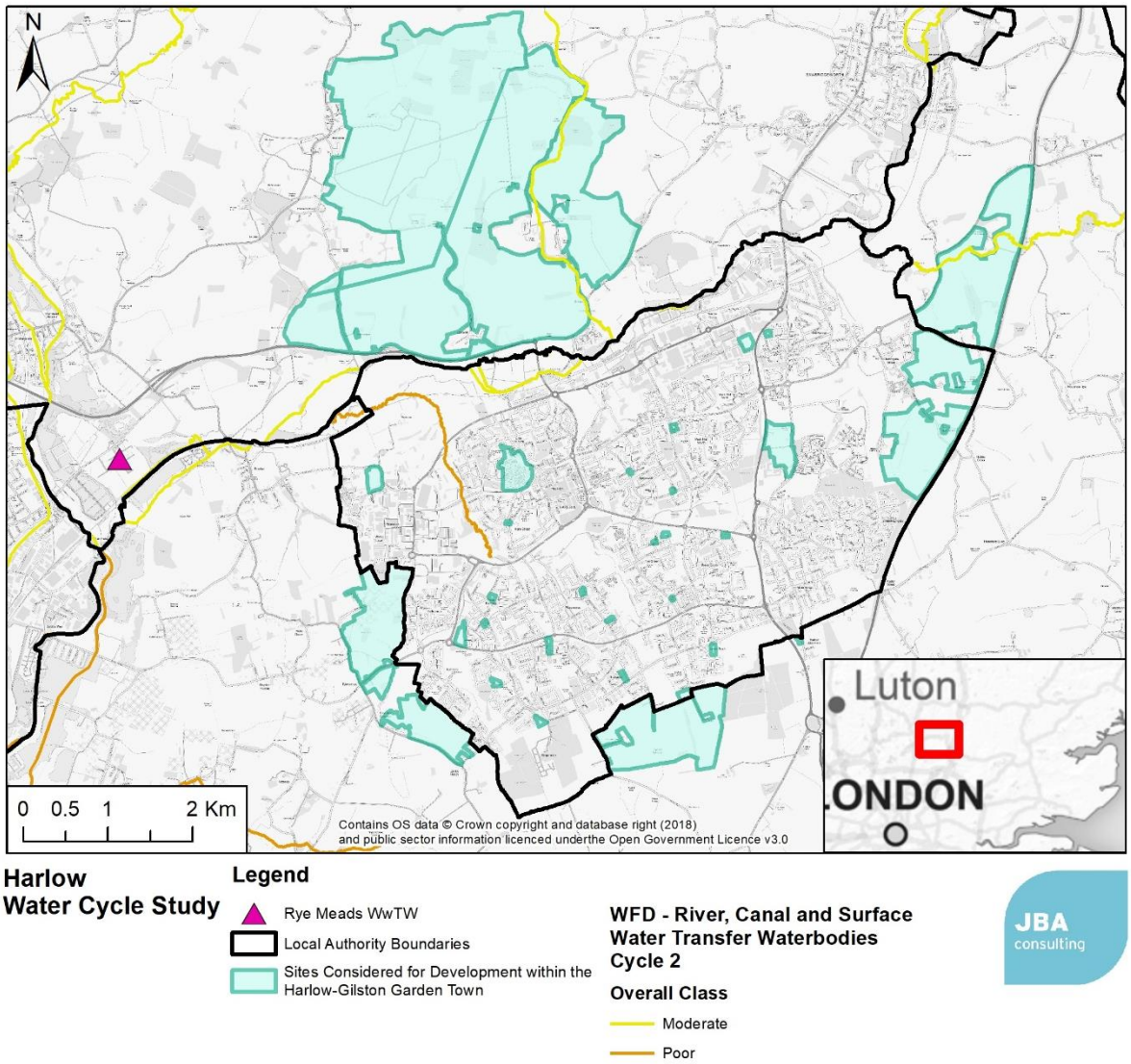
6 Wastewater Treatment Flow and Water Quality

6.1 Wastewater Treatment Works

Rye Meads Wastewater Treatment Works (WwTW) is the main WwTW the study area, as well as the surrounding local authorities.

The location of Rye Meads WwTW is displayed in Figure 6-1, alongside the 2015 Water Framework Directive overall class for the watercourses into which the WwTW discharges. A more detailed overview of the WwTW can be found in Appendix A.

Figure 6-1: Location of Rye Meads WwTW



6.2 Assessing Wastewater Flow and Water Quality

To initially assess the impact of growth within the study area on wastewater flows and water quality, two assessments were completed:

1. Wastewater Treatment Flow Permit Headroom Assessment
2. Water Quality Assessment

These assessments aimed to answer the following questions and, where necessary, to recommend further actions to fully assess the impact of growth on wastewater flows and water quality within the study area. The questions are based on Environment Agency Water Cycle Study Guidance:

1. Will the proposed housing growth have a detrimental impact on water quality?
2. Is there sufficient environmental capacity within the receiving water environment to accommodate the resulting increase in flow and pollutant loads from the Wastewater Treatment Works because of the planned housing growth?
3. If not, are there alternative discharge locations that will not cause a failure of water quality targets or cause a deterioration in water quality?
4. Is there an increased risk of discharge from storm water overflows causing an adverse water quality impact?
5. Will the sewerage undertaker need to apply to increase the levels of treated sewage effluent that can be discharged under the existing environmental permits, to allow for future growth?
6. Will the quality standard on the environmental permit need to be tightened to meet existing or future water quality standards because of the proposed growth (e.g. Water Framework Directive (WFD))?
7. Can the existing sewerage and wastewater treatment networks cope with the increased wastewater the proposed growth will generate?
8. If new major infrastructure is required (wastewater treatment works, major pumping mains or sewer mains) can they be provided and funded in time?

Rye Meads wastewater treatment works is assessed based on the levels of growth discussed in Section 2.1, however it is recommended that the cumulative impact of growth across the study area is assessed from a water quality perspective.

6.3 Data Requirements

The data required to assess the impact of growth on Wastewater Treatment Work flow permits and water quality is shown in Table 6-1.

Table 6-1: Data Required for the Assessment of Water Quality

Data Required	Data Source	Received?
Wastewater Treatment Works	Thames Water	Yes
WwTW locations	Thames Water	Yes
Discharge locations		
Upstream River Data	Environment Agency	Yes
Mean flow	Environment Agency	Yes
95th exceedance flow	Environment Agency	Yes
Contaminant means	Environment Agency	Yes
Contaminant standard deviations		
WwTW Discharge Data	Environment Agency	Yes
Effluent flow statistics	Environment Agency	Yes
Contaminant statistic		
River Quality Target Data	Environment Agency	Yes
No deterioration target	Environment Agency	Yes
Good status Target		
Flow Data		
Dry Weather Flows (DWF)	Environment Agency	Yes
Permits	Environment Agency	Yes
Measured Q80 flows		

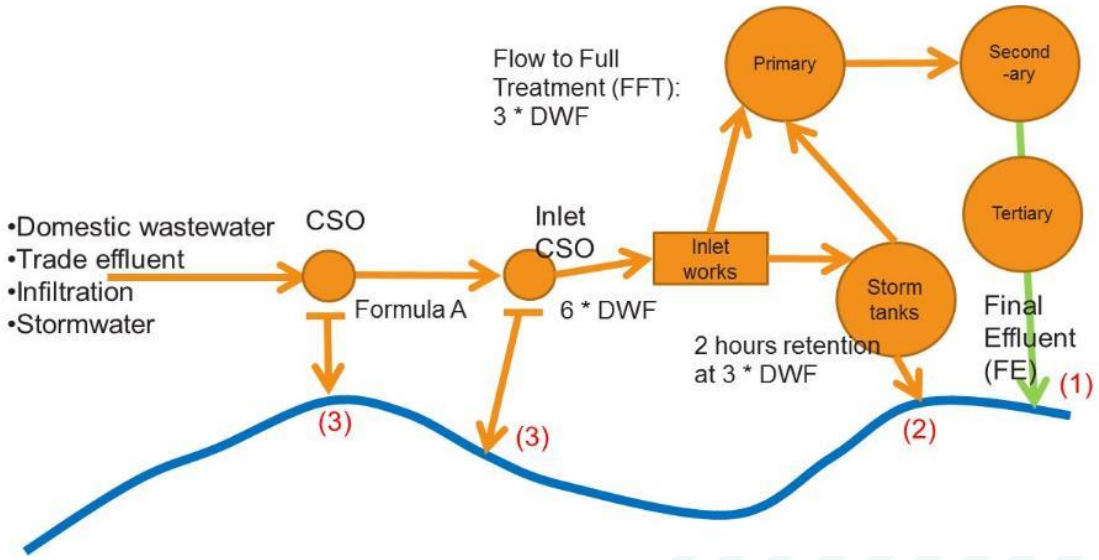
6.4 Wastewater Treatment Flow Permit Assessment

6.4.1 Introduction

The Environment Agency is responsible for regulating sewage discharge releases via a system of Environmental Permits (EPs). Monitoring for compliance with these permits is the responsibility of both the Environment Agency and the plant operators. Figure 6-2 summarises the different types of wastewater releases that might take place, although precise details vary from works to works, depending on the design.

During dry weather, the final effluent from the Wastewater Treatment Works (WwTW) should be the only discharge (1). With rainfall, the storm tanks fill and eventually start discharging to the watercourse (2) and Combined Sewer Overflows (CSOs) upstream of the storm tanks start to operate (3). The discharge of storm sewage from treatment works is allowed only under conditions of heavy rain or snow melt. Therefore, the flow capacity of treatment systems is required to be sufficient to treat all flows arising in dry weather and the increased flow from smaller rainfall events. After rainfall, storm tanks should be emptied back to full treatment, freeing their capacity for the next rainfall event.

Figure 6-2: Overview of typical combined sewerage system and water recycling centre discharges.



Environmental permits are used alongside water quality limits, as a means of controlling the pollutant load discharged from a water recycling centre to a receiving watercourse. Sewage flow rates must be monitored for all WwTWs where the permitted discharge rate is greater than 50 m^3/day in dry weather.

Permitted discharges are based on a statistic known as the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for water recycling centre design, as a means of estimating the 'base flow' in sewerage modelling and for determining the flow at which discharges to storm tanks will be permitted by the permit (Flow to Full Treatment, FFT).

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

environmental objectives, with specific regard to the Chemical Status element of the Water Framework Directive (WFD) classification.

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

6.4.2 Methodology

Thames Water were provided with the list of proposed development sites and the potential housing numbers (see Appendix B). They were then invited to provide an assessment of the receiving WwTW and provide any additional comments about the impacts of the development.

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

- Calculate the current measured Dry Weather Flow (DWF). This was calculated as the 80-percentile exceedance flow for the period 2013 to 2016, to match the river flow records. As a check, the DWF for 2017, the last full year for which data was available at the time of request, was also calculated, and this value was used where it was greater than the 2013-2016 DWF, in order to ensure that any recent trends or step changes in flow were represented within the current DWF.
- The flow data was cleaned to remove zero values and low outlier values which would bring the measured DWF down.
- Potential development sites and existing commitments were assigned to a WwTW using the sewerage drainage area boundaries. In the case of this WCS, Rye Meads WwTW served the entire study area.
- For each site, the future DWF was calculated assuming an occupancy rate of 2.4p/h (assumption provided by Thames Water), a per-capita consumption of 122 l/p/d for new dwellings (as average value across supply area used by Affinity Water) and that 95% of water used is returned to sewer (assumption used by UK water companies, including Thames Water). Permitted headroom was used as a substitute for actual designed hydraulic capacity for each WwTW being assessed. In some cases, permitted DWF might relate well to the actual designed hydraulic capacity of a WwTW, in other cases it might not.

TW used the following red / amber / green traffic light definition to score each site:

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

6.4.3 Results

Permit conditions for Rye Meads treatment works were obtained from the Environment Agency. There are plans to refurnish Rye Meads WwTW during AMP 7 (2020 – 2025), with a view to potential upgrades during AMP 8 (2025 – 2030). If undertaken, this will provide additional capacity at the WwTW and to improve compliance with water quality targets.

Table 6-2: WwTW Permit Conditions

WwTW	Operator	Permitted Maximum DWF (Ml/d)	BOD 95%ile (mg/l)	NH4 95%ile (mg/l)	P Annual Mean (Mg/l)	Proposed changes to permit
Rye Meads	TW	10	6	2	1	TBC - Likely change to permitted DWF

JBA undertook an assessment of Rye Meads WwTW, the only treatment works serving the study area, based on the proposed housing numbers managed by the WwTW and an assessment of how growth will affect the headroom capacity. The assessment also considered the contribution to Rye Meads WwTW from the neighbouring Local Authorities of East Hertfordshire, North Hertfordshire, Stevenage, Welwyn Hatfield, Epping Forest, Harlow and Broxbourne, based on the growth forecasts provided by Thames Water. The results of the assessment provided by Thames Water are summarised in Table 6-3.

Table 6-3: Calculation of growth within Rye Meads WwTW, commitments and potential future growth (all sites)

WwTW	Housing growth over plan period (dwellings)			Employment growth over plan period (Hectares)		
	Within study area	Within neighbouring LPAs	Total	Within study area	Within neighbouring LPAs	Total
Rye Meads	15,700	27,357	**43,057**	13.5	23.5	**37.0**

Rye Meads WwTW

Rye Meads is a large WwTW serving the Local Authorities of Harlow, East Herefordshire, North Hertfordshire, Stevenage, Welwyn Hatfield, Epping Forest and Broxbourne. The catchment is expected to accommodate all of the growth within the Harlow study area, as well as a large proportion of growth from the neighbouring authorities.

A headroom assessment undertaken by JBA (Figure 6-3) indicates that Rye Meads has capacity to accommodate growth within the study area and surrounding authorities over the plan period, within the current permitted DWF discharge of 110 ML/d.

Consultation with Thames Water during production of the WCS[65] identified that Rye Meads WwTW is currently being upgraded, to '*extend the treatment capacity and improve discharge quality standards*', with the upgrades due to be completed in 2019.

Thames Water assessment of potential growth levels within the Harlow-Gilston Garden Town study area identified that there will be capacity at the treatment works up to 2036. In relation to the longer-term allocation sites, Thames Water '*do not have a detailed assessment past 2036, but do not foresee future issues with space or water quality for Rye Meads STW*'[65].

Based on growth forecasts and capacity assessments, Thames Water expect to have treatment capacity at Rye Meads WwTW up to 2036. However, delivery of additional

[65] S. Lock. Email correspondence: Growth assessment update for capacity at Rye Meads WwTW. 13 July 2018.

upgrades may be required, including *'refurbishment in AMP7 (*2025-2030*), with potential upgrades required to increase processing capacity in AMP8 (*2030-2035*)'* [66]. Any upgrades, if required, will be subject to business planning, and informed by growth and risk forecasts.

It was clarified that the models used to determine the capacity of Rye Meads WwTW are more detailed than the method used within this WCS, and based on the impact of housing growth on WwTW performance both now and in the future. As a result, the Thames Water consultation comments concluded, *'it is considered that this updated view of the plan for upgrades at Rye Meads does not conflict with the JBA assessment on headroom capacity'* [67].

The Thames Water RAG assessment classifies Rye Meads WwTW as "green" (see Appendix B). This reflects the existing WwTW capacity, the fact that none of the proposed sites require safeguarding, and the potential treatment capacity of 447,134 Population Equivalent (PE) able to be provided by upgrades to the WwTW[67].

[66] C. Colloff. Email correspondence: Clarification on Rye Meads WwTW headroom assessment and infrastructure upgrades. 26 April 2018.
[67] S. Tsilika. Email correspondence: Thames Water site comments. 3, 4 April 2018.

Figure 6-3: Rye Meads WwTW Headroom Forecast

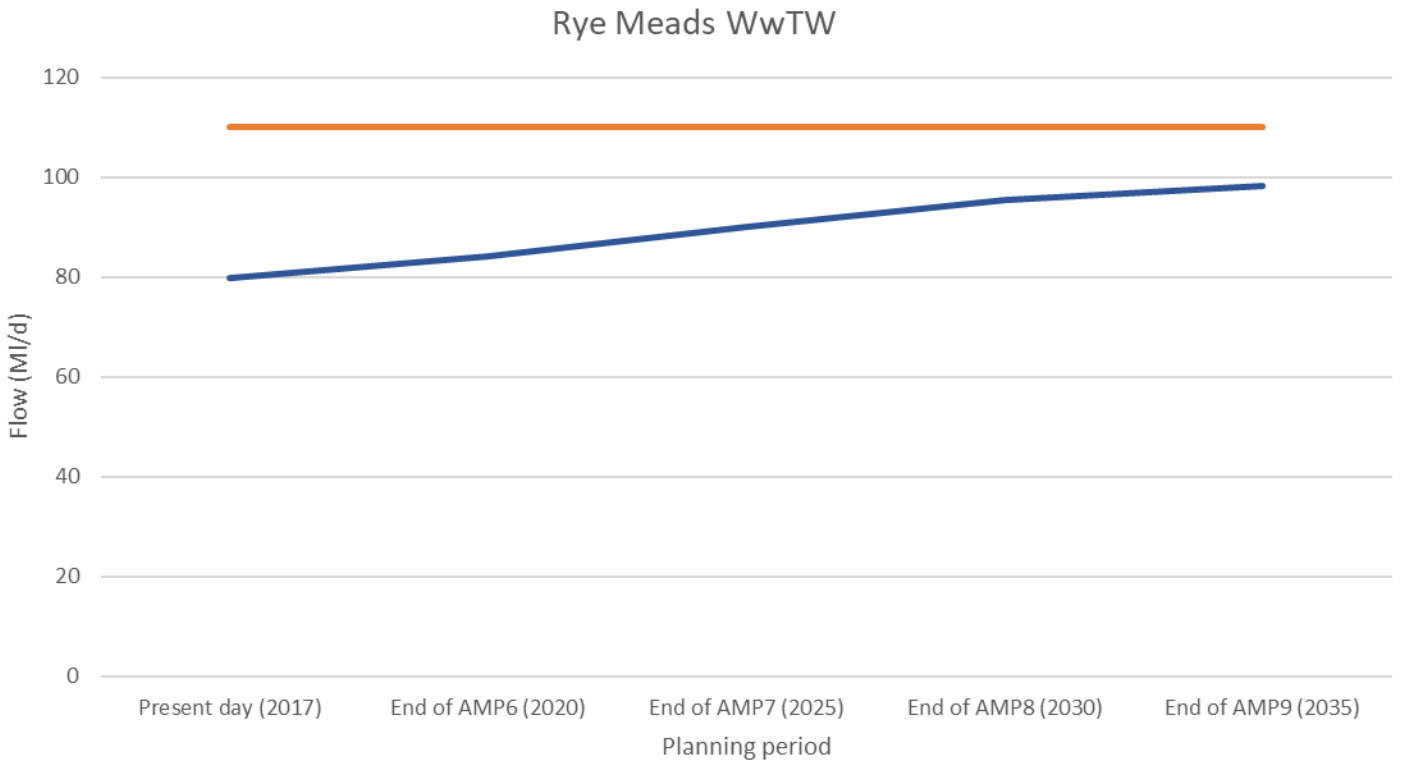


Table 6-4: Wastewater Treatment Works Flow and Quality Consent Assessment – JBA Assessment.

WwTW	Permitted Maximum DWF (Ml/d)	Headroom Assessment									
		Present day (2013-2015 measured flow)		End of AMP6 (2020)		End of AMP7 (2025)		End of AMP8 (2030)		End of AMP9 (2035)	
		DWF (Ml/d)	Headroom % of Permitted	Total DWF (Ml/d)	Headroom % of Permitted	Total DWF (Ml/d)	Headroom % of Permitted	Total DWF (Ml/d)	Headroom % of Permitted	Total DWF (Ml/d)	Headroom % of Permitted
Rye Meads	110.0	79.83	27%	84.06	24%	90.04	18%	95.521	13%	98.223	11%

6.4.4 Conclusions

The assessment indicates that Rye Meads WwTW has sufficient capacity to accommodate all planned growth from Harlow District and the Harlow-Gilston Garden Town, as well as the surrounding six Local Planning Authorities of East Herefordshire, North Hertfordshire, Stevenage, Welwyn Hatfield, Epping Forest and Broxbourne, up to 2036.

JBA Assessment indicated that there is sufficient headroom capacity within the existing Rye Mead WwTW to accommodate expected growth levels within the study area and surrounding authorities.

Thames Water classified Rye Meads WwTW as a "green" assessment (see Appendix B), indicating that the works have sufficient capacity for planned levels of growth within the study area over the plan period. This assessment takes into account the ongoing capacity increase at the WwTW , as well as the potential to further upgrade works within AMP Cycles 7 and 8 (2020 - 2030).

No further assessment of wastewater treatment capacity is required.

6.4.5 Recommendations

Table 6-5 details the recommendations arising from the flow permit assessment.

Table 6-5: Wastewater Treatment Works Permit Actions

Action	Responsibility	Timescale
Provide Annual Monitoring Reports to Thames Water detailing projected housing growth in the Local Authority.	HC EHDC EFDC	Ongoing
Thames Water to assess growth demands annually within the Rye Meads WwTW catchment, as part of their wastewater asset planning activities and feedback to HC, EHDC and EFDC if concerns arise.	TW HC EHDC EFDC	Ongoing

6.5 Water Quality Assessment

6.5.1 Introduction

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

It is Environment Agency policy to model the impact of increasing effluent volumes on the receiving watercourses. Where the scale of development is such that a deterioration is predicted, a variation to the Environmental Permit (EP) may be required for the WwTW to improve the quality of the final effluent. This is to prevent the increased pollution load from resulting in a deterioration in the water quality of the watercourse. This is known as "no deterioration" or "load standstill". The need to meet river quality targets is also taken into consideration when setting or varying a permit.

The Environment Agency operational instructions on water quality planning and no-deterioration are currently being reviewed. Previous operational instructions[68] (now withdrawn) set out a hierarchy for how the no-deterioration requirements of the WFD should be implemented on inland waters. The potential impact of development should be assessed in relation to the following objectives:

- **Could the development cause a greater than 10% deterioration in water quality?**
  This objective is to ensure that all the environmental capacity is not taken up by one stage of development and there is sufficient capacity for future growth.
- **Could the development cause a deterioration in WFD class of any element assessed?**
  This is a requirement of the Water Framework Directive to prevent a deterioration in class of individual contaminants. The "Weser Ruling"[69] by the European Court of Justice in 2015 specified that individual projects should not be permitted where they may cause a deterioration of the status of a water body. If a water body is already at the lowest status ("bad"), any impairment of a quality element was considered to be a deterioration. Emerging practice is that a 3% limit of deterioration is applied.
- **Could the development alone prevent the receiving watercourse from reaching Good Ecological Status or Potential?**
  Is Good Ecological Status (GES) possible with current technology or is GES technically possible after development with any potential WwTW upgrade?

6.5.2 Methodology

The Environment Agency's River Quality Planning (RQP) tool was the selected approach for this assessment in conjunction with the Environment Agency's recommended guidance documents[70,71.]. The tool uses a Monte Carlo mass balance approach which allows the user to calculate permit values needed to achieve a particular river quality

68 Environment Agency (2012) Water Quality Planning: no deterioration and the Water Framework Directive. Accessed online at http://www.fwr.org/WQreg/Appendices/No_deterioration_and_the_WFD_50_12.pdf on 08/08/2017
69 European Court of Justice (2015) PRESS RELEASE No 74/15 Accessed online at: https://curia.europa.eu/jcms/upload/docs/application/pdf/2015-07/cp150074en.pdf on 08/08/2017
70 Environment Agency (2014) H1 Annex D2. Assessment of sanitary and other pollutants within Surface Water Discharges. Accessed online at https://www.gov.uk/government/publications/h1-annex-d2-assessment-of-sanitary-and-other-pollutants-in-surface-water-discharges on 22/11/2017.
71 Environment Agency (2012) Water Quality Planning: no deterioration and the Water Framework Directive. Accessed online at http://www.fwr.org/WQreg/Appendices/No_deterioration_and_the_WFD_50_12.pdf on 22/11/2017

standard. The tool can also predict the discharge quality required to achieve a downstream water quality target.

6.5.3 Results

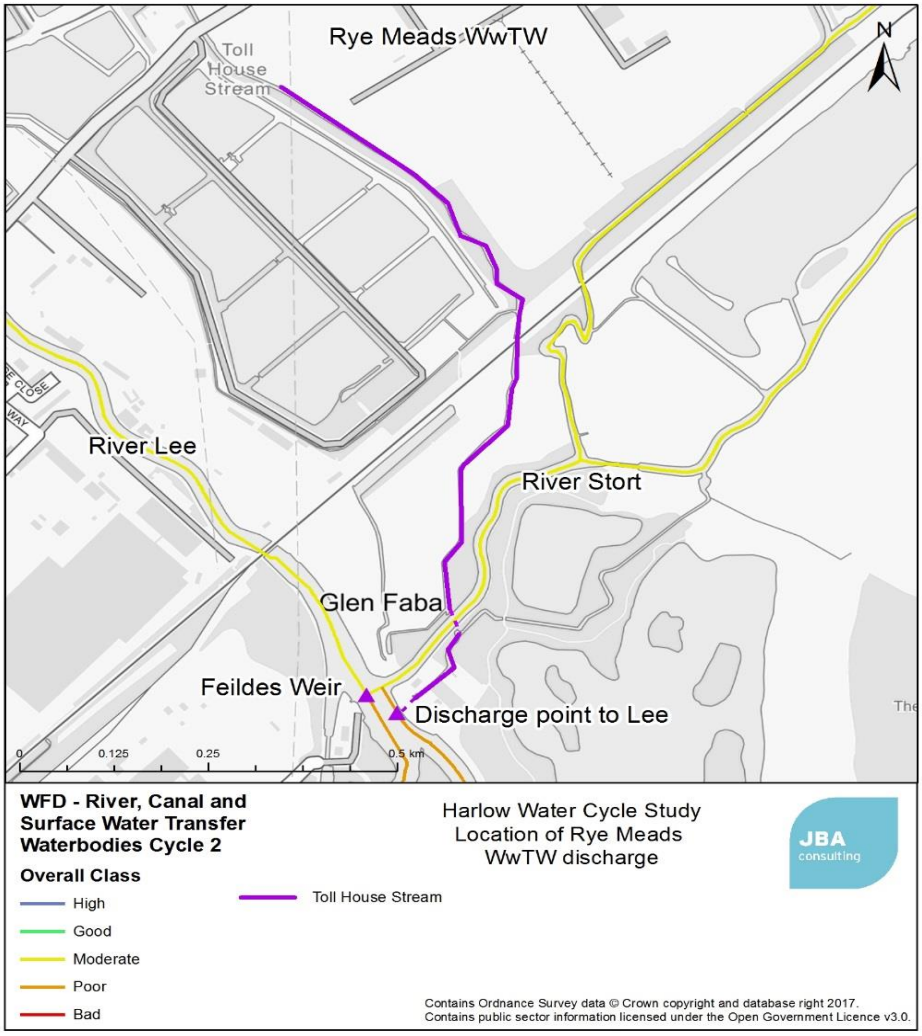
Rye Meads WwTW

Rye Meads WwTW is located west of Harlow, on the north eastern edge of Hoddesdon. Rye Meads WwTW was identified as the only WwTW likely to receive flows from proposed growth in the study area. This treatment works was built in the 1960s to serve the new towns of Stevenage and Harlow and serves a population of approximately 400,000. Refurbishments to the WwTW are planned within AMP 7 (2020 – 2025), with the potential for further works in AMP 8 (2025 – 2030) to extend the treatment capacity and improving discharge quality.

The receiving watercourse for this treatment works is Toll House Stream, an ordinary watercourse not monitored for water quality as part of the Water Framework Directive. The stream flows through a siphon under the River Stort before discharging into the River Lee just south of Fieldes Weir. It was agreed with the Environment Agency[72] that as Toll House Stream is not monitored for water quality and is primarily a conduit for effluent discharge to enter the River Lee, the water quality assessment would focus in the River Lee itself. Figure 6-4 shows the point of discharge in the Lee.

[72] K. Murphy. Email correspondence: Assessment of downstream water quality. 4 April 2018.

Figure 6-4: Discharge point for Rye Meads WwTW



Both the Lee upstream of Fieldes Weir, and the Stort were given a Moderate Ecological status in 2016 WFD Cycle 2, this was primarily due to the status for Phosphate. Downstream of the weir, this status deteriorated to "Poor".

Table 6-6 provides an overview of the outcome of the water quality assessment for Rye Meads WwTW.

The Environment Agency responded to the draft water quality assessment and advised that low river flows had been observed recently, which should be taken into account. The analysis was therefore repeated using the lowest annual mean flow from the previous 30 years (between 1986 and 2016). As this additional analysis did not significantly change the conclusions (excepting Ammonia, the result had improved) the original analysis was retained.

The water quality assessment concluded that:

- Proposed growth in the Harlow area is predicted to lead to a deterioration of 11% in Ammonia at Rye Meads WwTW. This cannot be completely prevented with treatment at Technically Achievable Limits (TAL), but could be reduced to close to zero.
- BOD and Phosphate are predicted to deteriorate by less than 10%.

- WFD "High" ecological status is already being achieved by the receiving water body for the determinands BOD and Ammonia. This is unlikely to be affected by the proposed growth.
- Good ecological status for the determinand Phosphate cannot be achieved due to current technology limits. The proposed growth is unlikely to prevent the waterbody achieving "Moderate" status for this determinand in the future.
- Climate change during the plan period could lead to deterioration of the water quality as a result of decreased river flows and hence less dilution. This is not, however, sufficient to lead to a class deterioration for any determinand, but the deterioration in ammonia and phosphate is predicted to be greater than 10%. In the case of ammonia this could not be prevented with treatment at TAL.
- Using a reduced river flow to reflect recent low flows does not significantly change the results.

Full details of the methodology and results of the Water Quality modelling for Rye Meads WwTW are provided in Appendix A.

Table 6-6: Outcome of RQP assessment for Rye Meads WwTW

Watercourse (WwTW)	Could the development cause a greater than 10% deterioration in WQ?	Could the development cause a deterioration in WFD class of any element?	Could the development prevent the water body from reaching GES?
Key	No infrastructure upgrade required to achieve		No infrastructure upgrade required to achieve
	Infrastructure upgrade likely to be required, but achievable with treatment at TAL		Infrastructure upgrade likely to be required, but achievable with treatment at TAL, or not achievable due to current technology limits.
	Cannot be achieved with treatment at TAL. Environmental capacity could be a constraint on growth.		Cannot be achieved with treatment at TAL. Environmental capacity could be a constraint on growth.
Rye Meads	Cannot be achieved with treatment at TAL. Environmental capacity could be a constraint on growth.	No class deterioration is predicted.	Good Ecological Status cannot be achieved for P due to current technology limits. The proposed growth should not prevent the waterbody achieving moderate status for P in the future. Ensure proposed growth doesn't cause significant deterioration.

6.5.4 Priority substances and other EU-level dangerous substances

As well as the general chemical and physicochemical water quality elements (BOD, NH_4, P etc.) addressed above, a watercourse can fail to meet GES due to exceeding permissible concentrations of hazardous substances. Currently 33 substances are defined as hazardous or priority hazardous substances, with others under review. Such substances may pose risks both to humans (when contained in drinking water) and to aquatic life and animals feeding in aquatic life. These substances are managed by a range of different approaches, including EU and international bans on manufacturing and use, targeted bans, selection of safer alternatives and end-of-pipe treatment solutions. There is considerable concern within the UK water industry that regulation of these substances by setting permit values which require their removal at wastewater treatment works, will place a huge cost burden upon the industry and its customers, and that this approach would be out of keeping with the "polluter pays" principle.

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

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

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

6.5.5 Summary

This water quality assessment identifies the potential water quality impacts of Rye Meads WwTW on the Rive Lee, due to future growth in effluent flows. The assessment incorporated levels of proposed growth leading to an increased discharge of treatment effluent, as well as water quality monitoring data, Water Framework Directive classifications and permit information. The Environment Agency's River Quality Planning (RQP) tool was used in the assessment.

Table 6-7 concludes the initial headroom and water quality assessments for Rye Meads WwTW, based on Environment Agency guidance questions for the completion of Water Cycle Studies.

No further assessment of water quality is recommended.

Table 6-7: Summary of Wastewater Flow and Water Quality Assessment Questions

Question	Rye Meads WwTW
Will the proposed housing growth have a detrimental impact on water quality? Evidence found in Section 6.5.	Significant housing growth to be served by Rye Meads, detailed modelling required.
Is there sufficient environmental capacity within the receiving water environment to accommodate the resulting increase in flow and pollutant loads from the Wastewater Treatment Works because of the planned housing growth? Evidence in Section 6.5.	Yes. Planned housing growth is expected to cause a deterioration in Ammonia. This cannot be completely prevented; however can be reduced to close to zero with treatment at technically achievable limits.
If not, are there alternative discharge locations that will not cause a failure of water quality targets or cause a deterioration in water quality?	Not applicable.
Is there an increased risk of discharge from storm water overflows causing an adverse water quality impact? Evidence in Section 5.1.3	No active CSO Consents in the study area, so risk is low.
Will the sewerage undertaker need to apply to increase the levels of treated effluent that can be discharged under the existing permits, to allow for future growth? Evidence found in Section 6.4	The works has sufficient capacity to accommodate all growth. Further capacity will be provided by planned upgrades to the works.
Will the quality standard on the environmental permit need to be tightened to meet existing or future water quality standards because of the proposed growth (e.g. Water Framework Directive (WFD)?	Yes, it is anticipated that the Ammonia permit will need to be tightened to prevent a deterioration.
Can the existing wastewater treatment networks cope with the increased wastewater the proposed growth will generate? Evidence in Section 5.1	Thames Water currently has no concerns in terms of short term flows in Harlow District and the Harlow-Gilston Garden Town over the development period of the study area. To aid future planning, the Water Company is looking to conduct refurbishment of the WwTW in AMP7, with potential upgrades to increase processing capacity in AMP8, subject to the business planning and growth process.
If new major infrastructure is required (wastewater treatment works, major pumping mains or sewer mains) can they be provided and funded in time? Evidence in Section 5.1	Thames Water has not raised any concerns in terms of infrastructure provision in Harlow District and the Harlow-Gilston Garden Town, over the development period of the study area. The increase in capacity of foul sewers in the vicinity of the Latton Priory site (SP5.1) has been identified as requiring implementation at a very early stage in development.
Recommendations for Further Assessments	No further work required.

6.6 Wastewater Treatment Works Odour Assessment

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

6.6.1 Methodology

Sewerage undertakers recommend that an odour assessment may be required if the site of a proposed development is close to a WwTW and is encroaching closer to the WwTW than existing urban areas.

A GIS assessment was carried out to identify sites that the sewerage undertaker considers may be at risk from odour nuisance due to encroachment on an existing WwTW. For Thames Water, this is defined as development sites less than 800m from the WwTW and encroaching closer to the WwTW than existing urbanised areas.

If there are no existing houses close to a WwTW it is more likely that an odour assessment is needed. Another important aspect is the location of the site in respect to the WwTW. Historic wind direction records for sites around the study area indicate that the prevailing wind is from south southwest (measured at Stanstead Airport) to west southwest (measured at Luton Airport)[73].

A red / amber / green assessment was applied:

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

6.6.2 Data Collection

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

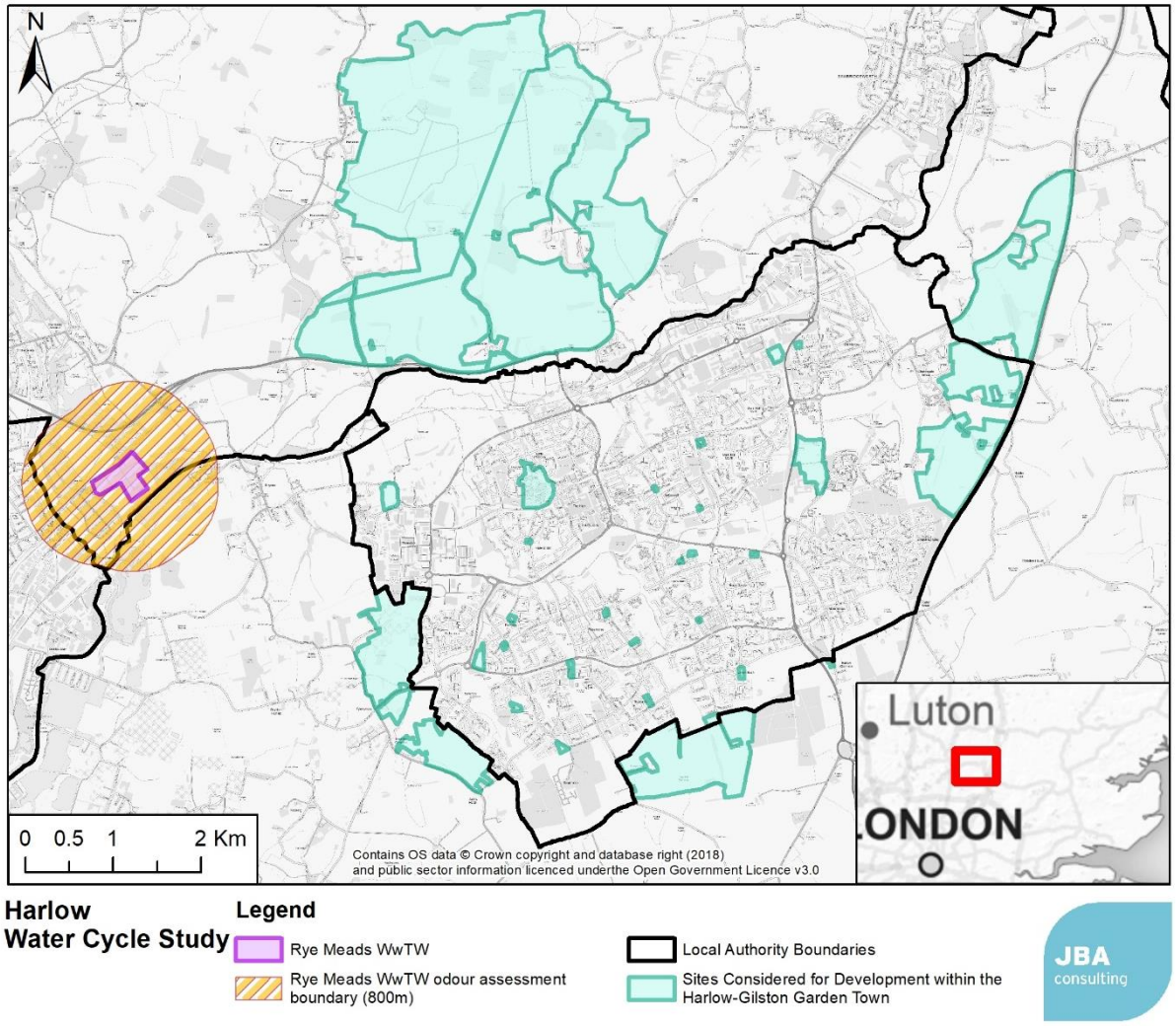
- Potential development sites within Harlow District and the Harlow-Gilston Garden Town (provided by HDC in GIS format)
- WwTW locations (provided by Thames Water)
- Site tracker spreadsheet (see Appendix B)

6.6.3 Results

An overview of the sites within the study area assessed as part of the WCS, and their location in relation to the 800m odour assessment buffer are shown in Figure 6-5 below.

73 RenSMART website http://www.rensmart.com/Weather/WindArchive#monthlyLayer.

Figure 6-5: Extent of odour impact assessment for Rye Meads WwTW.



6.6.4 Conclusions

The odour screening assessment concluded that none of the sites within the study area are identified as at risk of experiencing odour due to their proximity to the existing Rye Meads WwTW.

It should be noted that works are being undertaken to increase the capacity of Rye Meads WwTW. The resulting larger WwTW is likely to have a greater impact on odour for surrounding areas, and may require a revised assessment, although odour impact will have been considered in the design of the upgrade.

Although the potential Local Plan sites are identified as unlikely to be impacted by odour from WwTWs, it is recommended that for any sites which subsequently become available within the 800m polygon around Rye Meads shown in Figure 6-5, odour assessments may be required as part of the planning application process. It is the responsibility of developers to undertake an odour risk assessment.

Odour assessments for sites subsequently indicated to be potentially at risk of experiencing odour nuisance, should be undertaken by site developers. No further assessment of odour impact is required.

6.6.5 Recommendations

Table 6-8 provides a summary of actions relating to the wastewater treatment works odour assessment.

Table 6-8: Wastewater Treatment Works Odour Actions

Action	Responsibility	Timescale
Carry out an odour assessment for sites which subsequently become available within 800m of Rye Meads WwTW, for example windfall sites.	Site Developers HC EHDC EFDC	Ongoing

7 Flood Risk Management

7.1 Assessment of Additional Flood Risk from Increased WwTW Discharges

7.1.1 Introduction

In catchments with a large planned growth in population and which discharge effluent to a small watercourse, the increase in discharged effluent might have a negative effect on the risk of flooding. An assessment has been carried out to quantify such an effect.

7.1.2 Methodology

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

- Calculate the increase in DWF due to the planned growth;
- Identify the point of discharge of Rye Mead WwTW (as used in Water Quality Assessment in Section 6.5.2);
- At each outfall point, use the FEH CD-ROM v3.0 to extract the catchment descriptors;
- Use FEH Statistical and ReFH[74] methods to calculate peak 1 in 30 (Q30) and 1 in 100 (Q100) year fluvial flows;
- Select the method which provides the lower flow estimate, and which therefore will be most affected by an increase in inflows; and
- Calculate the additional foul flow as a percentage of the Q30 and Q100 flow.

A red / amber / green score was applied to score the associated risk as follows:

Additional flow ≤5% of Q30. Low risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q30. Moderate risk that increased discharges will increase fluvial flood risk	Additional flow ≥5% of Q100. High risk that increased discharges will increase fluvial flood risk

The datasets used to assess the risk of flooding are as follows:

- Current and predicted future DWF for Rye Meads WwTW
- Location of Rye Meads WwTW outfall (as used in Water Quality Assessment in Section 6.5.2)
- Catchment descriptors from FEH CD-ROM v3.0[75]

7.1.3 Results

Table 7-1**:** below shows the additional flow from the WwTW as a percentage of the Q30 and Q100 peak flow. This shows that the additional flows from Rye Meads WwTW post-development, would have a negligible effect on the predicted peak flow events with return periods of 30 and 100 years.

74 Note: ReFH2 was released in February 2015. This implements improvements which are mainly relevant to permeable and urbanised catchments. As the study catchments are not permeable or highly urbanised, and that the ReFH method is not being used to generate hydrographs in this case, ReFH1 has been used.

Table 7-1: Summary of DWF increase as a percentage of Q30 and Q100 peak flow

WwTW	FEH Stat Q30 (m^3/s)	FEH Stat Q100 (m^3/s)	Additional Average DWF (Ml/d)	Average Additional Flow (m^3/s)	Flow increase % Q30	Flow increase % Q100
Rye Meads	86.1	114.7	128.35	1.49	1.7%	1.3%

7.1.4 Conclusions

The impact of increased effluent flows from Rye Meads WwTW is unlikely to have a significant impact on flood risk in the River Lee.

No further assessment is recommended.

7.1.5 Recommendations

Table 7-2: Summary of Flood Risk Management Recommendations

Action	Responsibility	Timescale
Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	TW	During design of WwTW upgrades

7.2 Surface Water Drainage and SuDS

7.2.1 Introduction

Since April 2015[76], management of the rate and volume of surface water has been a requirement for all major development sites, through the use of Sustainable Drainage Systems (SuDS).

Essex County Council and Hertfordshire County Council, as Lead Local Flood Authorities (LLFAs) within the study area, are statutory consultees to the planning system for surface water management within major development, which covers the following development scenarios:

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

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

National standards on the management of surface water are outlined within the Defra Non-statutory Standards for Sustainable Drainage Systems, with local requirements specified by Hertfordshire County Council, and drainage design checklists provided by Essex County Council. The CIRIA C753 SuDS Manual provides the industry best practice guidance for design and management of SuDS.

7.2.2 Use of SuDS in Water Resource Management

Using rainwater as a resource

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

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

Water Quality

SuDS allow the management of diffuse pollution generated by urban areas, through the sequential treatment of surface water within the SuDS management train. This reduces the pollutants entering lakes and rivers, resulting in lower levels of water supply and wastewater treatment being required.

This treatment of diffuse pollution at source can contribute to meeting WFD water quality targets, as well as national objectives for sustainable development.

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

Resilience to climate change

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

SuDS also play a role in controlling the rate and volume of runoff leaving urban areas during predicted wetter winters. The storage and controlled release of rainwater from a development site can help to manage the flood risk to downstream communities.

7.2.3 Methodology

To identify the varying surface water runoff rates expected within greenfield sites in the study area, discharge rates of the contributing catchments has been calculated. The FEH Statistical Method was used, in line with best practice for estimating runoff from smaller catchments.

The runoff rates are identified in litres/per second/per hectare (l/s/Ha) which can then be scaled to the site area, to provide a site-wide greenfield runoff rate. These runoff rates should be treated as indicative, as prediction of runoff, particularly from smaller catchments, is always imprecise. The runoff estimation is based on river flow information from much larger catchments than the average development site. However, at present this is the best available technique for estimating runoff at a site scale.

7.2.4 Results

The typical greenfield runoff rates identified for each catchment are provided in Table 7-4, with the locations of catchments provided in Figure 7-1. The equivalent greenfield runoff rate for each site is provided in the 'Greenfield Runoff Rates' tab of Appendix B.

Due to the moderately impermeable nature of the catchments, the runoff rates produced by greenfield land are relatively high. Permeability ranges across the catchments, with the likely percentage of rainfall forming overland runoff (or SPRHOST value) ranging from 32% to 46% (Table 7-3).

The highest greenfield runoff rates are expected within the Canons Brook and Eastwick Brook catchments, with lowest runoff rates in the Pincey Brook and Harlowbury Brook catchments.

These calculations provide indicative runoff rates across the study area. Site-specific runoff rate and volume calculations should be undertaken for all developments, with reference to Essex CC and Hertfordshire CC requirements.

Figure 7-1: Location of catchment areas

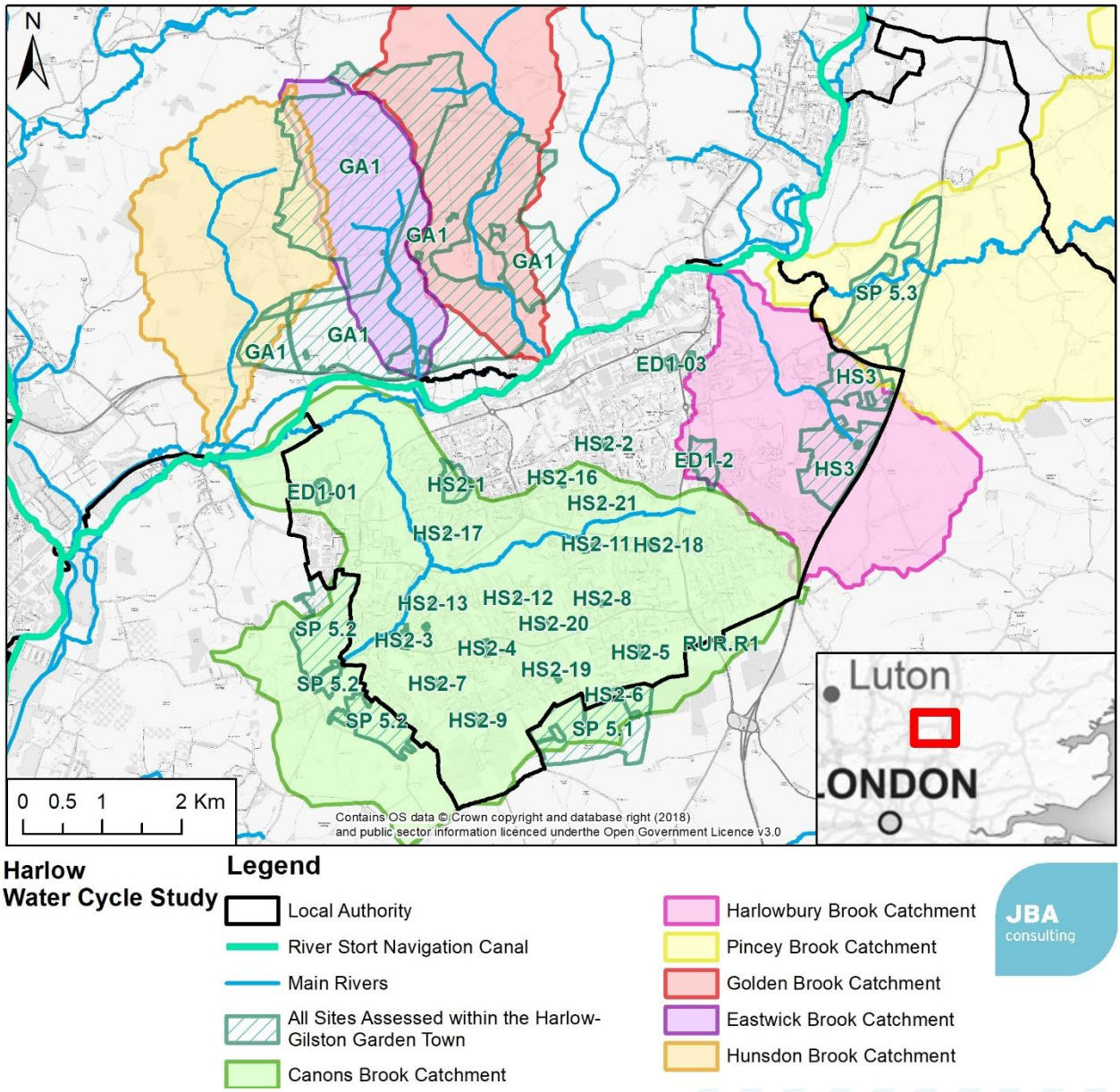


Table 7-3: Catchment areas of watercourses in the study area

Catchment	Area (km^2)	Standard Percentage Runoff (SPRHOST) (%)
Pincey Brook	54.7	46
Canons Brook	22.5	43
Hunsdon Brook	7.1	44
Harlowbury Brook	7.9	32
Eastwick Brook	4.1	42
Golden Brook	11.2	45

Table 7-4: Greenfield runoff rates for catchments draining the study area

Return Period (1 in X-years)	Harlowbury Brook discharge rate (l/s/ha)	Pincey Brook discharge rate (l/s/ha)	Hunsdon Brook discharge rate (l/s/ha)	Canons Brook discharge rate (l/s/ha)	Eastwick Brook discharge rate (l/s/ha)	Golden Brook discharge rate (l/s/ha)
1 in 2	**1.1**	**1.2**	**1.4**	**1.7**	**1.7**	**1.4**
1 in 30	**2.5**	**2.6**	**3.1**	**3.9**	**3.8**	**3.3**
1 in 100	**3.3**	**3.2**	**4.1**	**5.2**	**5.1**	**4.4**

7.2.5 Implications for surface water drainage in Harlow District and the Harlow-Gilston Garden Town

Discharge of surface water

Due to the clay geology underlying most sites within the study area, site-wide discharge of surface water drainage from new developments via infiltration (such as the use of soakaways) is unlikely to be feasible. However, this does not prevent the use of SuDS within the Harlow-Gilston Garden Town study area, and the surface geology may provide opportunities for shallower infiltration methods, such as filter strips, raingardens or swales.

In light of water scarcity in the Upper Lee catchment, and the progressive water efficiency policies of Harlow, Epping Forest and East Hertfordshire Councils, rainwater harvesting should be encouraged as a means of surface water discharge, to allow the re-use of rainwater as potable water supply.

Storage requirements

The storage volumes required to attenuate post-development runoff rates are likely to be greater on the more permeable catchments, such as Pincey Brook and Harlowbury Brook where, in their undeveloped greenfield states, a larger proportion of rainfall would naturally drain via infiltration.

Recommendations for discharge rates on greenfield and brownfield sites, as well as identification of Critical Drainage Areas (CDAs) within the administrative boundary of Harlow, are provided within the Harlow Surface Water Management Plan (SWMP)[77].

Storage requirements must be agreed directly with Essex CC and Hertfordshire CC, as Lead Local Flood Authorities (LLFA) and supporting calculations will need to demonstrate that sufficient storage is provided on site.

Water quality

Due to the current WFD status of the River Stort and Lee, and the presence of environmentally designated sites (see Section 8.1) water quality of surface water runoff is a key consideration.

SuDS designs should control the 'first flush' of pollutants (usually mobilised by the first 5mm of rainfall) at source, to ensure contaminants are not released from the site. Surface water runoff should be treated sequentially within the site, through use of the SuDS Management Train. Infiltration techniques, where feasible, will need to consider Groundwater Source Protection Zones (GSPZs), and are likely to require consultation with the Environment Agency.

7.2.6 Conclusions

Greenfield runoff rates have been estimated for the larger river catchments draining the study area.

The allocation of sites within the Harlow, East Hertfordshire and Epping Forest Local Plans provide an opportunity to deliver exemplar SuDS which contribute to the flood risk, water quality and water resources targets of the WCS, SFRAs and Harlow SWMP.

The town of Harlow itself is unique in its extensive network of green spaces. Although competition for use of these spaces is high, there are opportunities for strategic surface water management features to be integrated into these spaces, and complement other land uses. This is of particular importance upstream of the environmentally designated

[77] Capita Symonds (2013) Harlow Surface Water Management Plan. Available on request.

sites of Harlow Woods and Hunsdon Mead Sites of Special Scientific Interest (SSSI) (see Section 8).

7.2.7 Recommendations

Action	Responsibility	Timescale
Encourage the use of rainwater harvesting to manage surface water in new developments.	HC EFDC EHDC ECC / HCC	Ongoing
In partnership, identify opportunities for incorporating SuDS into designated Green Wedges (where available), Open Spaces and Green Infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	HC EFDC EHDC ECC / HCC TW EA NE	Ongoing
Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	TW ECC / HCC HC EFDC EHDC Developers	Ongoing
Ensure the findings of Harlow SWMP are used to inform the surface water drainage policy and decision making. In particular: All developments should restrict post-development runoff rates to greenfield rates for the same return period, as outlined in Table 7-4. LLFAs may impose stricter greenfield runoff rates. Brownfield development should reduce runoff rates by 50% compared to the existing state, for rainfall events up to and including the 1 in 100-year return period. Developments greater than 1 property or 0.1Ha within CDAs and Local Flood Risk Zones (LFRZs) identified in the SWMP should seek betterment to Greenfield runoff rates.	Developers ECC / HCC HC EFDC EHDC	Ongoing

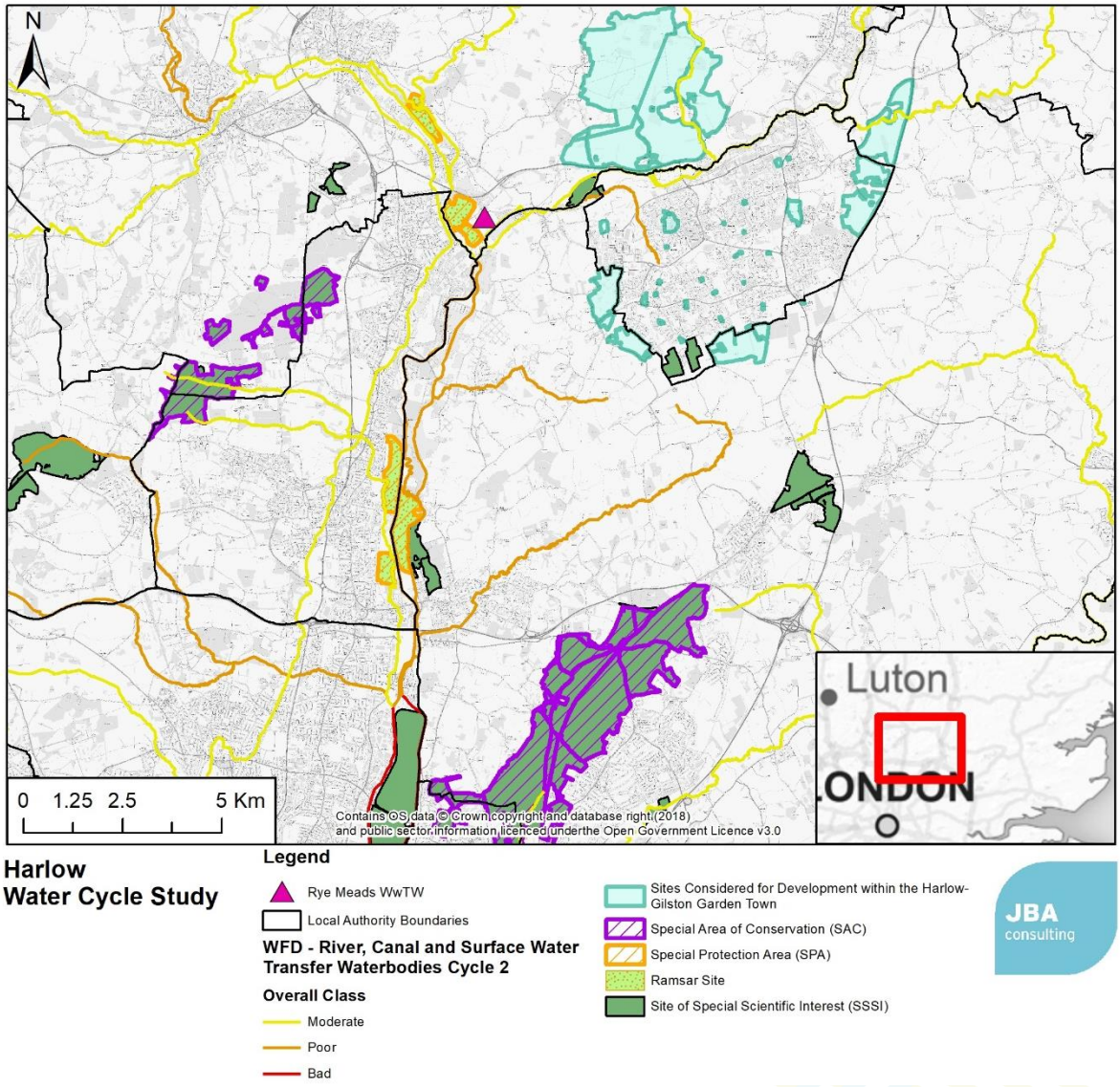
8 Environmental Constraints and Opportunities

8.1 Sites with Environmental Designation

Changes in wastewater discharges to watercourses passing through or close to environmentally sensitive sites have the potential to cause an adverse effect on these sites. Figure 8-1 shows the sites that exist in and around the study area with environmental designations. Of particular interest to this WCS are WwTWs which discharge into a watercourse that subsequently passes through a site with an environmental designation.

Natural England was consulted during the early stages of the WCS, and identified a number of considerations within the study area, including water-dependent designated sites, green infrastructure, flood risk, and the potential impacts of strategic sewer network upgrades[78].

Figure 8-1: Map of environmental designations and their proximity to watercourses



[78] N. Fuller. Email correspondence: Water Cycle Study Update for Greater Harlow. 16 January 2018.

Table 8-1 shows potential sources of additional pollution from developments, and their pathways to environmentally sensitive sites (receptors). An assessment has been made of their likely impact on the designated sites.

Table 8-1: Potential impact of Rye Meads WwTW on environmentally designated sites.

Source	Pathway	Receptor	Distance downstream
Rye Meads WwTW	River Stort / Surface Water Runoff	Rye Meads SSSI (TQ351888)	3.8 km
	River Stort / Surface Water Runoff	Rye Meads SPA (TL387102)	3.8 km
	River Stort / Surface Water Runoff	Lee Valley Ramsar site (TQ351888)	3.8 km
	River Lee	Lee Valley SPA (TQ351888)	6.0km
	River Lee / River Lee Navigation (Canal)	Turnford and Cheshunt Pits SSSI (TL370027)	7.2km
	River Lee / River Lee Navigation (Canal)	Waltham Abbey SSSI (TL375019)	8.3km
	River Lee Navigation (Canal)	Cornmill Stream and Old River Lea SSSI (TL379012)	9.0km

Rye Meads WwTW discharges into the Toll House Stream, a tributary of the River Lee, via a siphon beneath the River Stort, and is located within 450m of the Rye Meads SPA and Lea Valley Ramsar site. Effluent passes through a series of eight tertiary lagoons before discharging into the watercourse. However, proximity of the wastewater treatment works to the environmentally designated sites indicates a moderate potential impact on the environment.

Thames Water correspondence identified that Rye Meads WwTW is located immediately adjacent to environmentally designated areas, however did not identify these as a constraint to growth. The specific impacts of expanding the works is assessed by Thames Water, in consultation with Natural England, to mitigate any adverse effects to the environment.

In addition, the Harlow Woods SSSI and Hunsdon Mead SSSI have the potential to be affected by surface water runoff, if it is not properly managed within the site boundary.

- **Harlow Woods SSSI.** This designation slopes relatively steeply from south to north, where it borders the Kingsmoor area of Harlow. Given this topography, it is considered highly likely that runoff from nearby proposed development (SP5.1 to the east and SP5.2 to the north west) could enter and impact upon this SSSI.

- **Hunsdon Mead SSSI**. Comments provided by Natural England[79] have identified that flooding and contamination of Hunsdon Mead SSSI from Canons Brook is a concern. Pollutants are reportedly mobilised by surface water runoff, conveyed within Canons Brook, and enter Hunsdon Mead SSSI via flooding of the watercourse. Many of the sites under consideration for development within Harlow and to its south and west are within the catchment of the Canons Brook. However, correspondence with Thames Water has identified that network capacity modelling '*shows no significant increase in risk of sewer flooding within Hunsdon Mead SSSI as a result of planned growth*'[80]. Strategic options for managing flood risk and the source of contaminants within the Canons Brook catchment should be explored in partnership.

8.1.1 Blue-Green Spaces and Infrastructure

'Blue-green infrastructure' is a term used to describe vegetation or water landscape elements, such as hedgerows, woodland, green roofs, watercourses and ponds. Where integrated into urban areas, blue green infrastructure can help to manage flooding, reduce the urban 'heat island effect' and improve air quality, while also providing spaces for wildlife habitats and recreation[81].

Harlow Council has designated a large number of green areas within the study area, including Green Wedges and interconnecting Green Fingers, which provide habitats and migratory corridors for wildlife. These green areas provide opportunities for strategic management solutions of flood risk and water quality, while providing ecological, amenity and health benefits. For example, the creation of a wetland area can allow the interception of a surface water flow path, treatment of urban runoff through the fall out of pollutants and sediment, and provide a habitat for protected bird species and wetland ecosystems.

To mitigate harm to the SPA, Ramsar Site and SSSIs from additional visitor numbers from nearby developments, developers can use measures such as Suitable Accessible Natural Greenspaces (SANGs) within new developments. This aims to provide alternative green space, and divert visitors away from designated areas, reducing pressure on them.

Green spaces within developments or the should seek to support the objectives of the Biodiversity Action Plans of Essex[82] and Hertfordshire[83]

8.1.2 Lee Valley Site Improvement Plan

Natural England has developed a Site Improvement Plan for the Lee Valley, to provide an overview of current and future issues which may affect the condition of the Lee Valley Special Protected Area (SPA), a Natura 2000 designated area.

The Lee Valley SPA provides numerous wetland habitats for birds, through the availability of water supply reservoirs, sewerage treatment lagoons and gravel pits. In the Lee Valley, deterioration of water quality and changes in the hydrology of the Lee catchment threatens three species of bird: the Bittern, Gadwall and Shoveler.

The following actions have been identified for partner organisations, including Thames Water, Natural England and the Environment Agency:

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[79] N. Fuller. Email correspondence: Water Cycle Study Update for Greater Harlow. 16 January 2018.
[80] G. Kasselman. Email correspondence: Wastewater network capacity assessment. 9 July 2018.
[81] Cambridge University (2016) Assessing the benefits of blue-green infrastructure. Available at: http://www.publichealth.cam.ac.uk/assessing-benefits-blue-green-infrastructure/
[82] Essex Biodiversity Project (2011) The Essex Biodiversity Action Plan. Available at: http://www.essexbiodiversity.org.uk/biodiversity-action-plan.
[83] Hertfordshire Wildlife Trust (2006) A Biodiversity Action Plan for Hertfordshire. Available at: www.hef.org.uk/nature/biodiversity_vision/table_of_contents.pdf.

Actions for Water Pollution:

- 1A – Define appropriate water quality standards for significant water bodies to inform management of changes in water quality.
- 1B – Agree water quality management for significant water bodies with key stakeholders.
- 1C – Develop and implement a Diffuse Water Pollution Plan.

Hydrological changes:

- 2A – Define more clearly the water level requirements for the habitats supporting the SPA bird features.
- 2B – As a follow up action to 2A, agree the necessary water level management with key stakeholders for significant water bodies.

8.1.3 Conclusions and recommendations

The potential for adverse impacts on the water environment is closely related to the presence and sensitivity of water features on, or in close proximity to development sites. Where such features exist, adequate protection measures should be implemented in the design of the development, to ensure effective protection during both construction and operational phases. Such measures would include the provision of wide vegetated buffer zones adjacent to watercourses, to reduce the risk of contaminated runoff affecting river water quality and to promote aquatic biodiversity. The use of SuDS systems would promote infiltration of surface runoff and contribute to groundwater recharge, whilst also offering potential biodiversity, flood risk and amenity benefits.

Changes in wastewater discharges to watercourses passing through or close to environmentally sensitive sites have the potential to cause an adverse effect on these sites. However, based on the additional volume of waste water, the probable impact from Rye Meads WwTW is minor or negligible. An Environmental Impact Assessment (EIA) was produced in 2014 to accompany the proposed upgrade of Rye Meads WwTW[84], and the Environment Agency and Natural England will remain consulted on the potential impacts of the works.

Correspondence with Thames Water[85] has identified that there are no proposals to increase the capacity of the trunk sewer passing through Hunsdon Mead SSSI, although some enhancement of local sewers in the vicinity of the trunk sewer is expected.

In line with the Natural England consultation response, it is recommended that any proposed sewer enhancement works in and around the Hunsdon Mead SSSI are prevented from adversely affecting the water quality and ecological habitat of the SSSI. Where possible, any proposed works should incorporate SuDS which provide attenuation and treatment of surface water.

There are also a range of potential environmental opportunities that could be delivered through development proposals and the Green Wedge network. Opportunities include enhancement of existing ecological features, such as watercourses, field margins and trees, the provision of new biodiversity habitats, and the creation of new recreational and amenity areas. These should contribute to delivering the actions of the Lee Valley Site Improvement Plan.

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[84] Thames Water Utilities Ltd. (2014) Rye Meads STW Upgrade: Request for an EIA Screening Opinion. Available at: http://anyflip.com/mjhy/keut.
[85] C. Colloff. Email correspondence: Clarification on Rye Meads WwTW headroom assessment and infrastructure upgrades. 26 April 2018.

No further assessment of impact upon environmentally designated sites is required.

9 Climate Change Impact Assessment

9.1 Approach

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made in this water cycle study. This has been undertaken using a matrix which considers both the potential impact of climate change on the assessment in question, and also the degree to which climate change has been considered in the information used to make the assessments contained within the WCS (see Table 9-1).

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

Table 9-1: Climate Change Pressures Scoring Matrix

		Impact of pressure		
		Low	Medium	High
Have climate change pressures been considered in the assessment?	Yes – quantitative consideration			
	Some consideration but qualitative only			
	Not considered			

9.2 Results

An overview of the assessment of climate change within the WCS is provided in Table 9-2.

Table 9-2: Scoring of Climate Change Consequences for the Water Cycle Study

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the assessment?	RAG
Water resources	High (1 and 2)	Yes – quantitative within dWRMP and RMBP	
Water supply infrastructure	Medium – some increased demand in hot weather	Yes – qualitative consideration within WRMP	
Wastewater Collection	High – Intense summer rainfall and higher winter rainfall increases flood risk	No – not considered in TW assessment	
Wastewater treatment	Medium – Increased winter flows and more extreme weather events reduces flow headroom	No – not considered in TW assessment	
WwTW odour	Low	No – not considered	

Assessment	Impact of Pressure (source of information)	Have climate change pressures been considered in the assessment?	RAG
Water quality	Nutrients: High (1) Sanitary determinands: Medium (1)	Yes – water quality assessment repeated with reduction in flows upstream of WwTW	
Flooding from increased WwTW discharge	Low	No – not considered	

(1) River Basin Management Plan Thames River Basin District

(2) Affinity Water dWRMP 2018

The most detailed assessment of climate change impacts focussed on the impacts of water quality. Climate change during the plan period could lead to deterioration of the water quality, as a result of decreased river flows and hence less dilution. However, this is not sufficient to lead to a class deterioration for any determinand. Further details of the method and results of this analysis are provided in Appendix A.

9.3 Recommendations

Table 9-3: Climate Change Actions

Action	Responsibility	Timescale
When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, TW, AW, HC, EFDC, EHDC	As required
Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	HC, EFDC, EHDC, Developers	As required

10 Summary and Recommendations

10.1 Water Cycle Study Summary

The Phase 1 Scoping Water Cycle Study has been carried out in cooperation with the Environment Agency, Affinity Water and Thames Water.

The overall conclusion is that no strategic-scale water or wastewater constraints on growth have been identified within the study area, and that a Phase 2 study is not required.

A site-by-site summary of the results of the assessments undertaken is included in Appendix B.

Development Scenarios and Policy Issues

This Water Cycle Study is an assessment of the impacts of planned development within Harlow District and the Harlow-Gilston Garden Town.

The Preferred Spatial Option for allocating required housing growth across West Essex and East Hertfordshire is the development of six strategic sites within Harlow District, the Harlow-Gilston Garden Town and the bordering authorities of Epping Forest and East Hertfordshire, which will provide up to 16,100 homes. Due to variance in the projected housing growth requirements, this assessment is based on current best estimates of growth within the Rye Meads WwTW catchment, which serves the three local authorities forming the Harlow-Gilston Garden Town. The forecast provided by Thames Water estimates that 9,484 new dwellings in East Hertfordshire, 9,428 in Harlow and 4,516 dwellings in Epping Forest will be provided by 2033. The use of these growth estimates will ensure consistency with Thames Water modelling and planning of Rye Meads WwTW.

Legal agreements under the Town and Country Planning Act Section 106 agreement, and Community Infrastructure Levy agreements are not intended to be used to obtain funding for water or wastewater infrastructure. It is not therefore necessary for East Hertfordshire District Council, Epping Forest District Council and Harlow Council to identify requirements for developers to contribute towards the cost of upgrades in its Local Plan.

The Water Industry Act sets out arrangements for connections to public sewers and water supply networks, and developers should ensure that they engage at an early stage with Affinity Water, and Thames Water to ensure that site specific capacity checks can be undertaken, and where necessary, additional infrastructure is constructed to accommodate the development. Where permitted, Affinity Water and Thames Water may seek developer contributions towards infrastructure upgrades. Upgrades to water resources and wastewater treatment works are funded through the company's business plans.

Water Resources

The boundary of the study area is located within the Environment Agency Abstraction Licensing Strategies (ALS) for the Upper Lee. The ALS has restricted water available for licensing and all sites have been considered under serious water stress by the Environment Agency.

The draft Water Resource Management Plan (dWRMP) demonstrates the pressures on water resources within the Affinity Water supply zone with increasing demand, population growth, resource uncertainty, the impacts of climate change and the need to reduce some abstractions to reduce their impacts on the environment.

The latest DCLG baseline number of households within Affinity Water's Water Resource Zone 5 (WRZ5) were 8% higher than the dWRMP draft forecast figures, although the

forecast percentage growth up to 2025 and 2045 was higher within the dWRMP. This reflects the difference in method used by Affinity Water within the dWRMP, which involves re-basing figures to reflect billed customers within WRZs, and is not considered to be cause for concern.

The Affinity Water dWRMP does not rely on new homes being more water-efficient than existing metered homes. However, the opportunity, to ensure that new homes do meet the higher standard of 110l/person/day, through the planning system, and at nominal additional cost to the developer, would be in line with general principles of sustainable development, water neutrality, and reducing energy consumed in the treatment and supply of water.

The overall RAG assessment for water resources in the study area is green, on the basis that there is sufficient time to address the supply demand issues identified in the next WRMP.

Difference between DCLG and Affinity Water baseline and growth scenarios for households in WRZ5 is to be resolved in the final WRMP. No further assessment of water resources is required.

Water Supply Infrastructure

All sites within the study area would be served by Affinity Water. The additional demand of these developments would require some reinforcement of the water supply network, although no significant constraints to the provision of this infrastructure have been identified.

No further assessment of water supply infrastructure is required.

Wastewater Collection and Treatment

The Thames Water RAG assessment prepared for this scoping stage has considered all potential Local Plan allocations within the study area. The assessment indicates that for several of the sites, foul sewer infrastructure upgrades are required to serve proposed growth, however no significant constraints to the provision of infrastructure have been identified. The exception to this is the site at Latton Priory, where Thames Water has recommended that early implementation of foul sewerage is required. In addition, a Statement of Common Ground is being prepared between Harlow Council and Thames Water, to set out areas of joint interest between the two parties, including the agreements on wastewater network and treatment capacity to support the delivery of growth within the Harlow-Gilston Garden Town area.

In terms of surface water sewer capacity, all but one site is identified as being located in an area of limited or very limited surface water network capacity. This highlights the significant constraints, and need to limit the volumes of surface water runoff entering the sewer network in new developments, through the use of Sustainable Drainage Systems (SuDS) and restricting new drainage connections into the existing sewer network, wherever possible.

Thames Water's preferred method of surface water disposal is using a sustainable drainage system (SuDS) discharging to ground or open watercourses, with connection to the sewerage system seen as the last option. The study area is predominantly situated on clay and therefore widespread infiltration is unlikely to be feasible. However, this does not preclude the incorporation of SuDS to manage surface water within developments. Instead, rainwater harvesting and discharge to watercourse are the recommended means of draining a site.

Sewerage Undertakers have a duty under Section 94 of the Water Industry Act 1991 to provide sewerage and treat wastewater arising from new domestic development. Except where strategic upgrades are required to serve very large or multiple

developments, infrastructure upgrades are usually only implemented following an application for a connection, adoption, or requisition from a developer. Early developer engagement with water companies is therefore essential to ensure that sewerage capacity can be provided without delaying development.

No further assessment of wastewater collection and treatment is required.

Wastewater Treatment Works Flow Permit Assessment

The assessment indicates that Rye Meads WwTW has sufficient capacity to accommodate all planned growth from the study area, as well as the surrounding six Local Planning Authorities of East Herefordshire, North Hertfordshire, Stevenage, Welwyn Hatfield, Epping Forest and Broxbourne, up to 2036.

Thames Water classified Rye Meads WwTW as a "green" assessment, indicating that the works have sufficient capacity for planned levels of growth within the study area over the plan period. This assessment takes into account current upgrades to the WwTW, as well as the potential for further refurbishments within AMP Cycle 7 (up to 2025) and AMP Cycle 8 (up to 2030), dependent on business planning and growth requirements.

No further assessment of wastewater treatment capacity is required.

Water Quality Impact Assessment

A water quality assessment was carried out on Rye Meads WwTW, which serves Harlow District, the Harlow-Gilston Garden Town, and the neighbouring LPAs, to determine the likely effect of proposed development on water quality.

It was identified that Rye Meads WwTW has the potential to experience a deterioration in Ammonia, BOD and Phosphate within the River Lee. However, it was determined that proposed growth is unlikely to prevent the receiving waterbody from achieving its target WFD status. In addition, planned works to increase the capacity of Rye Meads WwTW may allow improvements in water quality of the River Lee.

No further assessment of water quality is required.

Wastewater Treatment Works Odour Assessment

An odour screening assessment was completed to identify sites that are in close proximity to existing WwTWs where odour may be a cause of nuisance and complaints. Results concluded that no sites were at risk of experiencing odour due to their proximity to existing WwTWs.

No further assessment of odour impact is required.

Flood Risk

A detailed assessment of flood risk can be found within the Harlow (2016), East Hertfordshire (2016) and Epping Forest (2015) Strategic Flood Risk Assessments.

An assessment was carried out to determine whether increased discharges of treated effluent from Rye WwTW due to the additional development within the study area and neighbouring LPAs could lead to an increase in fluvial flood risk from the receiving watercourse. The results showed that the impact of increased effluent flows is not predicted to have a significant impact upon flood risk in the River Lee.

No further assessment of flood risk from wastewater effluent discharges is required.

Surface Water and SuDS

Greenfield runoff rates were calculated for the major catchments draining the study area, to provide an initial indication of discharge rates for development sites. Due to water scarcity, surface water re-use through rainwater harvesting should be promoted within new developments.

Due to the identified pressures on the Thames Water surface water sewer network, management of surface water through SuDS is of particular importance within the Harlow-Gilston Garden Town sites. The Green Wedge network within Harlow should be utilised, where possible, to deliver blue-green infrastructure and exemplar SuDS which contribute to the flood risk, water quality and water resources targets of the WCS, SFRAs and Harlow SWMP.

Environment Constraints and Opportunities

Data from the Environment Open data from the Environment Agency were used to create a map showing sites with environmental designations within the study area, in order to identify sites likely to be impacted by additional discharge from Rye Meads WwTW. The impact of untreated surface water runoff from development sites on designated environmental sites was also considered. The map should be used in conjunction with Sustainability Appraisals (SA) and evidence studies where these are available.

No further assessment of impact upon environmentally designated sites is required.

Climate Change

A qualitative assessment has been undertaken to assess the potential impacts of climate change on the assessments made within this water cycle study. The assessment used a matrix which considers both the potential impact of climate change on the assessment in question, and the degree to which climate change has been considered in the information used to make the assessments contained within the WCS.

The capacity of the sewerage system stands out as one element of the assessment where the consequences of climate change are expected to be high, but no account has been made of climate impacts in the assessment.

Where feasible, climate change should be taken into account in future planning and modelling by Thames Water, however it is not considered necessary to undertake any further assessment to address this aspect.

10.2 Timescales for Implementing Water and Wastewater Infrastructure Upgrades

Where it is identified that potential growth may exceed the existing capacity of the water and wastewater systems, the water and wastewater companies will need to plan how they will provide additional capacity. The timescale required to implement any specific infrastructure upgrade will depend on many site-specific factors, including but not limited to the scale of works, engineering complexity, planning and environmental constraints, negotiation of land purchase, access and wayleave, ground conditions and traffic conditions.

It is beyond the scope of this water cycle study to assess the timescales required to make individual infrastructure upgrades, however Table 10-2, developed with advice from water companies, provides indicative timescales for different types and sizes of upgrade:

Figure 10-1: Indicative timescales for implementing water infrastructure upgrades

Infrastructure type	Trigger for water company to assess requirements and develop plans	Indicative project timescales for infrastructure upgrades or other interventions	
		Minor	Major
Water resources	Publication of LPA Local Plans and associated updates	Demand management measures, minor new resource e.g. borehole: 3-5 years	New strategic asset e.g. water reuse plant, reservoir: 5-20 years
Water supply	Pre-development enquiries Planning applications	Localised supply pipe upgrades: 1-2 years	New supply mains, boosters, service reservoirs, treatment works 3-5 years
Wastewater treatment	Pre-development enquiries Planning applications	Minor upgrade of existing treatment works: 2-4 years	Major upgrade or new treatment works 3-5 years
Sewerage	Pre-development enquiries Planning applications	Localised sewerage upgrades: 1-3 years	New collector sewers or other strategic assets: 3-5 years

As is emphasised throughout this study, early developer engagement with water companies is essential to ensure that water and wastewater providers have adequate time to provide infrastructure upgrades required to accommodate growth.

10.3 Safeguarding of Sites

The water and wastewater utilities, Affinity Water and Thames Water were asked whether there are any sites within the study area which they would seek to have safeguarded from further development in the Local Plan, in order to protect the site for potential future strategic water and wastewater assets. No sites have been identified as requiring safeguarding at this stage.

10.4 Recommendations

Figure 10-2: All recommendations

Aspect	Action	Responsibility	Timescale
Water Resources	Compare household numbers between DCLG and the Affinity Water final WRMP, following incorporation of the updated household data.	Affinity Water	Within timescale of final WRMP
	Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with Local Planning Authorities.	Affinity Water	Ongoing
	Provide yearly profiles of projected housing growth to water companies to inform the WRMP	HDC, EHDC, EFDC and other LPAs in the Affinity WRZ5	Ongoing
	Use planning policy to require the 110l/person/day water consumption target permitted by National Planning Policy Guidance in residential development in water-stressed areas, and encourage use of the BREEAM standard to deliver percentage improvement over baseline building water consumption of at least 12.5% in non-residential development.	HDC EHDC EFDC	In Emerging Local Plan
	Water companies should advise EHDC, EFDC and HC of any strategic water resource infrastructure developments within the council's boundary, where these may require safeguarding of land to prevent other type of development occurring. At present, none have been identified.	Affinity Water	In Emerging Local Plan
Water Supply Infrastructure	Undertake technical studies to understand options to provide sufficient bulk and local transfer capacity and communicate results with HC.	Affinity Water	Ongoing
	Developers should seek early consultation with Affinity Water to ensure adequate time is available to provide local distribution mains upgrades to meet additional demand.	Developers Affinity Water	Ongoing
	Encourage the use of rainwater harvesting and non-potable water recycling within Harlow-Gilston Garden Town developments, to move closer to achieving water neutrality for the	HC EFDC EHDC	In preparation of delivering the Harlow-Gilston Garden Town

Aspect	Action	Responsibility	Timescale
	development.	Affinity Water	
Wastewater Collection	Take into account wastewater infrastructure constraints in phasing development in partnership with Thames Water	HC EHDC EFDC Thames Water	Ongoing
	Thames Water and developers to work closely and early in the planning promotion process to develop an outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets / upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	TW and Developers	Ongoing
	Developers to demonstrate to the Lead Local Flood Authority (LLFA) that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA.	Developers Essex CC and Hertfordshire CC as LLFA	Ongoing
Wastewater Treatment Flow	Provide Annual Monitoring Reports to Thames Water detailing projected housing growth in the Local Authority.	HC EHDC EFDC	Ongoing
	Thames Water to assess growth demands annually within the Rye Meads WwTW catchment, as part of their wastewater asset planning activities and feedback to HC, EHDC and EFDC if concerns arise.	TW HC EHDC EFDC	Ongoing
Water Quality	HC, EHDC and EFDC should consider the available environmental capacity at each settlement when assigning draft site allocations.	HC EFDC EHDC	Local Plan preparation

Aspect	Action	Responsibility	Timescale
Odour Assessment	Carry out an odour assessment for sites which subsequently become available within 800m of Rye Meads WwTW, for example windfall sites.	Site Developers EHDC EFDC HC	Ongoing
Wastewater treatment flood risk from increased effluent	Proposals to increase discharges to a watercourse may also require a flood risk activities environmental permit from the EA (in the case of discharges to Main River), or a land drainage consent from the Lead Local Flood Authority (in the case of discharges to an Ordinary Watercourse).	TW	During design of WwTW upgrades
Surface Water Drainage and SuDS	Encourage the use of rainwater harvesting to manage surface water in new developments.	HC EHDC EFDC ECC / HCC	Ongoing
	In partnership, identify opportunities for incorporating SuDS into designated Green Wedges (where available), Open Spaces and Green Infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	HC EHDC EFDC ECC / HCC TW EA NE	Ongoing
	Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	TW ECC / HCC HC EHDC EFDC Developers	Ongoing
	Ensure the findings of Harlow SWMP are used to inform the surface water drainage policy and decision making. In particular: All developments should restrict post-development runoff rates to greenfield rates for the same return period, as outlined in Table 7-4. LLFAs may impose stricter greenfield runoff rates. Brownfield development should reduce runoff rates by 50% compared to the existing state, for rainfall events up to and including the 1 in 100-year return period. Developments greater than 1 property or 0.1Ha within CDAs and Local Flood Risk Zones (LFRZs) identified in the SWMP	Developers ECC / HCC HC EHDC EFDC	Ongoing

Aspect	Action	Responsibility	Timescale
	should seek betterment to Greenfield runoff rates.		
Climate Change	When undertaking detailed assessments of environmental or asset capacity, consider how the latest climate change guidance can be included.	EA, TW, AW, HC, EHDC, EFDC	As required
	Take "no regrets" decisions in the design of developments which will contribute to mitigation and adaptation to climate change impacts. For example, consider surface water exceedance pathways when designing the layout of developments.	HC EHDC EFDC Developers	As required

10.5 Conclusion

This Phase 1 Water Cycle Study has not identified any issues which require further assessment by a Phase 2 study.

Environment Agency guidance recommends a series of questions to be addressed as part of a WCS[86]. A summary of the WCS findings against these questions is provided in Table 10-1.

Table 10-1: Findings of the WCS against the questions posed within Environment Agency WCS guidance

Outline WCS Question	Conclusion	Sections Addressed
Is there enough water?	Harlow District and the Harlow-Gilston Garden Town are located in the Upper Lee catchment, which is an area of serious water stress, with restricted water abstraction licencing. The Affinity Water dWRMP identifies a series of measures for managing the pressures on water resources, including universal metering and leakage reduction. This will be aided by introducing a policy of 110l/p/day for water consumption in new homes, as proposed within the draft Local Plans. As a result, it is considered there is sufficient time to address the water supply and demand issues for Harlow District and the Harlow-Gilston Garden Town.	Section 4.2 Section 4.3

[86] Environment Agency (2014) Water Cycle Study Guidance. Available at: https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality#water-cycle-studies

Outline WCS Question	Conclusion	Sections Addressed
Will there be a water quality impact?	Proposed growth in the study area is predicted to lead to a deterioration of 11% in Ammonia and of less than 10% in BOD and Phosphate on the River Lee at Rye Meads WwTW. However, this is unlikely to affect the waterbody achieving target WFD status in the future.	Section 6.5
Can development be accommodated without increasing flood risk?	The flood risk impact on the River Lee due to the expected increase in treated effluent discharge from Rye WwTW was assessed. There is not predicted to be a significant impact on flood risk, with growth of Harlow District and the Harlow-Gilston Garden Town.	Section 7.1 Section 7.2
Are there other location specific environmental risks that need to be considered?	The designated environmental sites with potential to be affected by additional discharge from Rye Meads WwTW were assessed. Rye Meads SPA and Lea Valley Ramsar are located close to Rye Meads WwTW, and the combined sewer network runs beneath Hunsdon Mead SSSI. Risks and opportunities have been identified within these areas. However, continued careful management of wastewater assets in these locations will mitigate environmental risks.	Section 8.1
What constraints are there on increasing capacity?	Responses from Thames Water did not identify any constraints in wastewater flow capacity. Restrictions in capacity were identified in areas of the foul, however no significant constraints to the provision of infrastructure have been identified. The exception is the Latton Priory site, which will require early foul infrastructure implementation. No new connections are permitted to the surface water sewer network. The feasibility of alternative surface water discharge methods for each site is provided in the accompanying site spreadsheet.	Appendix B
What opportunities are there for changing proposed	It is considered that the proposed development locations support the proposed growth, and do not require changing.	N/A

Outline WCS Question	Conclusion	Sections Addressed
development location?		
Are there outstanding concerns about infrastructure provision?	Affinity Water and Thames Water have been consulted on the feasibility of foul and surface water infrastructure provision. With the exception of foul sewerage provision at the Latton Priory site, which requires early implementation, correspondence has not identified any outstanding concerns on infrastructure provision.	Section 5.1

Appendices

A Appendix A – Water Quality Assessment

B Appendix B – Sites under consideration

C Appendix C - Wastewater Treatment Works Permit Summary

Table 10-2: Rye Meads WwTW Permit Information used within Water Quality Assessment.

Permit Number	DWF (Ml/d)	BOD (mg/l)	Ammonia (mg/l)	Phosphorus (mg/l)
CLCR.0048	110	6	2	1

EB1111

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