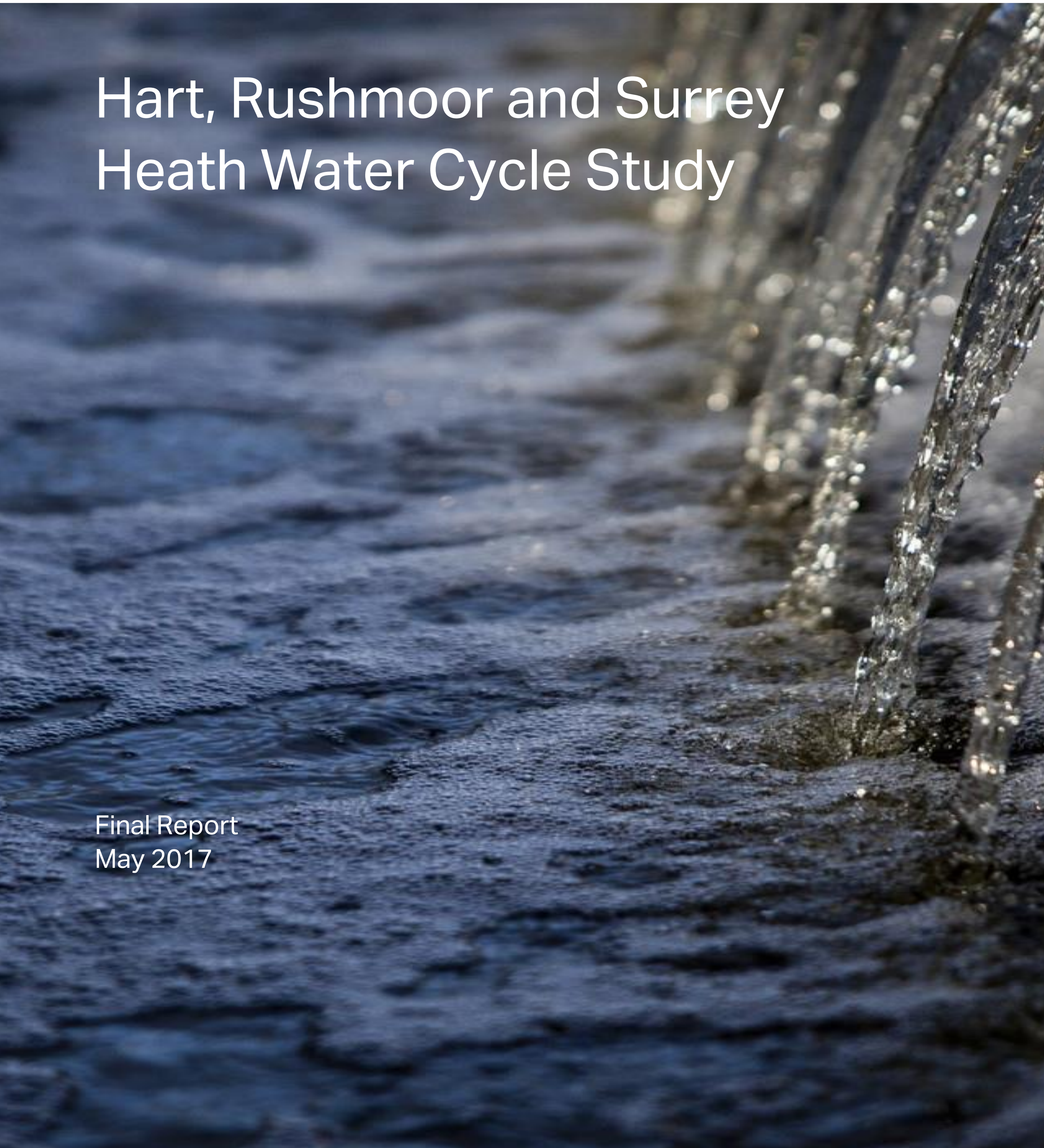
Water

Submitted to
East Hampshire District Council

Submitted by
AECOM
Midpoint
Alençon Link
Basingstoke
Hampshire
RG21 7PP
United Kingdom

Hart, Rushmoor and Surrey Heath Water Cycle Study



Final Report
May 2017

Appendix A. Relevant Planning Documents to the WCS

Local Authority Relevance	Category	Document Name	Publication Date
All	Water	Blackwater Valley Water Cycle Study Scoping Report	2011
All	Environment	Thames River Basin District Management Plan (RBMP)	2015
Hart	Flood Risk	Hart Strategic Flood Risk Assessment November 2016	2016
Rushmoor	Flood Risk	Rushmoor Borough Council Level 1 SFRA Update	2015
Surrey Heath	Flood Risk	Surrey Heath SFRA	2015
All	Housing	Hart, Rushmoor and Surrey Heath Strategic Housing Market Assessment (SHMA)	2016
All	Employment	Hart, Rushmoor and Surrey Heath Joint Employment Land Review	2016
Surrey Heath	Environment	Biodiversity and Planning in Surrey	2014
Hart	Environment	Hart Biodiversity Action Plan 2012 - 2017	2012
Rushmoor	Environment	Rushmoor Biodiversity Action Plan 2016 - 2021	2016
All	Environment	Thames Basin Heaths Special Protection Area Delivery Framework	2009
Surrey Heath	Water	Affinity Water Final Water Resource Management Plan 2015 - 2020	2014
All	Water	South East Water Water Resource Management Plan 2015 - 2040	2014
All	Climate Change	United Kingdom Climate Projections 2009 (UKCP09)	2009
All	Water	Loddon abstraction licensing strategy	2013
Surrey Heath	Water	Thames abstraction licensing strategy	2014

Appendix B. Legislative Drivers Shaping the WCS

Directive/Legislation/Guidance	Description
Birds Directive 2009/147/EC	Provides for the designation of Special Protection Areas.
Building Regulations Approved Document G – sanitation, hot water safety and water efficiency (March 2010)	The current edition covers the standards required for cold water supply, water efficiency, hot water supply and systems, sanitary conveniences and washing facilities, bathrooms and kitchens and food preparation areas.
Eel Regulations 2009	Provides protection to the European eel during certain periods to prevent fishing and other detrimental impacts.
Environment Act 1995	Sets out the role and responsibility of the Environment Agency.
Environmental Protection Act 1990	Integrated Pollution Control (IPC) system for emissions to air, land and water.
Flood & Water Management Act 2010	The Flood and Water Management Act 2010 is the outcome of a thorough review of the responsibilities of regulators, local authorities, water companies and other stakeholders in the management of flood risk and the water industry in the UK. The Pitt Review of the 2007 flood was a major driver in the forming of the legislation. Its key features relevant to this WCS are: • To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods. • To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SuDS for new developments and redevelopments. • To widen the list of uses of water that water companies can control during periods of water shortage, and enable Government to add to and remove uses from the list. • To enable water and sewerage companies to operate concessionary schemes for community groups on surface water drainage charges. • To make it easier for water and sewerage companies to develop and implement social tariffs where companies consider there is a good cause to do so, and in light of guidance that will be issued by the SoS following a full public consultation.
Future Water, February 2008	Sets the Government's vision for water in England to 2030. The strategy sets out an integrated approach to the sustainable management of all aspects of the water cycle, from rainfall and drainage, through to treatment and discharge, focusing on practical ways to achieve the vision to ensure sustainable use of water. The aim is to ensure sustainable delivery of water supplies, and help improve the water environment for future generations.
Groundwater Directive 80/68/EEC	To protect groundwater against pollution by 'List 1 and 2' Dangerous Substances.
Habitats Directive 92/44/EEC and Conservation of Habitats & Species Regulations 2010	To conserve the natural habitats and to conserve wild fauna and flora with the main aim to promote the maintenance of biodiversity taking account of social, economic, cultural and regional requirements. In relation to abstractions and discharges, can require changes to these through the Review of Consents (RoC) process if they are impacting on designated European Sites. Also the legislation that provides for the designation of Special Areas of Conservation provides special protection to certain non-avian species and sets out the requirement for Appropriate Assessment of projects and plans likely to have a significant effect on an internationally designated wildlife site.

Directive/Legislation/Guidance	Description
Land Drainage Act 1991	Sets out the statutory roles and responsibilities of key organisations such as Internal Drainage Boards, local authorities, the Environment Agency and Riparian owners with jurisdiction over watercourses and land drainage infrastructure.
Making Space for Water, 2004	Outlines the Government's strategy for the next 20 years to implement a more holistic approach to managing flood and coastal erosion risks in England. The policy aims to reduce the threat of flooding to people and property, and to deliver the greatest environmental, social and economic benefit.
National Planning Policy Framework	Planning policy in the UK is set by the National Planning Policy Framework (NPPF). NPPF advises local authorities and others on planning policy and operation of the planning system. A WCS helps to balance the requirements of various planning policy documents, and ensure that land-use planning and water cycle infrastructure provision is sustainable.
Pollution Prevention and Control Act (PPCA) 1999	Implements the IPPC Directive. Replaces IPC with a Pollution Prevention and Control (PPC) system, which is similar but applies to a wider range of installations.
Ramsar Convention	Provides for the designation of wetlands of international importance
Urban Waste Water Treatment Directive (UWWTD) 91/271/EEC	This Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. Its aim is to protect the environment from any adverse effects caused by the discharge of such waters.
Water Act 2003	Implements changes to the water abstraction management system and to regulatory arrangements to make water use more sustainable.
Water Framework Directive (WFD) 2000/60/EC	The WFD combines water quantity and water quality issues together. An integrated approach to the management of all freshwater bodies, groundwaters, estuaries and coastal waters at the river basin level has been adopted. The overall requirement of the directive is that all river basins must achieve 'good ecological status' by 2015 or by 2027 if there are grounds for derogation. The Environment Agency is the body responsible for the implementation of the WFD in the UK. The Environment Agency have been supported by UKTAG[53], an advisory body which has proposed water quality, ecology, water abstraction and river flow standards to be adopted in order to ensure that water bodies in the UK (including groundwater) meet the required status[54]. Standards, and water body classifications are published via River Management Plans (RBMP) the latest of which were completed in 2015.
Natural Environment & Rural Communities Act 2006	Covering Duties of public bodies – recognises that biodiversity is core to sustainable communities and that Public bodies have a statutory duty that states that "every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity
Water Resources Act 1991	Protection of the quantity and quality of water resources and aquatic habitats. Parts have been amended by the Water Act 2003.
Wildlife & Countryside Act 1981 (as amended)	Legislation that provides for the protection and designation of SSSIs and specific protection for certain species of animal and plant among other provisions.

[53] The UKTAG (UK Technical Advisory Group) is a working group of experts drawn from environment and conservation agencies. It was formed to provide technical advice to the UK's government administrations and its own member agencies. The UKTAG also includes representatives from the Republic of Ireland.
[54] UK Environmental Standards and Conditions (Phase I) Final Report, April 2008, UK Technical Advisory Group on the Water Framework Directive.

Appendix C. Wastewater Treatment Assessment

C.1 Modelling assumptions and input data

Several key assumptions have been used in both RQP and SIMCAT water quality modelling as follows:

- The wastewater generation per new household is based on an assumed Occupancy Rate (OR) of 2.4 people per house and an average consumption of 150 l/h/d for dwellings in Hart, Rushmoor and the west of Surrey Heath (SEWL supply zone) and 163 l/h/d for dwellings in the east of Surrey Heath (AWL supply zone) (as set out in Section 1.6).
- WwTW current flows were taken as the observed dry weather flow (DWF) as provided by the Environment Agency's monitoring data for the period 2012 to 2014. Future flows for each AMP period were calculated by adding the volume of additional wastewater generated by new dwellings (using an OR of 2.4, a consumption value of 150 l/h/d or 163 l/h/d) in each phase of growth to the current observed DWF value.
- Raw water quality data for modelling was provided by Environment Agency water quality planners. The WFD 'no deterioration' target for each WwTW are the downstream status, for each water quality element, based on river monitoring data collected between 2012 and 2014. The mean value and standard deviation was calculated, using this raw data for ammonia and phosphate where available for both the upstream (of the WwTW) and downstream (the discharge).
- For the purposes of this study, the limits of conventionally applied treatment processes are considered to be:
  - 5mg/l for BOD (95% ile limit);
  - 1mg/l for Ammoniacal-N (95% ile limit); and
  - 0.5mg/l for Phosphate (mean average).

C.2 RQP

Modelling of the quality permits required to meet the two WFD requirements has been undertaken for WwTW outside of the Blackwater Catchment, using RQP 2.5 (River Quality Planning), the Environment Agency's software for calculating permit conditions. The software is a monte-carlo based statistical tool that determines the statistical quality required from discharges in order to meet defined downstream targets, or to determine the impact of a discharge on downstream water quality compliance statistics.

River flow data for the RQP modelling has been calculated using outputs from LowFlows Enterprise software – data was provided as mean flow and Q95.

C.3 Headroom Assessment

The permitted flow headroom capacity within an existing permit is assumed to be usable, however, the permit is not set to equate to the risk of deterioration in WFD thresholds in the receiving waterbody or the designed treatment performance of the WwTW.

Growth within permitted headroom could potentially cause a deterioration in status, therefore the following steps have been applied to calculate approximately how much available headroom each WwTW has in order to scope in WwTWs for water quality modelling assessment[55]:

a. Determine the quantity of growth within a WwTW catchment to determine the additional flow expected at each WwTW;

b. Calculate the additional wastewater flow generated at each WwTW;

c. Calculate the remaining permitted flow headroom at each WwTW;

d. Determine whether the growth can be accommodated within existing headroom by applying the scoping criteria detailed in Table C-1.

[55] The Environment Agency were also involved in the scoping stage of WwTWs, with the option to override this methodology to include WwTWs that may be scoped out if the Agency felt there was a risk of deterioration in the receiving waterbody.

Table C-1. Scoping criteria

Scoped In	Scoped Out
WwTWs where flow headroom is exceeded as a result of growth	WwTWs where flow headroom is not exceeded as a result of growth
WwTWs which already exceed their flow permit and receive any additional flow from growth	WwTWs which already exceed their flow permit but do not receive any additional flow from growth[56]
WwTWs which have been identified by the Environment Agency as receiving a significant quantity of growth.	

C.4 Water Quality Modelling Methodology

For those WwTWs which are scoped in, modelling has been undertaken to determine the new quality conditions required for each WwTW discharge permit to ensure:

- No deterioration of more than 10% of the current water quality of the receiving waterbody, or if this is not technically feasible,
- No deterioration from the current WFD status of the receiving waterbody, and
- The future target WFD status is not compromised by growth.

C.4.1 Modelling Scenario and Target Determination

The following steps set out the process to determine which modelling scenario (either 10% deterioration limit or status deterioration) should be applied for each determinand at each WwTW. The below steps also sets out the process how the target at the mixing point (input into RQP) which would equate to ensuring the target at the downstream sampling point is achieved, was derived.

A. Current downstream quality

Using the raw water quality data for the downstream sampling point, calculate the mean and standard deviation. Then use the 'Confidence limits on estimates of percentiles' function in RQP to calculate the 90%ile river target at the downstream sampling point (A).

B. Calculate the 10% no deterioration target

90%ile or mean at the downstream sampling point (A) x 1.1 = 10% no deterioration target (B).

- If B > the status of the downstream sampling point, do not proceed with the 10% Deterioration Test. Go straight to the Status Deterioration Test.
- If B < the status of the downstream sampling point, go to step C.

C.4.2 10% Deterioration Test

C. Calculate the effect of the input discharge quality (Future):

Model the future discharge flow and measured discharge quality. From the results, determine if the future 90%ile or mean mixing point (C) is greater or less than the 10% no deterioration target (calculated in B).

- If C is > B, avoiding 10% deterioration is not possible under current level of treatment. Go to the next step D to determine what quality permit would be required to avoid 10% deterioration.
- If C is < B, avoiding 10% deterioration is possible under current level of treatment. Tightening of permit may still be required to current discharge quality if WwTW is performing well within its quality permit. Go to Status Deterioration Test. **GREEN** or **AMBER**

D. Calculate required discharge quality (Future) to avoid 10% deterioration:

Model the future discharge flow and measured discharge quality against the 10% no deterioration river quality target (B). From the results, determine if the future 95%ile or mean discharge quality required (D) is within LCT.

- If D is > LCT, avoiding 10% deterioration is possible. Tightening of the quality permit within LCT and process upgrades will be required. **AMBER**

[56] If a WwTW does not receive any growth, the assessment for the WwTW is not within the scope of a WCS.

– If D is < LCT, avoiding 10% deterioration is not possible. Tightening of the quality permit would go beyond LCT. Go to Status Deterioration Test to determine what quality permit would be required to ensure growth does not cause deterioration in status, and if it is within LCT. Also undertake a qualitative assessment by investigating;

- The distance of the downstream sampling point from the discharge,
- Other potential inflows/inputs within the reach of watercourse between discharge and sampling point,
- How close the current quality at the downstream sampling point is to the lower status threshold, and
- Current treatment performance of the WwTW (i.e. is it currently performing well within its permit? Is its current performance beyond LCT?)

C.4.3 Status Deterioration Test

E. Calculate the required discharge quality (Future) to avoid status deterioration:

Model the future discharge flow and measured discharge quality against the status of the downstream sampling point river quality target. From the results, determine if the Future 95%ile discharge quality required in the Future (E) is within LCT.

– If E is > LCT, avoiding status deterioration is possible. Tightening of the quality permit and process upgrades will be required. **AMBER**

– If E is < LCT, avoiding status deterioration may not possible. Quality permit required would be beyond LCT. Carry out growth phasing to determine at what quantum of growth a quality permit at LCT is required. **RED**

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Also undertake a qualitative assessment to investigate possible reasons for this modelling output (same points to investigate as listed under D. The following outcomes may be:

- A solution may need to be confirmed between TWUL and the EA to solve an existing issue before growth comes forward,
- The WwTW may be treating beyond what is considered technically feasible to prevent a deterioration in status,
- The downstream sampling point is a significant distance downstream and therefore the dilution capacity in the reach of watercourse between the mixing point and downstream sampling point is not being taken into account,
- More information is required to confirm if growth would cause a decline in the WwTW performance and therefore what level of treatment should be assumed,
- A catchment model (SIMCAT) may need to be applied.

C.4.4 Future Target Status Test

If the current downstream sampling point status is lower than the waterbody target status, carry out the following test.

F. Calculate the required discharge quality (Current) to achieve future target status:

Model the current discharge flow and measured discharge quality against a river quality target at the mixing point. The upstream water quality is assumed as the midpoint of the future target status. The river quality target at the mixing point is taken as the future target status of the downstream sampling point. From the results, determine if the current 95%ile or mean discharge quality required (G) is within LCT. Then go to step H.

G. Calculate the required discharge quality (Future) to achieve future target status:

Model the future discharge flow and measured discharge quality against a river quality target at the mixing point. The upstream water quality is assumed as the midpoint of the future target status. The river quality target at the mixing point is taken as the status of the downstream sampling point.

– If G and H are < LCT, it is not possible to achieve the future target status based on current discharge flow (pre-growth). Therefore it is not growth that would be preventing the future target status from being achieved, but current limits in technology. **GREEN**

– If G and H are > LCT, it is possible to achieve the future target status. Tightening of the quality permit and process upgrades will be required. **AMBER**

– If G is > LCT and H is < LCT, growth will have a significant impact on the waterbody achieving the future target status. Based on current discharge flow (pre-growth), future target status could be achieved, but the addition of growth results in the requirement for a permit beyond LCT. Go to Phasing Test to determine at what quantum of growth a quality permit at LCT is required. May potentially require revision to housing figures or Article 4.7. **RED**

C.5 Results

'NO DETERIORATION' ASSESSMENT AMP6

	Fleet WwTW AMP6		Hartley Wintney WwTW AMP6	
	Ammonia	Phosphate	Ammonia	Phosphate
River Downstream of Discharge	Fleet Brook		River Hart	
Current permit quality condition (95%ile or AA)	2.5	1	2.5	1
Limit of Conventional Treatment (LCT) (95%ile or AA)	1	0.5	1	0.5
Deterioration Test Selection				
Current river quality at downstream sampling point (90%ile or AA)	0.47	0.46	0.27	0.22
Current river quality at mixing point (90%ile or AA)	0.76	0.64	0.51	0.28
10% No deterioration target at downstream sampling point (90%ile or AA)	**0.52**	**0.50**	0.30	0.24
Quality at mixing point to be maintained (90%ile or AA)	0.76	0.64	**0.51**	**0.28**
Most stringent 10% no deterioration target	*Sampling Point*	*Sampling Point*	*Sampling Point*	*Sampling Point*
Upstream sample point	PLDR0016		PLDR0019	
Downstream sample point	PLDR0063		PLDR0020	
10% Deterioration Test				
Future DWF (m^3/day)	**14561**		**6331**	
Future river quality at mixing point (90%ile or AA) (C)	0.77	0.65	N/A	0.29
Level of deterioration caused by future growth	49%	30%	N/A	4%
Future discharge quality required to limit deterioration to 10% (95%ile or AA) (D)	1.2	0.9	2.1	0.9
Status Deterioration Test				
Status deterioration target of d/s sample point	**Good**	**Poor**	**High**	**Poor**
Downstream sampling point used for status	PLDR0063		PLDR0020	
Status no deterioration target (90%ile or AA)	0.60	0.99	0.3*	1.00
Future DWF (m^3/day)	**14561**		**6331**	
Future discharge quality required (95%ile or AA)	1.4	**Current permit OK**	2.1	**Current permit OK**
Will growth prevent WFD objective of 'No Deterioration' from being achieved?	*No*	*No*	*No*	*No*

*The target to maintain the current river water quality at the point of mixing based on current discharge flow and quality has been applied (calculated to be 0.51mg/l)

FUTURE TARGET STATUS ASSESSMENT AMP6

WFD overall waterbody status target	N/A	**N/A**	**N/A**	**N/A**
River quality target (90%ile or AA)				
Current DWF (m3/day)				
Current discharge quality required (95%ile or AA)				
Future DWF AMP6 (m3/day)				
Discharge quality required AMP 6 (95%ile or AA)				
Will Growth prevent WFD Good Status from being achieved ?	*Assessment not required*		*Assessment not required*	

LOAD STANDSTILL ASSESSMENT AMP6

	Fleet WwTW AMP6	Hartley Wintney WwTW AMP6
	BOD	BOD
Downstream of Discharge	Fleet Brook	River Hart
Current permit quality condition (95%ile)	**10**	**25**
Limit of Conventional Treatment (LCT) (95%ile)	5	5
Discharge Permit Required		
Current DWF (m^3/day)	**14137**	**5958**
Current permit quality condition required (95%ile)	10	25
Future DWF (m^3/day)	**14561**	**6331**
Future permit quality condition required (95%ile)	9.7	23.5

Key to 'Effluent Quality Required'

Green Value – no change to current permit required

Amber Value – Permit tightening required, but within limits of conventionally applied treatment processes

Red Value – not achievable within limits of conventionally applied treatment processes

'NO DETERIORATION' ASSESSMENT AMP6

	Lightwater WwTW AMP6	
	Ammonia	Phosphate
River Downstream of Discharge	Hale Bourne	
Current permit quality condition (95%ile or AA)	2	2
Limit of Conventional Treatment (LCT) (95%ile or AA)	1	0.5
Deterioration Test Selection		
Current river quality at downstream sampling point (90%ile or AA)	0.69	0.26
Current river quality at mixing point (90%ile or AA)	0.41	0.23
10% No deterioration target at downstream sampling point (90%ile or AA)	0.76	0.29
Quality at mixing point to be maintained (90%ile or AA)	**0.41**	**0.23**
Most stringent 10% no deterioration target	*Mixing Point*	*Mixing Point*
Upstream sample point	Acquired via SIMCAT model	
Downstream sample point	PBNR0006	
10% Deterioration Test		
Future DWF (m^3/day)	**6060**	
Future river quality at mixing point (90%ile or AA) (C)	N/A	0.34
Level of deterioration caused by future growth	N/A	48%
Future discharge quality required to limit deterioration to 10% (95%ile or AA) (D)	**Current permit OK**	**1.0**
	*The target to maintain the current river water quality at the po	
Status Deterioration Test		
Status deterioration target of d/s sample point	**Moderate**	**Poor**
Downstream sampling point used for status	PBNR0006	
Status no deterioration target (90%ile or AA)	1.10*	0.97
Future DWF (m^3/day)	**6060**	
Future discharge quality required (95%ile or AA)	**Current permit OK**	**Current permit OK**
Will growth prevent WFD objective of 'No Deterioration' from being achieved?	*No*	*No*

*The quality at the downstream sampling point is significantly worse than the calculated quality at the mixing point, and results in a less stringent target. Therefore, the target to maintain the current water quality at the point of mixing based on current discharge flow and quality has been applied (calculated to be 0.41mg/l).

FUTURE TARGET STATUS ASSESSMENT AMP6

WFD overall waterbody status target	**Good by 2027**	**N/A**
River quality target (90%ile or AA)	0.6	
Current DWF (m3/day)	**6013**	
Current discharge quality required (95%ile or AA)	**Current permit OK**	
Future DWF AMP6 (m3/day)	**6060**	
Discharge quality required AMP 6 (95%ile or AA)	**Current permit OK**	
Will Growth prevent WFD Good Status from being achieved ?	*No - the current ammonia quality condition is sufficient to achieve Good status immediately downstream of the discharge.*	*Assessment not required*

LOAD STANDSTILL ASSESSMENT AMP6

	Lightwater WwTW AMP6
	BOD
Downstream of Discharge	Hale Bourne
Current permit quality condition (95%ile)	**10**
Limit of Conventional Treatment (LCT) (95%ile)	5
Discharge Permit Required	
Current DWF (m^3/day)	**6013**
Current permit quality condition required (95%ile)	10
Future DWF (m^3/day)	**6060**
Future permit quality condition required (95%ile)	9.9

Key to 'Effluent Quality Required'

Green Value – no change to current permit required

Amber Value – Permit tightening required, but within limits of conventionally applied treatment processes

Red Value – not achievable within limits of conventionally applied treatment processes

'NO DETERIORATION' ASSESSMENT AMP9

	Fleet WwTW AMP9		Hartley Wintney WwTW AMP9	
	Ammonia	Phosphate	Ammonia	Phosphate
River Downstream of Discharge	Fleet Brook		River Hart	
Current permit quality condition (95%ile or AA)	2.5	1	2.5	1
Limit of Conventional Treatment (LCT) (95%ile or AA)	1	0.5	1	0.5
Deterioration Test Selection				
Current river quality at downstream sampling point (90%ile or AA)	0.47	0.46	0.27	0.22
Current river quality at mixing point (90%ile or AA)	0.76	0.64	0.51	0.28
10% No deterioration target at downstream sampling point (90%ile or AA)	**0.52**	**0.50**	0.30	0.24
Quality at mixing point to be maintained (90%ile or AA)	0.76	0.64	**0.51**	**0.28**
Most stringent 10% no deterioration target	*Sampling Point*	*Sampling Point*	*Sampling Point*	*Sampling Point*
Upstream sample point	PLDR0016		PLDR0019	
Downstream sample point	PLDR0063		PLDR0020	
10% Deterioration Test				
Future DWF (m^3/day)	**15173**		**7361**	
Future river quality at mixing point (90%ile or AA) (C)	0.78	0.66	N/A	0.31
Level of deterioration caused by future growth	51%	32%	N/A	11%
Future discharge quality required to limit deterioration to 10% (95%ile or AA) (D)	**1.2**	**0.9**	**2.0**	**0.8**
Status Deterioration Test				
Status deterioration target of d/s sample point	**Good**	**Poor**	**High**	**Poor**
Downstream sampling point used for status	PLDR0063		PLDR0020	
Status no deterioration target (90%ile or AA)	0.60	0.99	0.3*	1.00
Future DWF (m^3/day)	**15173**		**7361**	
Future discharge quality required (95%ile or AA)	**1.4**	**Current permit OK**	**2.0**	**Current permit OK**
Will growth prevent WFD objective of 'No Deterioration' from being achieved?	*No*	*No*	*No*	*No*

*The target to maintain the current river water quality at the point of mixing based on current discharge flow and quality has been applied (calculated to be 0.51mg/l)

FUTURE TARGET STATUS ASSESSMENT AMP9

WFD overall waterbody status target	N/A	**N/A**	**N/A**	**N/A**
River quality target (90%ile or AA)				
Current DWF (m3/day)				
Current discharge quality required (95%ile or AA)				
Future DWF AMP6 (m3/day)				
Discharge quality required AMP 6 (95%ile or AA)				
Will Growth prevent WFD Good Status from being achieved ?	*Assessment not required*		*Assessment not required*	

LOAD STANDSTILL ASSESSMENT AMP9

	Ammonia	Ammonia
	BOD	BOD
Downstream of Discharge	2.5	2.5
Current permit quality condition (95%ile)	**10**	**25**
Limit of Conventional Treatment (LCT) (95%ile)	5	5
Discharge Permit Required		
Current DWF (m^3/day)	**14137**	**5958**
Current permit quality condition required (95%ile)	10	25
Future DWF (m^3/day)	**0**	**0**
Future permit quality condition required (95%ile)	**9.2**	**19**

Key to 'Effluent Quality Required'

Green Value – no change to current permit required

Amber Value – Permit tightening required, but within limits of conventionally applied treatment processes

Red Value – not achievable within limits of conventionally applied treatment processes

'NO DETERIORATION' ASSESSMENT AMP9

	Lightwater WwTW AMP9	
	Ammonia	Phosphate
River Downstream of Discharge	Hale Bourne	
Current permit quality condition (95%ile or AA)	2	2
Limit of Conventional Treatment (LCT) (95%ile or AA)	1	0.5
Deterioration Test Selection		
Current river quality at downstream sampling point (90%ile or AA)	0.69	0.26
Current river quality at mixing point (90%ile or AA)	0.41	0.23
10% No deterioration target at downstream sampling point (90%ile or AA)	0.76	0.29
Quality at mixing point to be maintained (90%ile or AA)	**0.41**	**0.23**
Most stringent 10% no deterioration target	*Mixing Point*	*Mixing Point*
Upstream sample point	Acquired via SIMCAT model	
Downstream sample point	PBNR0006	
10% Deterioration Test		
Future DWF (m^3/day)	**6272**	
Future river quality at mixing point (90%ile or AA) (C)	N/A	0.35
Level of deterioration caused by future growth	N/A	52%
Future discharge quality required to limit deterioration to 10% (95%ile or AA) (D)	**Current permit OK**	**0.9**
	*The target to maintain the current river water quality at the po	
Status Deterioration Test		
Status deterioration target of d/s sample point	**Moderate**	**Poor**
Downstream sampling point used for status	PBNR0006	
Status no deterioration target (90%ile or AA)	1.10*	0.97
Future DWF (m^3/day)	**6272**	
Future discharge quality required (95%ile or AA)	**Current permit OK**	**Current permit OK**
Will growth prevent WFD objective of 'No Deterioration' from being achieved?	*No*	*No*

*The quality at the downstream sampling point is significantly worse than the calculated quality at the mixing point, and results in a less stringent target. Therefore, the target to maintain the current water quality at the point of mixing based on current discharge flow and quality has been applied (calculated to be 0.41mg/l).

FUTURE TARGET STATUS ASSESSMENT AMP9

WFD overall waterbody status target	**Good by 2027**	**N/A**
River quality target (90%ile or AA)	0.6	
Current DWF (m3/day)	**6013**	
Current discharge quality required (95%ile or AA)	**Current permit OK**	
Future DWF AMP6 (m3/day)	**6272**	
Discharge quality required AMP 6 (95%ile or AA)	**Current permit OK**	
Will Growth prevent WFD Good Status from being achieved ?	*No - the current ammonia quality condition is sufficient to achieve Good status immediately downstream of the discharge.*	*Assessment not required*

LOAD STANDSTILL ASSESSMENT AMP9

	Ammonia
	BOD
Downstream of Discharge	2
Current permit quality condition (95%ile)	**10**
Limit of Conventional Treatment (LCT) (95%ile)	5
Discharge Permit Required	
Current DWF (m^3/day)	**6013**
Current permit quality condition required (95%ile)	10
Future DWF (m^3/day)	**0**
Future permit quality condition required (95%ile)	9.6

Key to 'Effluent Quality Required'

Green Value – no change to current permit required

Amber Value – Permit tightening required, but within limits of conventionally applied treatment processes

Red Value – not achievable within limits of conventionally applied treatment processes

Appendix D. River Blackwater Water Quality Modelling

D.1 Introduction

To understand the impacts and required mitigation of proposed growth on the river environment across the Blackwater catchment, water quality modelling has been undertaken using existing SIMCAT and SAGIS models provided by the Environment Agency. River water quality modelling using the Environment Agency's SIMCAT modelling software is recognised as the best current approach to support decision making for water quality management, planning to achieve water quality standards and understanding and planning to limit the impacts of proposed development on the water environment. SIMCAT is used to help understand the current situation and, more significantly, predict the effects of future changes.

The baseline for each of SIMCAT and SAGIS models has been updated using river quality, flow and effluent monitoring observations over the period 2013 to 2015 and proposed growth scenarios, split across the four growth phases outline in the WCS, run to determine the permit requirements for individual WwTWs to meet a number of water quality requirements, including a 10% deterioration limit in current river quality and achievement of future water quality targets / status under the Water Framework Directive (WFD).

D.2 Modelling Software

D.2.1 **SIMCAT**

SIMCAT is a computer model that allows SIMulation of the water quality of CATchments. The model was developed from the 1970s and continues to evolve through Environment Agency development. It is a stochastic model which means it takes data in the form of statistics - means, standard deviations and numbers of samples – and produces results in the form of statistics and probabilities. The user feeds in statistics on water quality and flow for all inputs including point discharges and diffuse pollution to rivers, the computer program combines the distributions using a method called Monte Carlo. The calculations cascade down the catchment, adding inputs as they proceed downstream and recalculating the resultant river quality.

For this study SIMCAT 14.8 software was used.

D.2.2 SAGIS

The Source Apportionment Geographical Information System (SAGIS) represents the evolution of mass balance water quality modelling. It enables water quality planning centred around engaging all contributing sectors and implementing the 'Polluter Pays Principle'. The system utilises SIMCAT software to run mass balance equations which reference data stored in national and regional databases, these are then placed in the form of map outputs in the GIS interface. As with SIMCAT, the modelling software accounts for point and diffuse sources, but the SAGIS model allows for greater input and interpretation of diffuse sources, including industrial discharges, waste water discharges, combined sewer outfalls, storm tank discharges, mine waters, arable runoff, livestock inputs, atmospheric, urban runoff and on site waste water treatment works to enable a better understanding of source apportionment in individual catchments.

For this study, the updated SAGIS model was run using SIMCAT 14.8 software.

D.3 Existing SIMCAT and SAGIS Models

In 2006, the Environment agency produced a suite of National SIMCAT models, covering the 10 River Basin Districts in England and Wales, which were subsequently used by the Environment Agency to assess the pressures, risks and options for water quality improvements via Programmes of Measures in relation to individual water bodies at River Basin District scale and inform the first round of River Basin Management Plans.

The Thames RBD SIMCAT model covers the study area. The National SIMCAT model produced for the Thames RBD in 2006 has undergone a number of updates and refinements since its original construction, including an update and recalibration in 2009[57] to include updated river quality and flow observations between April 2005 and March 2008. The existing model was built and calibrated for Ammonia, BOD, phosphate and total organic nitrate.

Taking the Thames RBC SIMCAT model as a base, a calibrated SAGIS model of the Blackwater Catchment was built in 2013, with the baseline period 2006 – 2008. The Blackwater SAGIS model was built and calibrated for phosphate only.

Further details on the two existing models, provided by the Environment Agency are provided in Table D-1.

Table D-1 Model Details

Model Name	Coverage	Determinands	Model Features
Blackwater SAGIS	River Blackwater (from its headwater to its confluence with the River Whitewater)	Phosphate	Evolution of the Thames RBD SIMCAT model. Updated flow data, WwTW details, specific flow and quality inputs from CSO's, storm tanks, urban runoff and agriculture, and time of travel improvements included. Time period 2006-2008.
Thames River Basin District (RBD) SIMCAT model Wey and Loddon	River Wey and Loddon catchments (including the River Blackwater)	Ammonia, BOD, Phosphate, Total Organic Nitrate	Calibrated SIMCAT model for the Thames RBD (2009). Time period 2005-2008.

D.4 Baseline

D.4.1 Model Build

Minimal changes were been made to the Blackwater SAGIS model structure, the following features were removed:

– "Feature No 461 EVERSLEY QUARRY (Industrial Discharge)"; feature removed due to no recently recorded discharge flow or quality data
– "Feature No 987 WQPLDR0014 (River Monitoring Point)"; feature removed as quality sampling point is now closed.

The Thames RBC model was 'trimmed' to only include the River Blackwater and Cove Brook reaches to reduce modelling run times.

D.4.2 Assumptions

The following assumptions have been applied to both the Blackwater SAGIS model and Thames RBC model;

– Aldershot WwTW; latest discharge quality data has been used as it has been assumed that this WwTW can maintain its current treatment performance despite receiving some growth;
– Ash Vale WwTW; latest discharge quality data has been used as it has been assumed that this WwTW can maintain its current treatment performance;
– Eversley WwTW; original discharge quality data has been retained due to no recently recorded phosphate discharge quality data, and
– Lower Common WwTW; original discharge quality data has been retained due to no recently recorded phosphate discharge quality data.

D.4.3 Updating the Baseline

Observed data has been provided by the Environment Agency and has been applied to update both the Blackwater SAGIS model and Thames RBC model. Observed data from the period January 2013 to December 2015 has been used to derive the updated baseline for the following datasets;

– River flow data,
    - Gauged daily flow at the gauging station Blackwater at Farnborough (39123).
– River quality sampling data,
    - Water quality samples taken at nine sampling locations on the River Blackwater and Cove Brook.
– Discharge flow data,

[57] WRc for the Environment Agency, May 2009, Thames and Medway SIMCAT Projects – Calibration Report – Final Report, WRc Ref: UC8002.01,

  - Mean measured flow for six WwTWs provided by the Environment Agency,
  - Mean measured flow for Camp Farm WwTWs provided by Severn Trent Services.
- Discharge quality data,
  - Discharge quality samples taken at seven WwTWs provided by the Environment Agency.
- River Quality Targets,
  - 10% deterioration targets derived from observed current water quality (see below for further information),
  - Water quality sampling site specific phosphate status deterioration targets for the nine sampling points provided by the Environment Agency (see below for further information),.

It should be noted that none of the diffuse input files (.npd) for highways or other flows were altered as part of the updated baseline.

D.4.4 River Quality Targets

Individual targets (Table D-2) have been applied to each of the WwTW discharges to reflect the assessment requirements for each WwTW.

The WwTWs which require permit reviews (Camp Farm, Camberley and Eversley) have had a 10% deterioration target calculated and applied. The 10% deterioration targets have been derived from the calculated water quality downstream of each of the WwTW discharges taken from the updated baseline model. An additional 10% of the updated current river quality has then been added to give the 10% deterioration target.

The remainder of the WwTWs discharging to the River Blackwater, but which do not require permit review have had the site specific status target applied. The status target has been applied to ensure there is no cumulative effect of additional flows at WwTW discharges causing status deterioration to occur downstream.

Table D-2 WwTW river quality targets

WwTW	Sampling Point	Phosphate target applied (annual average mg/l)	Ammonia target applied (90%ile mg/l)
Camp Farm	PLDR0011	0.502	1.09
Camberley	PLDR0135	0.317	0.485
Eversley	PLDR0007	0.237	0.518

D.4.5 Manual Calibration

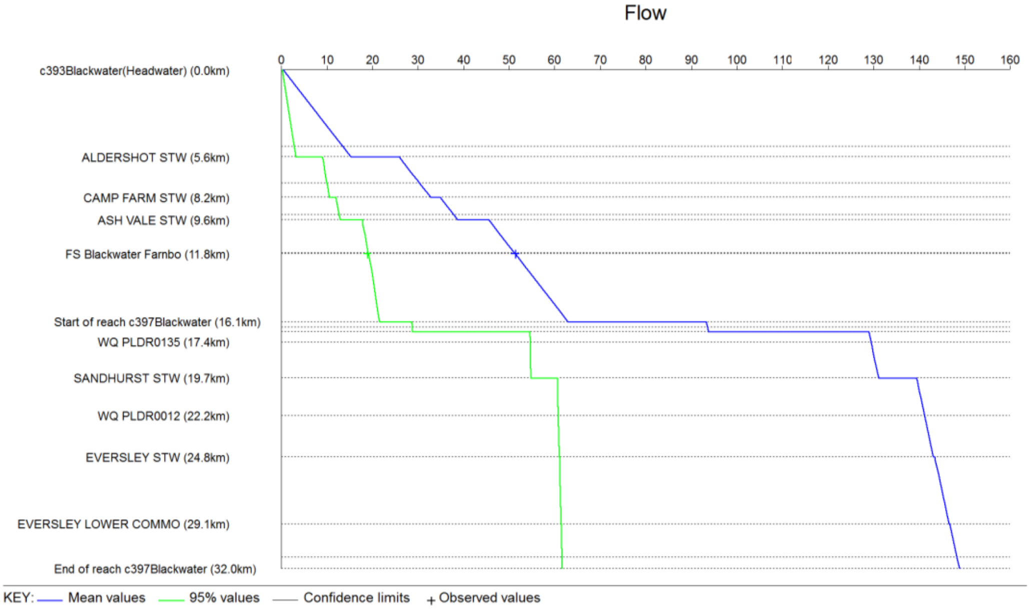
River Flow
The modelled flow from SIMCAT 14.8 was calibrated against observed data from the period January 2013 to December 2015.

The aim of the manual flow calibration is to meet the calibration criteria of ±1 standard deviation of both the mean and 95^{th} percentile observed value at the flow gauge site Blackwater at Farnborough (39123). Where possible, this was improved to match the modelled values of the observed data.

The existing diffuse flows inputs to the reaches and waterbodies in the Blackwater SAGIS model provided a fair baseline calibration to the observed flow gauge 39123. To improve the calibration, the diffuse flow inputs (excluding the .npd datasets) into Reach 393 of the model were increased.

Figure D-1 indicates a good match between the calibrated flow and observed flow at the gauging station.

Figure D-1 Manual calibration results of river flow for the updated Blackwater SAGIS baseline model



River Quality

Phosphate

The modelled quality from SIMCAT 14.8 was calibrated for phosphate against observed data for the period from January 2013 to December 2015.

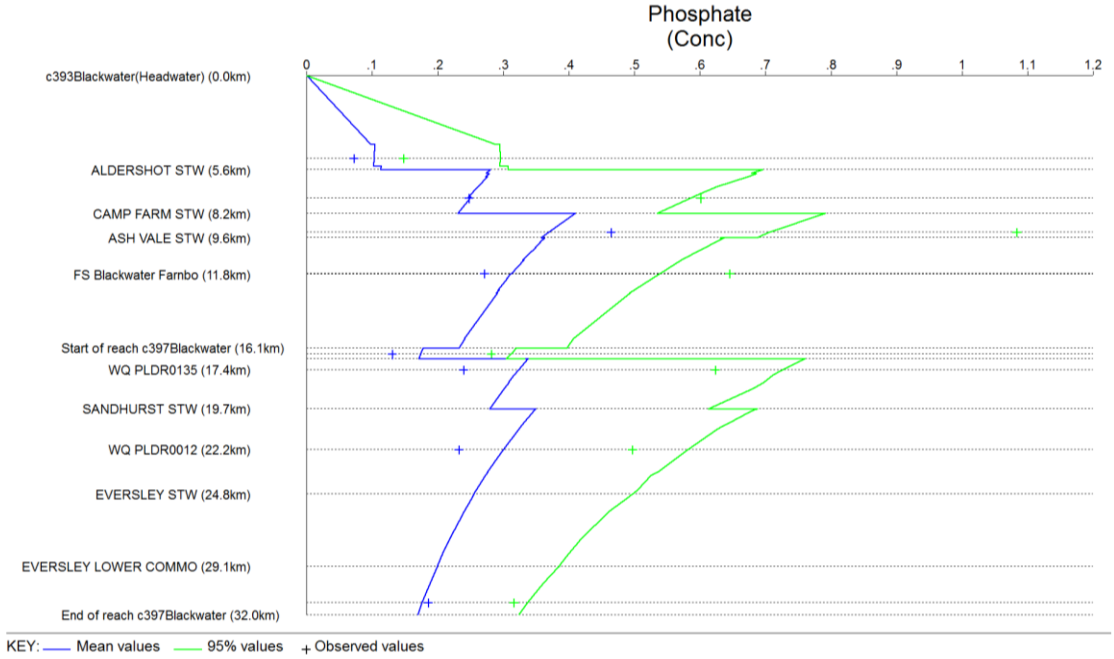
The aim of the manual quality calibration was to meet the calibration criteria of ±1 standard deviation of the observed value at water quality sites.

During manual calibration diffuse inputs were changed to account for the missing inputs from unmodelled watercourses, effluent discharges and actual diffuse inputs to the river network. Overall a reasonable calibration was achieved across the length of the Blackwater for the mean given the number of WwTW inputs and water quality sampling points along the watercourse. The fit to the 95%ile values was not as good as that achieved for the mean values due to the variable nature of some of the data.

SIMCAT cannot realistically replicate observed data if within a reach there are numerous river quality monitoring points and discharges, with significant variability. Figure D-2 shows the variability within the Blackwater and the model calibration within that reach. Due to the inconsistent nature of the observed concentrations at river quality points within close proximity of each other, it has not been possible to reproduce the observed data in this stretch at all points.

The manual calibration for the updated baseline achieved a similar result to the manual calibration achieved for the existing model.

Figure D-2 Manual calibration results of river quality for the updated Blackwater SAGIS baseline model



D.4.6 Auto-Calibration

Following manual calibration, the model was auto-calibrated where necessary to improve the match to the observed data in the Blackwater catchment. Auto-calibration has been reviewed and for sites which auto-calibration is obviously inappropriate have had auto-calibration either supressed or removed completely. In most cases, no alterations were required from the existing model auto-calibration.

Consultation with the Environment Agency confirmed a poor ammonia calibration around the Camp Farm WwTW discharge, whereby the model is overestimating predicted loads and concentrations of ammonia within the River Blackwater. This therefore represents a precautionary approach when using the model to assess the impact of the proposed growth on the water environment.

D.5 What-If Scenarios

D.5.1 Growth Phases

Four growth scenarios were assessed against the calibrated updated Blackwater SAGIS baseline model to determine the impact of phased growth across the plan period.

Additional discharge flows were calculated by applying the following steps:

a. The WwTW catchment in which the development site falls within has been identified,

b. Using the proposed housing trajectory data (as provided by the respective local authority), the number of dwellings per AMP period has been determined for each WwTW,

c. The number of dwellings per WwTW per AMP period has then been multiplied by the consumption rate and occupancy rate to define the additional wastewater flow from residential dwellings,

d. Additional flow from employment is added to give the total additional wastewater flow from growth,

e. The total additional wastewater flow from growth is then added to the current (2013-15) measured discharge flow at each WwTW.

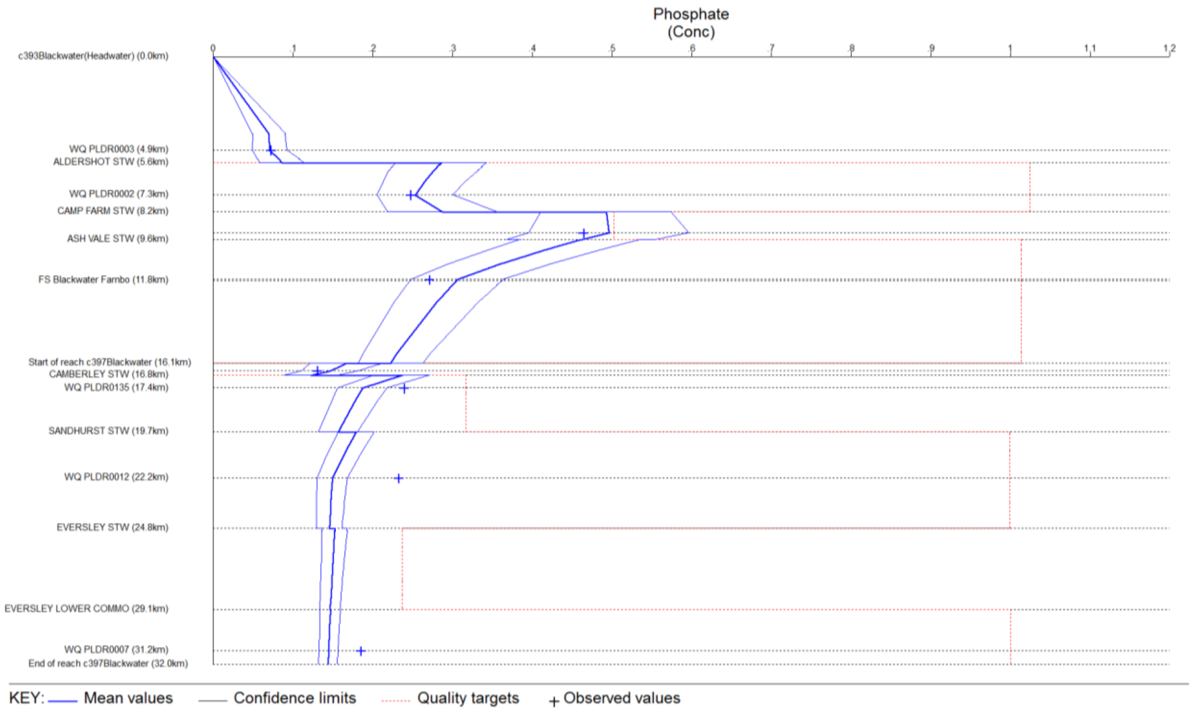
Table D-3 Total discharge flow per WwTW, per AMP period

WwTW	Discharge Flows (Ml/d)				
	Current	AMP6	AMP7	AMP8	AMP9
Aldershot	10.573	10.742	10.900	10.947	10.956
Camp Farm	2.121	2.529	3.031	3.582	3.583

WwTW	Discharge Flows (Ml/d)				
	Current	AMP6	AMP7	AMP8	AMP9
Camberley	35.177	36.002	36.903	38.052	38.624
Sandhurst	8.320	8.344	8.374	8.374	8.374
Eversley	0.300	0.309	0.345	0.345	0.345

For each growth phase, the Blackwater SAGIS model was updated with the calculated discharge flows for each WwTW. All other data inputs including the river targets remained unchanged.

Figure D-3 River quality results for AMP6 growth phase with river quality targets



D.5.2 Modelled Scenarios

For each growth phase, 2 scenarios were run (a total of 8 no. runs), as follows:

– **10% Deterioration**

- Run Type 4 (running the full gap filled model) was used for each growth phase to demonstrate the effect of additional flows on river quality.

- Run Type 8 (setting the discharge standards to meet the river quality targets, with aspects of no deterioration) was used for each growth phase, applying the river quality targets as detailed in Table D-2.

– **Future Target Status**

- Run Type 9 (setting the discharge standards to meet the river quality targets, assuming mid-class upstream quality standards) was used for the updated baseline model.

Appendix E. Reasons for setting an Alternative Objective

Where certain conditions apply and are met then alternative objectives have been set for water bodies; these involve taking an extended time period to reach the objective or meeting a lower status or a combination of both. In some water bodies it is recognised that time constraints on putting actions in place, or the time taken for the environment to respond once actions are implemented, mean that the objective will only be achieved over more than one river basin management planning cycle. An objective of less than good status is set where:

– there is currently no solution to the problem;

– the costs of taking action exceed the benefits; and/or

– background conditions in the environment mean achieving good status is not possible.

E.1 Justification for 'Moderate' Ecological Status Objective for River Blackwater

Section 5.4 of the Thames RBMP Part 2: River basin management planning overview and additional information[58] sets out the specific circumstances for the particular elements and the justification behind the alternative objective. The individual sub-elements 'Macrophytes and Phytobenthos Combined' and 'Phosphate' of the River Blackwater (GB106039017290) waterbody have had alternative objectives of 'Moderate' and 'Poor' status to be achieved by 2021 and 2027. This has then been applied to the overall waterbody, which has an objective of 'Moderate' Ecological status by 2021 and 2027.

The reason the alternative objective has been set is described as '**Technically infeasible – No known technical solution is available**'.

The explanation for the use of this exemption, as detailed in Table 6 of the Thames RBMP, is provided below.

In England it is generally currently considered to be technically infeasible to build a sewage treatment works that will reduce phosphate in discharges to less than 0.5mg/l.

If a water body requires discharges of less than 0.5mg/l phosphate to achieve good status then this reason has been used to justify a less stringent objective under Article 4(5).

The exemptions apply to the phosphate and the impacted biological elements such as phytobenthos and macrophytes.

Trials are underway involving water and sewerage companies to investigate sewage treatment technologies that could be used to reduce phosphate below 0.5 mg/l. The trials will determine how effective these technologies are and are due to be complete by 2017. The results of the trials will inform the review and update of river basin management plans in 2021.

This exemption has been used when the environmental and socioeconomic needs served by the sewage treatment works to dispose of sewage cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs, as required by article 4(5)(a).

[58] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/500573/Part_2_River_basin_management_planning_process_overview_and_additional_information.pdf

Appendix F. Background to Wildlife Sites

F.1 Blackwater Valley Site of Special Scientific Interest (SSSI)[59]

The site comprises an area of unimproved alluvial meadows, swamp and wet valley alderwood in the Blackwater Valley between the towns of Sandhurst and Blackwater. The complex of meadows is grazed by stock and supports rich plant communities, with a number of species associated with ancient grassland sites. Such meadows are a nationally rare and threatened habitat. This was the largest, richest site for wildlife found in a survey of the valley conducted by the Berkshire, Buckinghamshire and Oxfordshire Naturalists Trust in 1986. The meadows are bounded by hedgerows, streams and ditches, and the River Blackwater runs through the site. An area of wet deciduous woodland supports a rare species of sedge. The structural and floristic diversity of the site provides habitats suitable for a wide range of insects and other invertebrates. The meadows provide a range of habitats from relatively well-drained grassland to seasonally waterlogged marsh, and from acid to neutral conditions.

F.2 Lavell’s Lake (Dinton Pastures) Local Nature Reserve (LNR)

Lavell's Lake has a rich and varied bird population. It is nationally known for its migratory and resident species including, waterfowl, waders and other migratory birds, dragonfly, and amphibians. Habitats present include meadows, tern islands, amphibian ponds and wader scrapes. The site is also known as Dinton Pastures Country Park.

F.3 Lodge Wood and Sandford Mill SSSI[60]

Although Lodge Wood is shown on Rocque's map of Berkshire in 1761 and may be an ancient woodland site, management has modified its original composition and structure. Both woodlands are dominated by alder and crack willow *Salix fragilis*, together with some ash. There is a relatively poorly developed understorey which includes hazel, dogwood, elder, blackthorn and red currant *Ribes sylvestre*. The southern part of Lodge Wood is drier, and dominated by pedunculated oak and ash, with some hawthorn and spindle and occasional planted exotics.

The humic soils which have high levels of nutrients following enrichment by floodwaters, support a limited ground flora, heavily dominated by stinging nettle *Urtica dioica*, goosegrass *Galium aparine* and ground-ivy *Glechoma hederacea*. Less common species include primrose *Primula vulgaris*, wood anemone *Anemone nemorosa*, dog's mercury *Mercurialis perennis* and lesser celandine *Ranunculus ficaria*, together with marsh marigold *Caltha palustris* and moschatel *Adoxa moschatellina* on wetter ground. The drier soils in the southern part of Lodge Wood support stands of bluebell *Hyacinthoides non-scripta* and wild daffodil *Narcissus pseudonarcissus*. Twenty-two species of moss and liverwort have been recorded.

Both Lodge Wood and Sandford Mill Woods support large colonies of Loddon Lily or summer snowflake *Leucojum aestivum*. This species has a very restricted distribution in Britain, and is listed in the British Red Data Book of vascular plants. In England it is largely confined to the Thames Basin, with one centre of distribution between Reading and Windsor, and another between Goring and Abingdon. It was first recorded from near Reading in 1799, and from the confluence of the Thames and Loddon in 1809. Because of its mode of dispersal the Loddon Lily is almost wholly associated with rivers, and the majority of colonies are found on islands or in dense willow carr. After flowering in April or May, when it is pollinated by bees, the fruits develop flotation chambers. Although they remain attached to the stem, in the event of flooding the stems break and the fruits are carried downstream and stranded amongst debris in thickets or on flood-plains. The bulbs can also be transported during heavy floods and deposited on river banks. The two small sites at Lodge Wood and Sandford Mill are estimated to contain over 10% of the total English population of Loddon Lily.

F.4 Sites of Importance for Nature Conservation (SINCs)

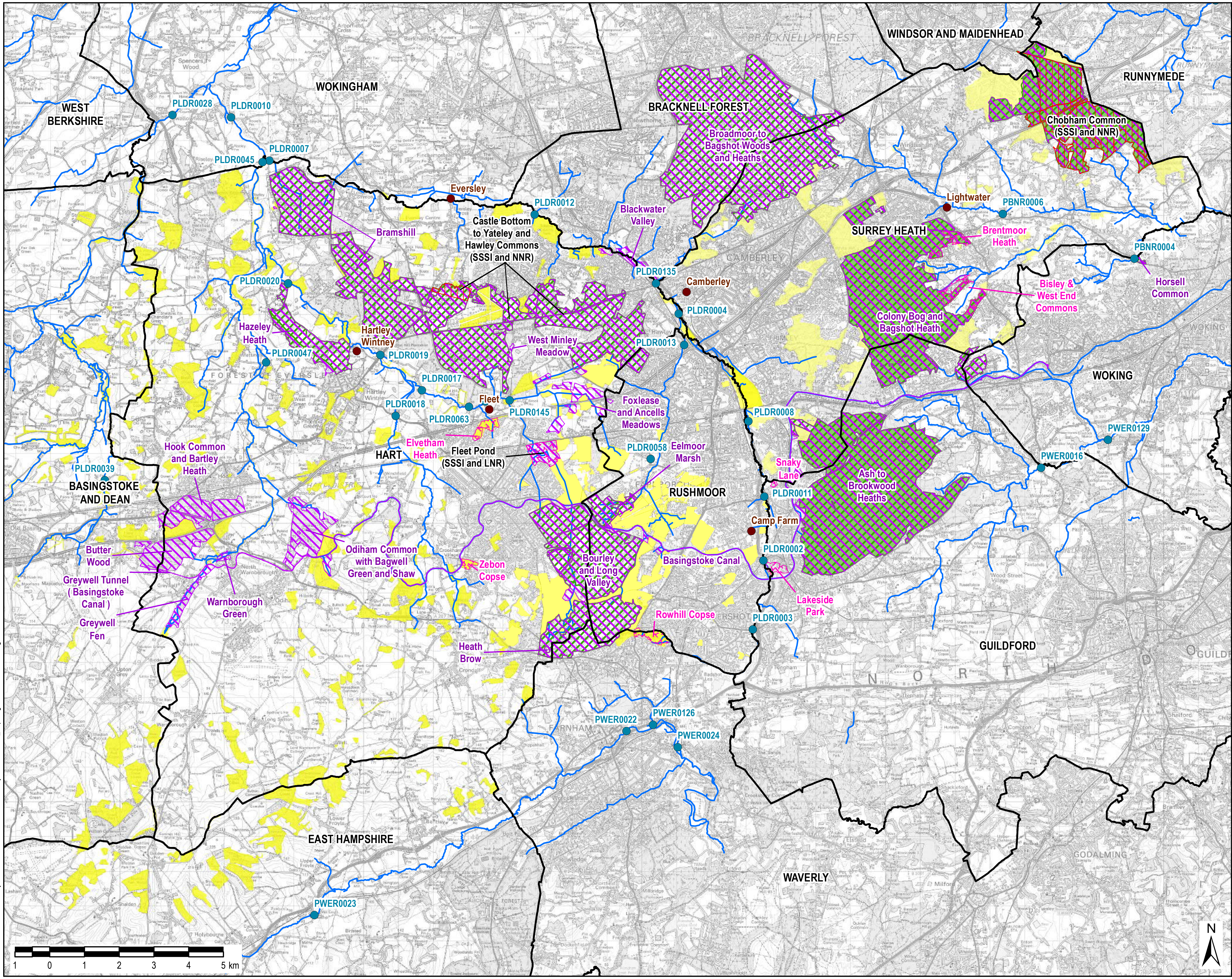
Table F-1 below contains details of the qualifying characteristics of the SINCs that have been identified as being hydrologically connected to WwTW discharges.

[59] Natural England (1992) Citation Blackwater Valley SSSI
[60] Natural England (1982) Citation Lodges Wood and Sandford Mill

Table F-1 Detail on SINCs identified as hydrologically connected to WwTW discharges

SINC Ref	SINC Name	SINC Criteria	Species supported that meet Section 6 of SINC Selection Criteria
HA0089	Old Chapel Farm Meadow	5A/6A	Carex vesicaria (Bladder-Sedge) [CS] Sanguisorba officinalis (Great Burnet) [CS]
HA0143	Fleethill Farm Meadows	2A/2B/2D/5B	
HA0194	Eversley Lakes	2D/6A/6B	Carex vesicaria (Bladder-Sedge) [RDB]
HA0219	Yateley Lakes	2D/6A/6B	Carex vesicaria (Bladder-Sedge) [CS] Stellaria neglecta (Greater Chickweed) [CS]
HA0223	Yateley Bridge Lake & Copse	1A/5A	
HA0239	Darby Green Lakes	6A/6B	Ceratophyllum demersum (Rigid Hornwort) [nHS] Lotus tenuis (Narrow-Lvd Bird's-Foot-Trefoil) [nHR] Myriophyllum alterniflorum (Alternate Water-Milfoil) [CS] Nymphoides peltata (Fringed Water-Lily) [NS]
HA0246	Darby Green Meadows	2A	
HA0249	Upper Meadow & Pond	2A/6A	Sanguisorba officinalis (Great Burnet) [CS]

F.5 Locations of WRCs and Pathways to Wildlife Sites



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- District Boundary
- WwTW Locations
- Sample Sites
- SINC
- Rivers

Designated Sites Intersecting Hart, Surry Heath and Rushmoor Districts

- National Nature Reserve (NNR)
- Local Nature Reserve (LNR)
- Site of Specific Scientific Interest (SSSI)
- Thames Basin Heath Special Protection Area (SPA)
- Thursley, Ash, Pirbright & Chobham Special Area of Conservation (SAC)

Purpose of Issue
FINAL

Client
HART, RUSHMOOR AND SURREY HEATH COUNCILS

Project Title
HART, RUSHMOOR AND SURREY HEATH WATER CYCLE STUDY

Drawing Title
LOCATIONS OF DESIGNATED WILDLIFE SITES

Drawn	Checked	Approved	Date
CN	JW	IHH	09/03/2017

AECOM Internal Project No.	Scale @ A3
60507863	1:100,000

AECOM
Scott House
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
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Drawing Number
FIGURE 7.1

Rev
01

File Name: I:\5004 - Information Systems\60507863 Hart Rushmoor Surrey Heath WCS\02_Maps\Figure X - Location of designated wildlife sites.mxd

Appendix G. Water Neutrality

Water Neutrality is defined in Section 6.7. This appendix provides supplementary information and guidance behind the processes followed.

G.1 Twin-Track Approach

Attainment of water neutrality requires a 'twin track' approach whereby water demand in new development is minimised as far as possible. At the same time measures are taken, such as retrofitting of water efficient devices on existing homes and business to reduce water use in existing development.

In order to reduce water consumption and manage demand for the limited water resources within the study area, a number of measures and devices are available[61], including:

- cistern displacement devices;
- flow regulation;
- greywater recycling;
- low or variable flush replacement toilets;
- low flow showers;
- metering;
- point of use water heaters;
- pressure control;
- rainwater harvesting;
- variable tariffs;
- low flows taps;
- water audits;
- water butts;
- water efficient garden irrigation; and,
- water efficiency promotion and education.

The varying costs and space and design constraints of the above mean that they can be divided into two categories, measures that should be installed for new developments and those which can be retrofitted into existing properties. For example, due to economies of scale, to install a rainwater harvesting system is more cost effective when carried out on a large scale and it is therefore often incorporated into new build schools, hotels or other similar buildings. Rainwater harvesting is less well advanced as part of domestic new builds, as the payback periods are longer for smaller systems and there are maintenance issues. To retrofit a rainwater harvesting system can have very high installation costs, which reduces the feasibility of it.

However, there are a number of the measures listed above that can be easily and cheaply installed into existing properties, particularly if part of a large campaign targeted at a number of properties. Examples of these include the fitting of dual-flush toilets and low flow showers heads to social housing stock, as was successfully carried out in Preston by Reigate and Banstead Council in conjunction with Sutton and East Surrey Water and Waterwise[62].

G.2 The Pathway Concept

The term 'pathway' is used here as it is acknowledged that, to achieve any level of neutrality, a series of steps are required in order to go beyond the minimum starting point for water efficiency which is currently mandatory for new development under current and planned national planning policy and legislation.

There are no statutory requirements for new housing to have a low water use specification as previous government proposals to make different levels compulsory have been postponed pending government review. For non-domestic development, there is no statutory requirement to have a sustainability rating with the Building Research Establishment Environmental Assessment Method (BREEAM), only being mandatory where specified by a public body in England such as:

- Local Authorities incorporating environmental standards as part of supplementary planning guidance;
- Department of Health for new healthcare buildings and refurbishments;
- Department for Education for all projects valued at over £500K (primary schools) and £2million (secondary schools);

[61] Source: Water Efficiency in the South East of England, Environment Agency, April 2007.
[62] Preston Water Efficiency Report, Waterwise, March 2009, www.waterwise.org.uk

– English Partnerships (now incorporated into the Homes and Communities Agency) for all new developments involving their land; and

– Office of Government Commerce for all new buildings.

Therefore, other than potential local policies delivered through a Local Plan, the only water efficiency requirements for new development are through the Building Regulations[63] where new homes must be built to specification to restrict water use to 125l/h/d or 110l/h/d where the optional requirement applies. However, the key aim of the Localism Act is to decentralise power away from central government towards local authorities and the communities they serve. It therefore creates a stronger driver for local authorities to propose local policy to address specific local concerns. New local level policy is therefore key to delivering aspirations such as water neutrality and the Localism Act provides the legislative mechanism to achieve this in the study area.

In addition to the steps required in new local policy, the use of a pathway to describe the process of achieving water neutrality is also relevant to the other elements required to deliver it, as it describes the additional steps required beyond 'business as usual' that both developers and stakeholders with a role (or interest) in delivering water neutrality would need to take, for example:

– the steps required to deliver higher water efficiency levels on the ground (for the developers themselves); and

– The partnership initiative that would be required beyond that normally undertaken by local authorities and water companies in order to minimise existing water use from the current housing and business stock.

Therefore, the pathway to neutrality described in this section of the WCS requires a series of steps covering:

– technological inputs in terms of physically delivering water efficiency measures on the ground;

– local planning policies which go beyond national guidance; and

– partnership initiatives and partnership working.

The following sections outline the types of water efficiency measures which have been considered in developing the technological pathway for the water neutrality target scenarios.

G.3 Improving Efficiency in Existing Development

G.3.1 Metering

The installation of water meters in existing housing stock has the potential to generate significant water use reductions because it gives customers a financial incentive to reduce their water consumption. Being on a meter also encourages the installation and use of other water saving products, by introducing a financial incentive and introducing a price signal against which the payback time of new water efficiency measures can be assessed. Metering typically results in a 5-10 per cent reduction from unmetered supply, which equates to water savings of approximately 60l per household per day, assuming an occupancy rate of 2.4[64] for existing properties.

In 2009, DEFRA instructed Anna Walker (the Chair of the Office of Rail Regulation) to carry out an independent review of charging for household water and sewerage services (the Walker Review)[65]. The typical savings in water bills of metered and unmetered households were compared by the Walker review, which gives an indication of the levels of water saving that can be expected (see Table G-1).

Table G-1: Change in typical metered and unmetered household bills

2009-10 Metered	2009-10 Unmetered	2014-15 Metered	2014-15 Unmetered	% change Metered	% change Unmetered
348	470	336	533	-3	13

G.3.2 Low or Variable Flush Toilets

Toilets use about 30 per cent of the total water used in a household[66]. An old style single flush toilet can use up to 13 litres of water in one flush. New, more water-efficient dual-flush toilets can use as little as 2.6 litres[67] per flush. A study carried out in 2000 by Southern Water and the Environment Agency[68] on 33 domestic properties in Sussex

[63] Part G of the Building Regulations
[64] 2.4 is used for existing properties and new properties. This figure was agreed with SEWL and AWL prior to the assessment
[65] Independent Walker Review of Charging and Metering for Water and Sewerage services, DEFRA, 2009, http://www.defra.gov.uk/environment/quality/water/industry/walkerreview/
[66] http://www.waterwise.org.uk/reducing_water_wastage_in_the_uk/house_and_garden/toilet_flushing.html
[67] http://www.lecico.co.uk/
[68] The Water Efficiency of Retrofit Dual Flush Toilets, Southern Water/Environment Agency, December 2000

showed that the average dual flush saving observed during the trial was 27 per cent, equivalent to a volumetric saving of around 2.6 litres per flush. The study suggested that replacing existing toilets with low or variable flush alternatives could reduce the volume of water used for toilet flushing by approximately 27 per cent on average.

G.3.3 Cistern Displacement Devices

These are simple devices which are placed in the toilet cistern by the user, which displace water and therefore reduce the volume that is used with each flush. These can be easily installed by householders and are very cheap to produce and supply. Water companies and environmental organisations often provide these for free.

Depending on the type of device used (which can vary from a custom made device, such bag filled with material that expands on contact with water, to a household brick) the water savings can be up to 3 litres per flush.

G.3.4 Low Flow Taps and Showers

Flow reducing aerating taps and shower heads restrict the flow of water without reducing water pressure. Thames Water estimates that an aerating shower head can cut water use by 60 per cent with no loss of performance[69].

G.3.5 Pressure Control

Reducing pressure within the water supply network can be an effective method of reducing the volume of water supplied to customers. However, many modern appliances, such as Combi boilers, point of use water heaters and electric showers require a minimum water pressure to function. Careful monitoring of pressure is therefore required to ensure that a minimum water pressure is maintained. For areas which already experience low pressure (such as those areas with properties that are included on a water company's DG2 Register), this is not suitable. Limited data is available on the water savings that can be achieved from this method.

G.3.6 Variable tariffs

Variable tariffs can provide different incentives to customers and distribute a water company's costs across customers in different ways.

The Walker review assessed variable tariffs for water, including:

- rising block tariff;
- a declining block tariff;
- a seasonal tariff; and,
- time of day tariff.

A rising block tariff increases charges for each subsequent block of water used. This can raise the price of water to very high levels for customers whose water consumption is high, which gives a financial incentive to not to consume additional water (for discretionary use, for example) while still giving people access to low price water for essential use.

A declining block tariff decreases charges for each subsequent block of water used. This reflects the fact that the initial costs of supply are high, while additional supply has a marginal additional cost. This is designed to reduce bills for very high users and although it weakens incentives for them to reduce discretionary water use, in commercial tariffs it can reflect the economies of scale from bulk supplies.

A seasonal tariff reflects the additional costs of summer water supply and the fact that fixed costs are driven largely by the peak demand placed on the system, which is likely to be in the summer.

Time-of-day tariffs have a variable cost per unit supply according to the time of the day when the water is used; this requires smart meters. This type of charging reflects the cost of water supply and may reduce an individual household's bill; it may not reduce overall water use for a customer.

G.3.7 Water Efficient Appliances

Washing machines and dishwashers have become much more water efficient over the past twenty years. An old washing machine may use up to 150 litres per cycle, whereas modern, efficient machines may use as little as 35 litres per cycle. An old dishwasher could use up to 50 litres per cycle, whereas modern models can use as little as 10 litres. However, this is partially offset by the increased frequency with which these are now used. It has been estimated[70] that dishwashers, together with the kitchen tap, account for about 8-14 per cent of water used in the home.

[69] http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/9047.htm
[70] Water Efficiency Retrofitting: A Best Practice Guide, Waterwise, 2009, www.waterwise.org.uk

The Water Efficient Product Labelling Scheme provides information on the water efficiency of a product (such as a washing machine) and allows the consumer to compare products and select the most efficient product. The water savings from installation of water efficient appliances vary depending on the type of machine used.

G.3.8 Non-Domestic Properties

There is also the potential for considerable water savings in non-domestic properties. Depending on the nature of a business, water consumption may be high, for example food processing businesses. Even in businesses where water use is not high, such as B1 Business or B8 Storage and Distribution, there is still the potential for water savings using the retrofitting measures listed above. Water audits are useful methods of identifying potential savings and implementation of measures and installation of water saving devices could be funded by the asset owner; this could be justified by significant financial savings which can be achieved through implementation of water efficient measures. Non-domestic buildings such as warehouses and large scale commercial (e.g. supermarkets) property have significant scope for rainwater harvesting on large roof areas.

G.3.9 Water Efficiency in New Development

The use of efficient fixtures and fittings as described above also apply to the specification of water use in the building of new homes. The simplest way of demonstrating the reductions that use of efficient fixtures and fitting has in new builds is to consider what is required in terms of installation of the fixtures and fittings at different ranges of specification to ensure attainment of water use requirements under the Building Regulations or the optional requirement. The Cambridge WCS[71] gave a summary of water use savings that can be achieved by the use of efficient fixtures and fittings, as shown below in Table G-2.

Table G-2: Summary of water savings borne by water efficiency fixtures and fittings

Component	Building Regs 125 l/h/d[72]	Building Regs Optional Target 110 l/h/d[73]	80 l/h/d	62 l/h/d
Toilet flushing	18.75	12.32	8.4 + 8.4 c	8.4 + 8.4 c
Taps	22.69	20.46	18 a	18 a
Shower	39.77	31.81	18	18
Bath	18.52	17.02	22.4 b	22.4 b
Washing machine	15.61	15.61	7.65 + 7.65 c	7.65 + 7.65 c
Dishwasher	4.1	4.1	3.6	3.6
Recycled water	0	0	-16.1	-32.2
External use	5	5		
Total per head	124	106	78	61.9
TOTAL PER HOUSEHOLD	**282.5**	**241.3**	**171.6**	**136.18**

a Combines kitchen sink and wash hand basin

b 120 litre bath

c rainwater/greywater harvesting

Table F-2 highlights that in order to achieve water use around 80 l/h/d, water re-use technology (rainwater harvesting and/or greywater recycling) needs to be incorporated into the development.

In using the BRE Water Demand Calculator[74], the experience of AECOM BREEAM/CHS assessors is that it is theoretically possible to get close to 80l/h/d through the use of fixture and fittings, but that this requires extremely high specification efficiency devices which are unlikely to be acceptable to the user and will either affect the saleability of new homes or result in the immediate replacement of the fixtures and fittings upon habitation. This includes baths at capacity below 120 litres, and shower heads with aeration which reduces the pressure sensation of the user. For this reason, it is not considered practical to suggest that 80l/h/d can be reached without some form of water recycling.

[71] Cambridge (and surrounding major growth areas) WCS Phase 2, Halcrow, 2010
[72] Figures calculated using the water efficiency calculator for new dwellings and maximum fittings consumption level provided in the Building Regulations Approved Document G
[73] Figures calculated using the water efficiency calculator for new dwellings and maximum fittings consumption optional requirement level provided in the Building Regulations Approved Document G
[74] http://www.thewatercalculator.org.uk/faq.asp

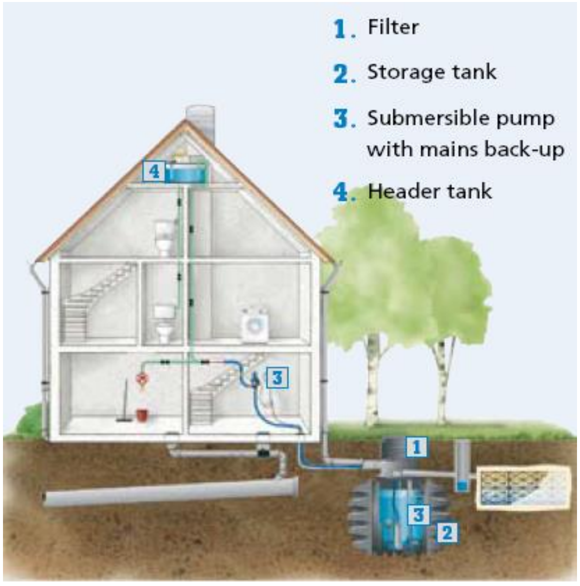
G.3.10 Rainwater Harvesting

Rainwater harvesting (RWH) is the capture and storage of rain water that lands on the roof of a property. This can have the dual advantage of both reducing the volume of water leaving a site, thereby reducing surface water management requirements and potential flooding issues, and be a direct source of water, thereby reducing the amount of water that needs to be supplied to a property from the mains water system.

RWH systems typically consist of a collection area (usually a rooftop), a method of conveying the water to the storage tank (gutters, down spouts and pipes), a filtration and treatment system, a storage tank and a method of conveying the water from the storage container to the taps (pipes with pumped or gravity flow). A treatment system may be included, depending on the rainwater quality desired and the source. Figure G-1 below gives a diagrammatic representation of a typical domestic system[75].

The level to which the rainwater is treated depends on the source of the rainwater and the purpose for which it has been collected. Rainwater is usually first filtered to remove larger debris such as leaves and grit. A second stage may also be incorporated into the holding tank; some systems contain biological treatment within the holding tank, or flow calming devices on the inlet and outlets that will allow heavier particles to sink to the bottom, with lighter debris and oils floating to the surface of the water. A floating extraction system can then allow the clean rainwater to be extracted from between these two layers[76].

Figure G-1: A typical domestic rainwater harvesting system



A sustainable water management strategy carried out for a proposed EcoTown development at Northstowe[77], approximately 10 km to the north west of Cambridge, calculated the size of rainwater storage that may be required for different occupant numbers, as shown below in Table G-3.

Table G-3: Rainwater Harvesting Systems Sizing

Number of occupants	Total water consumption	Roof area (m^2)	Required storage tank (m^3)	Potable water saving per head (l/d)	Water consumption with RWH (l/h/d)
1	110	13	0.44	15.4	94.6
1	110	10	0.44	12.1	97.9
1	110	25	0.88	30.8	79.2
1	110	50	1.32	57.2	52.8
2	220	25	0.88	15.4	94.6
2	220	50	1.76	30.8	79.2
3	330	25	1.32	9.9	100.1
3	330	50	1.32	19.8	90.2

[75] Source: Aquality Intelligent Water management, www.aqua-lity.co.uk
[76] Aquality Rainwater Harvesting brochure, 2008
[77] Sustainable water management strategy for Northstowe, WSP, December 2007

Number of occupants	Total water consumption	Roof area (m^2)	Required storage tank (m^3)	Potable water saving per head (l/d)	Water consumption with RWH (l/h/d)
4	440	25	1.76	7.7	102.3
4	440	50	1.76	15.4	94.6

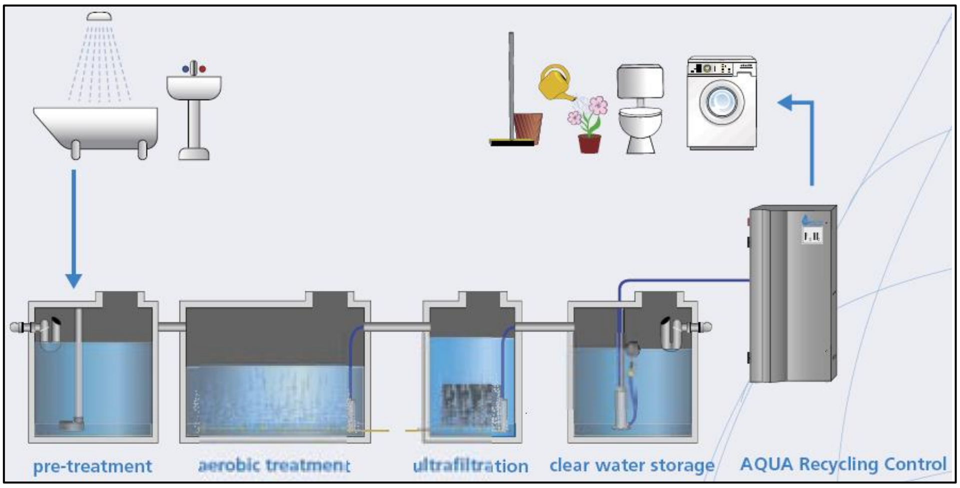
A family of four, with an assumed roof area of 50m^3, could therefore expect to save 61.6 litres per day if a RWH system were installed.

G.3.11 Greywater Recycling

Greywater recycling (GWR) is the treatment and re-use of wastewater from shower, bath and sinks for use again within a property where potable quality water is not essential e.g. toilet flushing. Recycled greywater is not suitable for human consumption or for irrigating plants or crops that are intended for human consumption. The source of greywater should be selected by available volumes and pollution levels, which often rules out the use of kitchen and clothes washing waste water as these tend to be most highly polluted. However, in larger system virtually all non-toilet sources can be used, subject to appropriate treatment.

The storage volumes required for GWR are usually smaller than those required for rainwater harvesting as the supply of greywater is more reliable than rainfall. In domestic situations, greywater production often exceeds demand and a correctly designed system can therefore cope with high demand application and irregular use, such as garden irrigation. Figure G-2 below gives a diagrammatic representation of a typical domestic system[78].

Figure G-2 A typical domestic greywater recycling system



Combined rainwater harvesting and greywater recycling systems can be particularly effective, with the use of rainwater supplementing greywater flows at peak demand times (e.g. morning and evenings).

The Northstowe sustainable water management strategy calculated the volumes of water that could be made available from the use GWR. These were assessed against water demand calculated using the BRE Water Demand Calculator[79].

Table G-4 demonstrates the water savings that can be achieved by GWR. If the toilet and washing machine are connected to the GWR system a saving of 37 litres per person per day can be achieved.

Table G-4: Potential water savings from greywater recycling

Appliance	Demand with Efficiencies (l/h/day)	Potential Source	Greywater Required (l/h/day)	Out As	Greywater available (80% efficiency) (l/h/day)	Consumption s with GWR (l/h/day)
Toilet	15	Grey	15	Sewage	0	0
Wash hand basin	9	Potable	0	Grey	7	9

[78] Source: Aquality Intelligent Water management, www.aqua-lity.co.uk
[79] http://www.thewatercalculator.org.uk/faq.asp

Appliance	Demand with Efficiencies (l/h/day)	Potential Source	Greywater Required (l/h/day)	Out As	Greywater available (80% efficiency) (l/h/day)	Consumptions with GWR (l/h/day)
Shower	23	Potable	0	Grey	18	23
Bath	15	Potable	0	Grey	12	15
Kitchen Sink	21	Potable	0	Sewage	0	21
Washing Machine	17	Grey	17	Sewage	0	0
Dishwasher	4	Potable	0	Sewage	0	4
TOTAL	**103**		**31**		**37**	**72**

The treatment requirements of the GWR system will vary, as water which is to be used for flushing the toilet does not need to be treated to the same standard as that which is to be used for the washing machine. The source of the greywater also greatly affects the type of treatment required. Greywater from a washing machine may contain suspended solids, organic matter, oils and grease, detergents (including nitrates and phosphates) and bleach. Greywater from a dishwasher could have a similar composition, although the proportion of fats, oils and grease is likely to be higher; similarly for wastewater from a kitchen sink. Wastewater from a bath or shower will contain suspended solids, organic matter (hair and skin), soap and detergents. All wastewater will contain bacteria, although the risk of infection from this is considered to be low[80].

Treatment systems for GWR are usually of the following four types:

- basic (e.g. coarse filtration and disinfection);
- chemical (e.g. flocculation);
- physical (e.g. sand filters or membrane filtration and reverse osmosis); and,
- biological (e.g. aerated filters or membrane bioreactors).

Table G-5 below gives further detail on the measures required in new builds and from retrofitting, including assumptions on the predicted uptake of retrofitting from the existing housing and commercial building use.

[80] Centre for the Built Environment, www.cbe.org.uk

Table G-5: Water Neutrality Scenarios – specific requirements for each scenario

WN Scenario	New development requirement			Retrofitting existing development	
	New development Water use target (l/h/d)	Water Efficient Fixtures and Fittings	Water Recycling technology	Metering Penetration assumption	Water Efficient Fixtures and Fittings
Low (Building Regulations)	125	- WC 6/4 litres dual flush or - 4.5 litres single flush - Shower 10 l/min - Bath 185 litres - Basin taps 6 l/min - Sink taps 8 l/min - Dishwasher 1.25 l/place setting - Washing machine 8.17 l/kilogram	None	91% (SEWL) 65% (AWL)	None
Low (Building Regulations + Retrofit)	125	- WC 6/4 litres dual flush or - 4.5 litres single flush - Shower 10 l/min - Bath 185 litres - Basin taps 6 l/min - Sink taps 8 l/min - Dishwasher 1.25 l/place setting - Washing machine 8.17 l/kilogram	None	91% (SEWL) 65% (AWL)	15% take up across study area: - WC 6/4 litres dual flush or - 4.5 litres single flush - Shower 10 l/min - Bath 185 litres - Basin taps 6 l/min - Sink taps 8 l/min - Dishwasher 1.25 l/place setting - Washing machine 8.17 l/kilogram
Medium (Building Regulations Optional Requirement)	110	- WC 4/2.6 litres dual flush - Shower 8 l/min - Bath 170 litres - Basin taps 5 l/min - Sink taps 6 l/min - Dishwasher 1.25 l/place setting - Washing machine 8.17 l/kilogram	None	91% (SEWL) 65% (AWL)	None
Medium (Building Regulations Optional Requirement + Retrofit)	110	- WC 4/2.6 litres dual flush - Shower 8 l/min - Bath 170 litres - Basin taps 5 l/min - Sink taps 6 l/min - Dishwasher 1.25 l/place setting - Washing machine 8.17 l/kilogram	None	91% (SEWL) 65% (AWL)	20% take up across study area: - WC 4/2.6 litres dual flush - Shower 8 l/min - Bath 170 litres - Basin taps 5 l/min - Sink taps 6 l/min - Dishwasher 1.25 l/place setting - Washing machine 8.17 l/kilogram
High	78	- 3-4.5litre dual flush toilet; - High spec aeration taps; - high spec low flow shower head; - 120 litre capacity bath; - high spec low flow shower head	Rainwater harvesting	92% (SEWL) 72% (AWL)	25% take up across study area: - 3-4.5 litre dual flush toilet or cistern device fitted; - high spec aerated taps fitted - high spec low flow shower head fitted

WN Scenario	New development requirement			Retrofitting existing development	
	New development Water use target (l/h/d)	Water Efficient Fixtures and Fittings	Water Recycling technology	Metering Penetration assumption	Water Efficient Fixtures and Fittings
		- High efficiency dishwasher - High efficiency washing machine			
Very High	62	- 3-4.5litre dual flush toilet; - High spec aeration taps; - high spec low flow shower head; - 120 litre capacity bath; - high spec low flow shower head - High efficiency dishwasher - High efficiency washing machine	Rainwater harvesting and Greywater recycling	100%	30% take up across study area: - 3-4.5 litre dual flush toilet or cistern device fitted; - high spec aerated taps fitted - high spec low flow shower head fitted

Appendix H. Water Neutrality Results

H.1 Hart

H.1.1 Demand for Water

Five different water demand projections have been used to calculate the potential increases in water demand in Hart for both the Objectively Assessed Housing Need (OAHN) and Duty to Cooperate (DtC) growth scenarios. The projections have been based on different rates of water use that could be implemented through future policies.

If the OAHN growth scenario came forward, the increase in demand for water could range between 0.9 and 2.39 Ml/d by 2032 as shown in Figure H-1.

If the DtC growth scenario came forward, the increase in demand for water could range between 1.34 and 3.56 Ml/d by 2032 as shown in Figure H-2.

Figure H-1 Water neutrality projections for Hart under the OAHN growth scenario

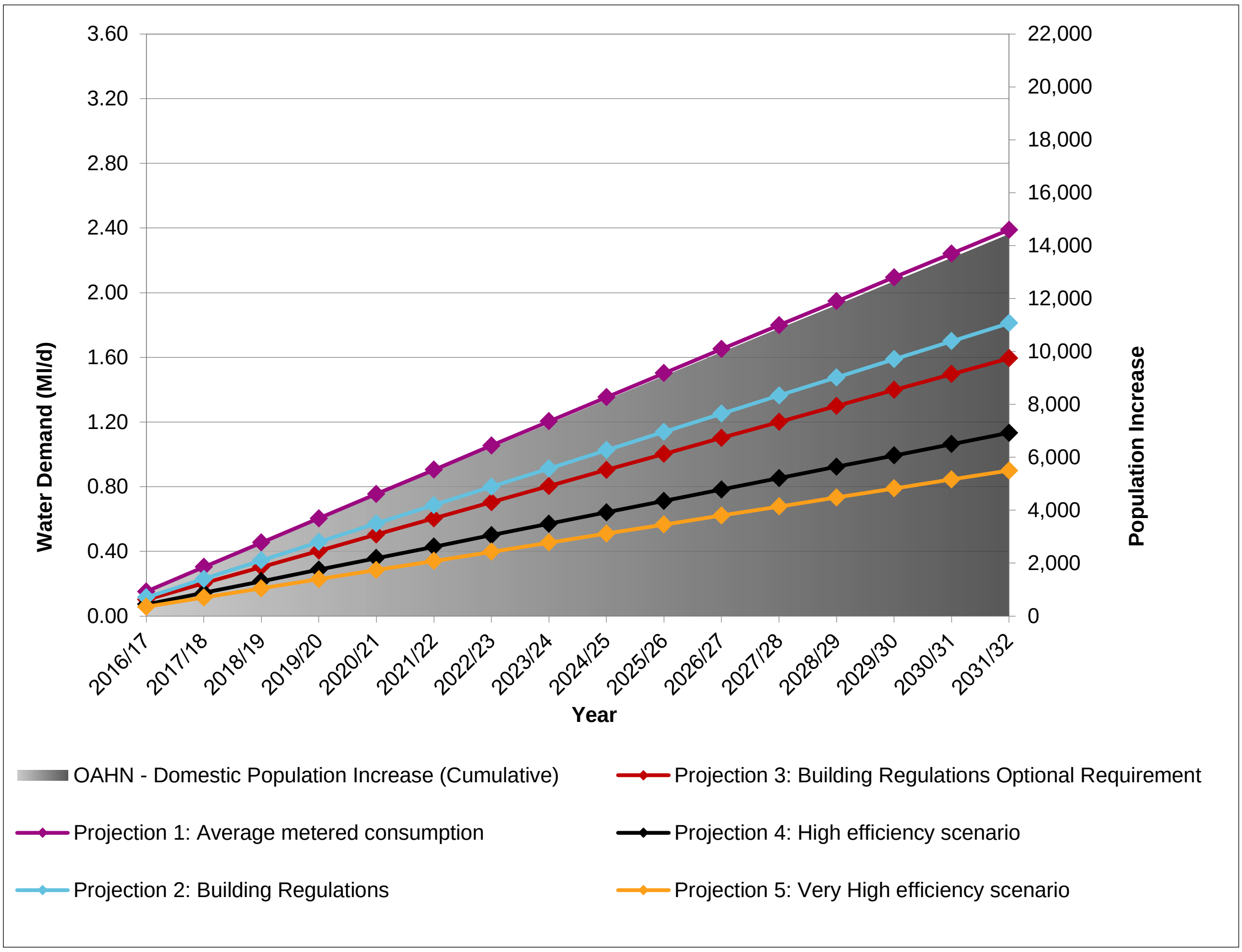
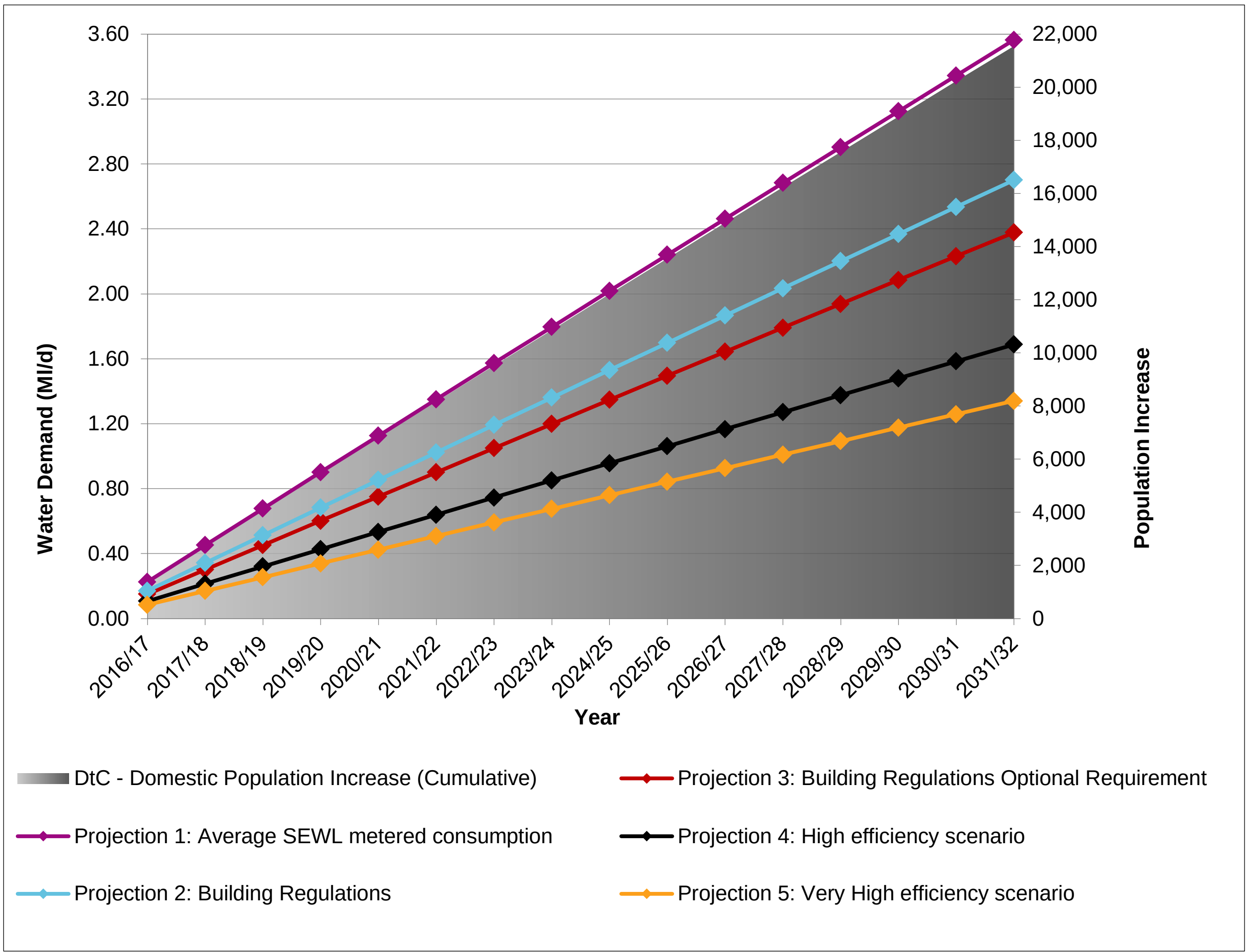


Figure H-2 Water neutrality projections for Hart under the DtC growth scenario



H.1.2 Neutrality Scenario Assessment Results

To achieve total water neutrality (WN), the demand post growth must be the same as, or less than existing demand. Based on estimates of population size, existing demand in Hart was calculated to be 15.5 Ml/d.

The tables below provide the results of the WN scenario assessments under both the OAHN and DtC growth scenarios.

If neutrality is achieved, the result is displayed green. If neutrality is not achieved, but is within 5%, the result is displayed amber, and red if neutrality above the 5% threshold is not achieved. The percentage of total neutrality achieved per WN scenario is also provided.

Table H-1 Achieving water neutrality under the OAHN growth scenario

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from OAHN Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Baseline	Projection 1: Average metered consumption	0	2.39	17.86	**17.30**	**17.30**	24%
Low	Projection 2a: Building Regulations Mandatory	0	1.81	17.29	**16.72**	**16.72**	48%
	Projection 2b: Low efficiency scenario	15	1.81	17.29	**16.72**	**16.49**	58%
Medium	Projection 3a: Building Regulations optional requirement	0	1.59	17.07	**16.51**	**16.51**	57%

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from OAHN Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
	Projection 3b: Medium efficiency scenario	20	1.59	17.07	**16.51**	**16.35**	63%
High	Projection 4: High efficiency scenario	25	1.13	16.61	**16.02**	**14.83**	100%
Very High	Projection 5: Very High efficiency scenario	30	0.90	16.38	**15.61**	**14.18**	100%

Table H-2 Achieving water neutrality under the DtC growth scenario

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from DtC Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Baseline	Projection 1: Average metered consumption	0	3.56	19.04	**19.04**	**18.48**	16%
Low	Projection 2a: Building Regulations Mandatory	0	2.70	18.18	**18.18**	**17.61**	40%
	Projection 2b: Low efficiency scenario	15	2.70	18.18	**18.18**	**17.38**	47%
Medium	Projection 3a: Building Regulations optional requirement	0	2.38	17.85	**17.85**	**17.29**	49%
	Projection 3b: Medium efficiency scenario	20	2.38	17.85	**17.85**	**17.13**	54%
High	Projection 4: High efficiency scenario	25	1.69	17.16	**17.16**	**15.39**	100%
Very High	Projection 5: Very High efficiency scenario	30	1.34	16.82	**16.82**	**14.62**	100%

The results show that total neutrality is only achieved by applying the High or Very High WN scenario, regardless of which growth scenario comes forward, requiring new homes to use water at a rate of 80 l/h/d or 62 l/h/d respectively. Under the OAHN growth scenario, projections 2a and 2b (Low WN) would give a range of between 48% and 58% neutrality which would require new homes to use water at a rate of 125 l/h/d. To achieve the same level of neutrality under the DtC growth scenario, projections 3a and 3b (Medium WN) would need to be followed, giving a range of between 49% and 54%, requiring new homes to use water at a rate of 110l/h/d.

H.1.3 Preferred Strategy - Delivery Pathway for Hart

It can be seen from the above results that water neutrality can only be achieved under both a High and Very High WN scenario. While this is achievable in theory, it is anticipated that this would come with significant cost. It is recommended that a WN target of Low (Projection 2a and 2b) be set for the district should the OAHN growth scenario come forward in order to balance the objective of achieving a more water neutral position as well as limiting the cost implications of implementing such an initiative. Should the DtC growth scenario come forward, a WN target of Medium (Projections 3a and 3b) is recommended.

In order to achieve these targets and enhance sustainable development moving forward, policy should be developed that ensures all new housing is as water efficient as possible and that objectives are set that new housing development is required to achieve the Building Regulations water use of 125 l/h/d (OAHN scenario) or 110 l/h/d (DtC scenario). Non-domestic buildings should as a minimum reach ‘Good’ BREEAM status.

To further promote 'water neutrality' in the district, it is recommended a policy be developed to carry out a programme of retrofitting and water audits of existing dwellings and non-domestic buildings with the aim to move towards delivery of 15% (OAHN scenario) or 20% (DtC scenario) of the existing housing stock with easy fit water savings devices, equivalent to the fittings as described for use in new dwellings under the Building Regulations mandatory requirement or optional requirement.

It is considered that, it is technically and politically straightforward to obtain the Low WN target with a small funded joint partnership approach and with new developers contributing standard, but water efficient homes with a relative low capital expenditure. The Medium WN target is also considered technically and politically feasible, but would require a larger funded joint partnership approach and new developers contributing higher specification water efficient homes.

Depending on the success of the first step to neutrality, higher WN scenarios could be aspired to by further developing policies and partnership working to deliver greater efficiencies.

H.2 Rushmoor

H.2.1 Demand for Water

Five different water demand projections have been used to calculate the potential increases in water demand in Rushmoor for both the Objectively Assessed Housing Need (OAHN) and Duty to Cooperate (DtC) growth scenarios. The projections have been based on different rates of water use that could be implemented through future policies.

If the OAHN growth scenario came forward, the increase in demand for water could range between 1.34 and 3.27 Ml/d by 2032 as shown in Figure H-3.

If the DtC growth scenario came forward, the increase in demand for water could range between 1.30 and 3.16 Ml/d by 2032 as shown in Figure H-4.

Figure H-3 Water neutrality projections for Rushmoor under the OAHN growth scenario

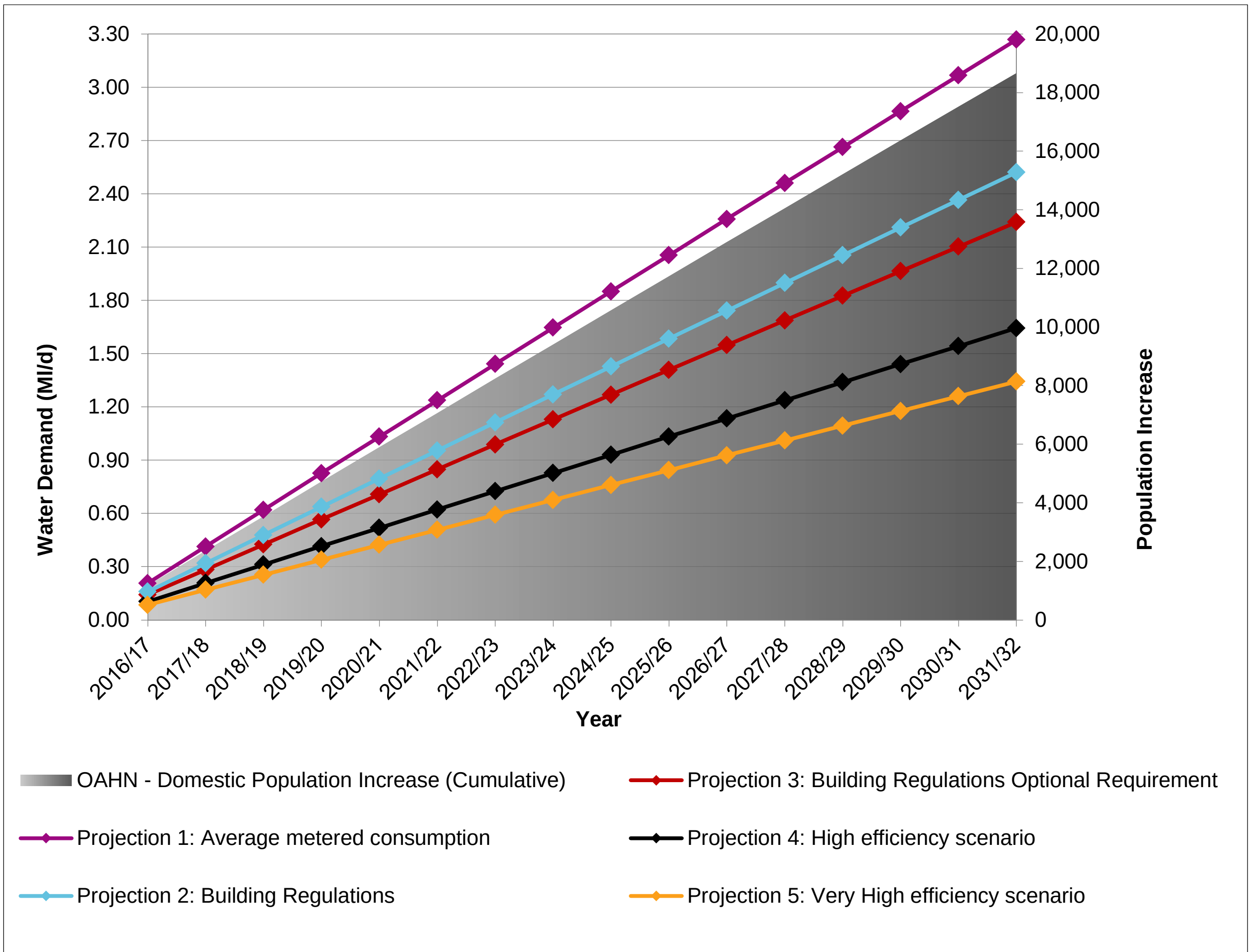
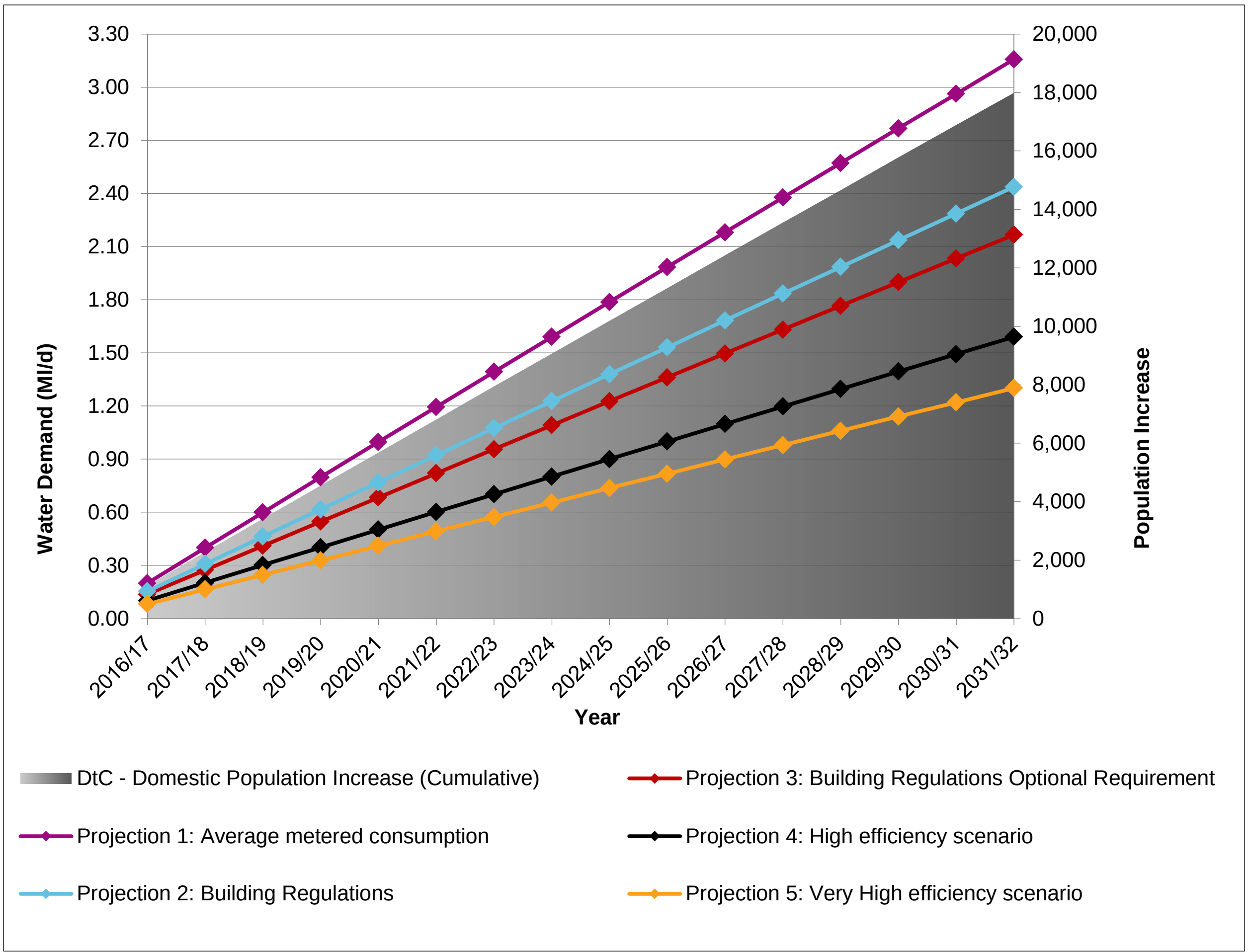


Figure G-1 Water neutrality projections for Rushmoor under the DtC growth scenario



H.2.2 Neutrality Scenario Assessment Results

To achieve total water neutrality (WN), the demand post growth must be the same as, or less than existing demand. Based on estimates of population size, existing demand in Rushmoor was calculated to be 15.4 Ml/d for Rushmoor.

The tables below provide the results of the WN scenario assessments under both the OAHN and DtC growth scenarios.

If neutrality is achieved, the result is displayed green. If neutrality is not achieved, but is within 5%, the result is displayed amber, and red if neutrality above the 5% threshold is not achieved. The percentage of total neutrality achieved per WN scenario is also provided.

Table H-3 Achieving water neutrality under the OAHN growth scenario

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from OAHN Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Baseline	Projection 1: Average metered consumption	0	3.27	18.71	18.15	18.15	17%
Low	Projection 2a: Building Regulations Mandatory	0	2.52	17.96	17.40	17.40	40%
	Projection 2b: Low efficiency scenario	15	2.52	17.96	17.40	17.17	47%
Medium	Projection 3a: Building Regulations optional requirement	0	2.24	17.68	17.12	17.12	49%

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from OAHN Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
	Projection 3b: Medium efficiency scenario	20	2.24	17.68	**17.12**	**16.96**	53%
High	Projection 4: High efficiency scenario	25	1.64	17.09	**16.50**	**15.32**	100%
Very High	Projection 5: Very High efficiency scenario	30	1.34	16.79	**16.02**	**14.60**	100%

Table H-4 Achieving water neutrality under the DtC growth scenario

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from DtC Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Baseline	Projection 1: Average metered consumption	0	3.16	18.60	**18.04**	**18.04**	18%
Low	Projection 2a: Building Regulations Mandatory	0	2.44	17.88	**17.32**	**17.32**	41%
	Projection 2b: Low efficiency scenario	15	2.44	17.88	**17.32**	**17.08**	48%
Medium	Projection 3a: Building Regulations optional requirement	0	2.17	17.61	**17.05**	**17.05**	49%
	Projection 3b: Medium efficiency scenario	20	2.17	17.61	**17.05**	**16.89**	54%
High	Projection 4: High efficiency scenario	25	1.59	17.03	**16.45**	**15.26**	100%
Very High	Projection 5: Very High efficiency scenario	30	1.30	16.74	**15.98**	**14.56**	100%

The results show that total neutrality is only achieved by applying the High or Very High WN scenario, regardless of which growth scenario comes forward, requiring new homes to use water at a rate of 80 l/h/d or 62 l/h/d respectively. Under both the OAHN and DtC growth scenarios, projections 2a and 2b (Low WN) would give a range of between 40% and 48% neutrality which would require new homes to use water at a rate of 125 l/h/d.

H.2.3 Preferred Strategy - Delivery Pathway for Rushmoor

It can be seen from the above results that water neutrality can only be achieved under both a High and Very High WN scenario. While this is achievable in theory, it is anticipated that this would come with significant cost. It is recommended that a water neutrality target of Low (Projection 2a and 2b) be set for the borough in order to balance the objective of achieving a more water neutral position as well as limiting the cost implications of implementing such an initiative.

In order to achieve this target and enhance sustainable development moving forward, policy should be developed that ensures all new housing is as water efficient as possible and that objectives are set that new housing development is required to achieve the Building Regulations water use of 125 l/h/d. Non-domestic buildings should as a minimum reach 'Good' BREEAM status.

To further promote 'water neutrality' in the borough, it is recommended a policy be developed to carry out a programme of retrofitting and water audits of existing dwellings and non-domestic buildings with the aim to move towards delivery of 15% of the existing housing stock with easy fit water savings devices, equivalent to the fittings as described for use in new dwellings under the Building Regulations mandatory requirement.

It is considered that, it is technically and politically straightforward to obtain the Low WN target with a small funded joint partnership approach and with new developers contributing standard, but water efficient homes with a relative low capital expenditure.

Depending on the success of the first step to neutrality, higher WN scenarios could be aspired to by further developing policies and partnership working to deliver greater efficiencies.

H.3 Surrey Heath

H.3.1 Demand for Water

Five different water demand projections have been used to calculate the potential increases in water demand in Surrey Heath for both the Objectively Assessed Housing Need (OAHN) and Duty to Cooperate (DtC) growth scenarios. The projections have been based on different rates of water use that could be implemented through future policies.

If the OAHN growth scenario came forward, the increase in demand for water could range between 0.98 and 2.77 Ml/d by 2032 as shown in Figure H-5

If the DtC growth scenario came forward, the increase in demand for water could range between 0.59 and 1.64 Ml/d by 2032 as shown in Figure H-6.

Figure H-5 Water neutrality projections for Surrey Heath under the OAHN growth scenario

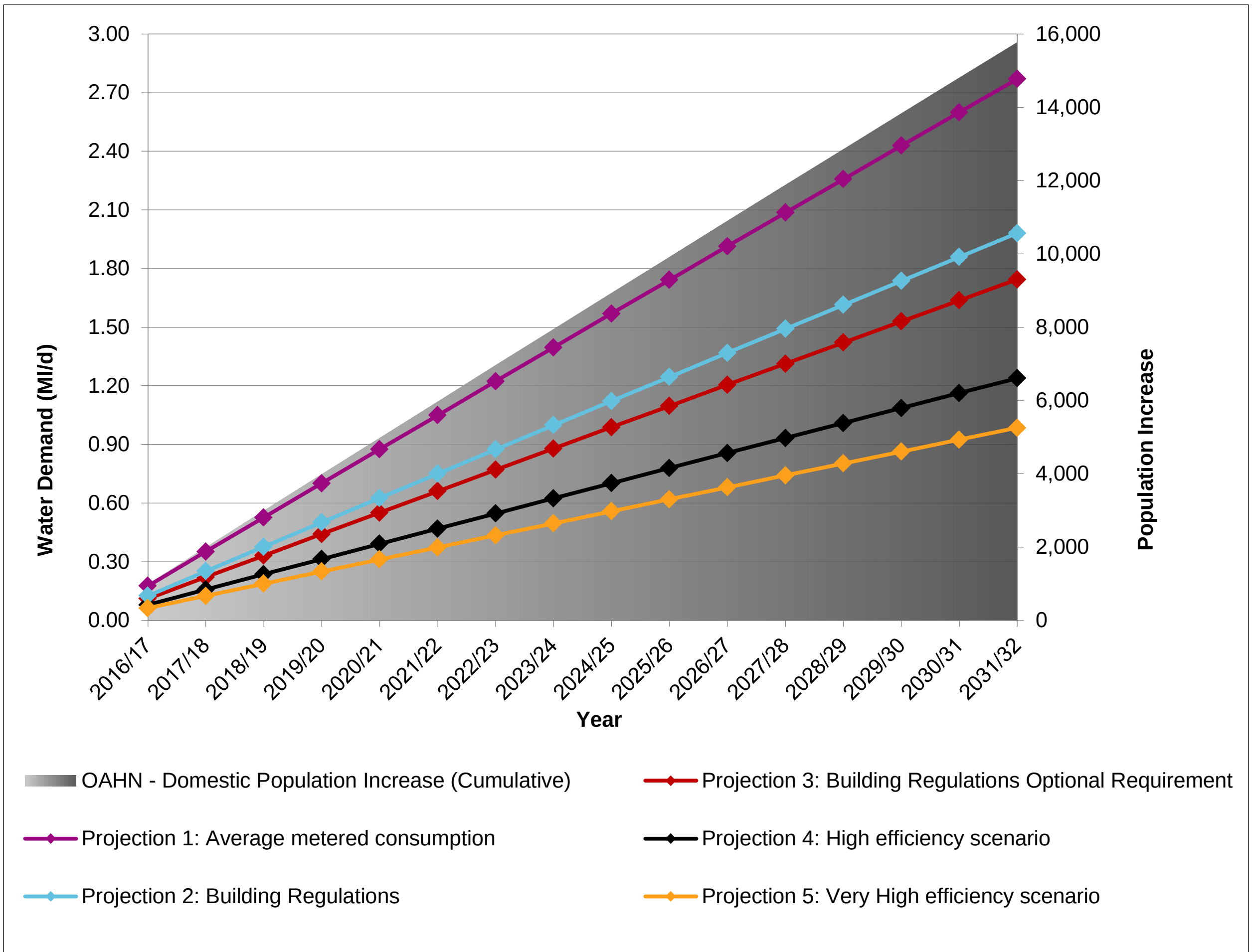
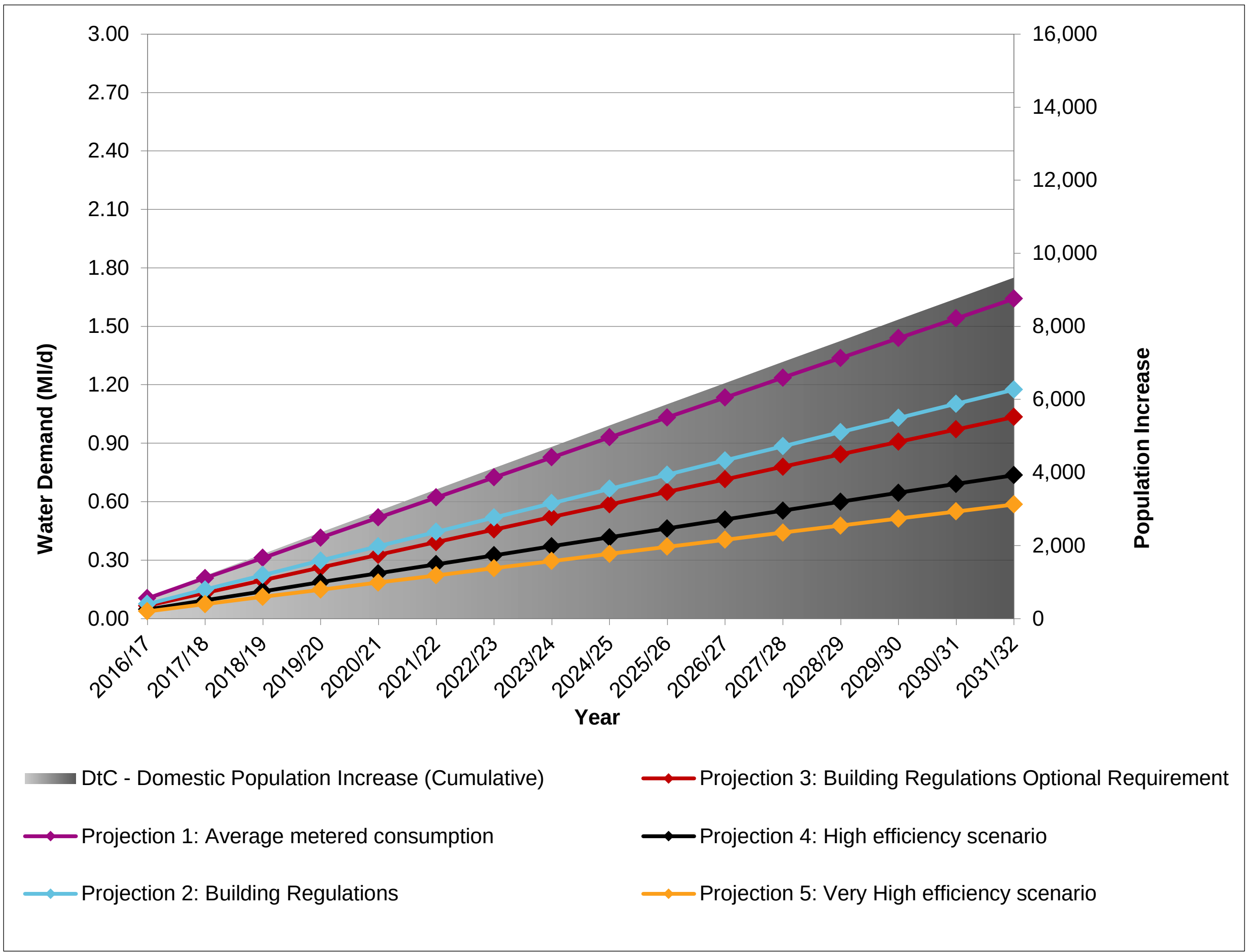


Figure H-6 Water neutrality projections for Surrey Heath under the DtC growth scenario



H.3.2 Neutrality Scenario Assessment Results

To achieve total water neutrality (WN), the demand post growth must be the same as, or less than existing demand. Based on estimates of population size, existing demand in Surrey Heath was calculated to be 15.3 Ml/d.

The tables below provide the results of the WN scenario assessments under both the OAHN and DtC growth scenarios.

If neutrality is achieved, the result is displayed green. If neutrality is not achieved, but is within 5%, the result is displayed amber, and red if neutrality above the 5% threshold is not achieved. The percentage of total neutrality achieved per WN scenario is also provided.

Table H-5 Achieving water neutrality under the OAHN growth scenario

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from OAHN Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Baseline	Projection 1: Average metered consumption	0	2.77	18.09	**17.61**	**17.61**	17%
Low	Projection 2a: Building Regulations Mandatory	0	1.98	17.30	**16.82**	**16.82**	46%
	Projection 2b: Low efficiency scenario	15	1.98	17.30	**16.82**	**16.60**	54%
Medium	Projection 3a: Building Regulations optional requirement	0	1.74	17.06	**16.58**	**16.58**	54%
	Projection 3b: Medium efficiency scenario	20	1.74	17.06	**16.58**	**16.43**	60%
High	Projection 4: High efficiency scenario	25	1.24	16.56	**16.01**	**14.92**	100%
Very High	Projection 5: Very High efficiency scenario	30	0.98	16.30	**15.44**	**14.12**	100%

Table H-6 Achieving water neutrality under the DtC growth scenario

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from DtC Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Baseline	Projection 1: Average metered consumption	0	1.64	16.96	**16.48**	**16.48**	29%
Low	Projection 2a: Building Regulations Mandatory	0	1.17	16.49	**16.01**	**16.01**	58%
	Projection 2b: Low efficiency scenario	15	1.17	16.49	**16.01**	**15.80**	71%
Medium	Projection 3a: Building Regulations optional requirement	0	1.03	16.35	**15.87**	**15.87**	66%
	Projection 3b: Medium efficiency scenario	20	1.03	16.35	**15.87**	**15.72**	75%
High	Projection 4: High efficiency scenario	25	0.74	16.05	**15.51**	**14.41**	100%

Neutrality Scenario	New Homes demand projections	% of existing properties to be retrofitted	Demand from DtC Growth (Ml/d)	Total demand post growth (Ml/d)	Total demand after metering effect (Ml/d)	Total demand after metering & retrofitting (Ml/d)	% Neutrality Achieved
Very High	Projection 5: Very High efficiency scenario	30	0.59	15.90	**15.04**	**13.72**	100%

The results show that total neutrality is only achieved by applying the High or Very High WN scenario, regardless of which growth scenario comes forward, requiring new homes to use water at a rate of 80 l/h/d or 62 l/h/d respectively. Under the OAHN growth scenario, projections 2a and 2b (Low WN) would give a range of between 46% and 54% neutrality which would require new homes to use water at a rate of 125 l/h/d. Under the DtC growth scenario, the Low WN would achieve a higher neutrality of between 58% and 71% as a result of the lower housing delivery target.

H.3.3 Preferred Strategy - Delivery Pathway for Surrey Heath

It can be seen from the above results that water neutrality can only be achieved under both a High or Very High efficiency scenario. While this is achievable in theory, it is anticipated that this would come with significant cost. It is recommended that a water neutrality target of Low (Projection 2a and 2b) be set for the borough in order to balance the objective of achieving a more water neutral position as well as limiting the cost implications of implementing such an initiative. Should the DtC growth scenario come forward, this WN target would achieve a higher level of neutrality.

In order to achieve this target and enhance sustainable development moving forward, policy should be developed that ensures all new housing is as water efficient as possible and that objectives are set that new housing development is required to achieve the Building Regulations water use of 125 l/h/d. Non-domestic buildings should as a minimum reach 'Good' BREEAM status.

To further promote 'water neutrality' in the borough, it is recommended a policy be developed to carry out a programme of retrofitting and water audits of existing dwellings and non-domestic buildings with the aim to move towards delivery of 15% of the existing housing stock with easy fit water savings devices, equivalent to the fittings as described for use in new dwellings under the Building Regulations mandatory requirement.

It is considered that, it is technically and politically straightforward to obtain this level with a small funded joint partnership approach and with new developers contributing standard, but water efficient homes with a relative low capital expenditure.

Depending on the success of the first step to neutrality, higher WN scenarios could be aspired to by further developing policies and partnership working to deliver greater efficiencies.

Appendix I.Development Site Assessment

Site Details						Wastewater and Water Supply			Surface Water Flood Risk				Fluvial Flood Risk				Groundwater Protection				Odour
Aecom ID	REF ID	Site Name	Locality	Site Area (ha)	Total Dwellings	WwTW Catchment	Wastewater Network Constraints	Water Supply Network Capacity	% High SW Flood Risk	% Medium SW Flood Risk	% Low SW Flood Risk	% no SW Flood Risk	% Flood Zone 1	% Flood Zone 2	% Flood Zone 3	Potential Receiving Watercourse	Aquifer Designation	Source Protection Zone	Groundwater Protection	SuDS Constraints	Odour Assessment
Hart_001	SHL001&SHL002	Land north-east of Hook	Hook	28.4	548	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to area of Hook	0	1	4	94	92	3	5	River Whitewater	Bedrock- Unproductive	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_002	SHL001&SHL002	Land north-east of Hook	Hook	6.7		HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to area of Hook	15	16	40	29	8	68	24	River Whitewater	Bedrock- Unproductive; Superficial- Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_003	SHL003	Land at Searles Farm, Hook	Hook	43.3	543	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Hook	7	4	11	78	71	5	24	River Whitewater	Bedrock- Unproductive; Superficial- Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_004	SHL005	Land North-West of Hook	Hook	107.3	270	HARTLEY WINTNEY	Medium	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Hook	5	3	8	83	97	<1	3	River Whitewater and Readen Pond	Bedrock- Unproductive	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_005	SHL040	Grove Farm	Fleet	19.2	423	FLEET	Low	Reinforcement identified between Sandhurst and Fleet	14	11	17	58	69	5	26	River Hart and Basingstoke Canal	Bedrock- Secondary A; Superficial - Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_006	SHL052	Pale Lane Farm	Fleet	60.8	650	FLEET	Very High	Reinforcement identified between Sandhurst and Fleet	2	2	8	89	99	<1	1	River Hart	Bedrock- Secondary A; Superficial - Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_007	SHL100	Sun Park, Guillemont	Farnborough	11.5	300	CAMBERLEY	Low	Reinforcement along Farnborough Road from North Camp	3	3	9	85	94	4	2	Hawley Lake Stream	Bedrock- Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_008	SHL112a	Cemex A	Eversley	48.7	105	EVERSLEY	Medium	Data not available	<1	<1	8	91	100	0	0	Blackwater River	Bedrock- Secondary A; Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Hart_009	SHL173	Owen's Farm 2, Hook	Hook	29.9	540	HARTLEY WINTNEY	Medium	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Hook	4	3	18	75	100	0	0	River Whitewater and Lyde River	Bedrock- Unproductive; Superficial- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Hart_010	SHL197	Hartland Park	Fleet	55.1	1500	CAMBERLEY	Low	Reinforcement identified between Sandhurst and Fleet and locally to site	<1	<1	4	95	100	0	0	Gelvert Stream and Basingstoke Canal	Bedrock- Secondary A; Superficial - Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_011	SHL116	Cross Farm, Crookham Village	Crookham Village	31.4	200	FLEET	Low	Reinforcement identified between Sandhurst and Fleet and locally to Crookham	8	8	10	74	84	1	14	River Hart and Basingstoke Canal	Bedrock- Secondary A; Superficial - Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_012	SHL004	Land at Totters Farm	Murrell Green	39.4	515	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	7	6	9	78	81	15	5	River Whitewater	Bedrock- Unproductive; Superficial- Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_013	SHL084	Land at Winchfield Lodge	Murrell Green	2.6	41	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	0	0	0	100	100	0	0	River Whitewater	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Hart_014	SHL136	Western Edge of Winchfield	Murrell Green	37.4	500	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	<1	<1	1	98	100	0	0	River Whitewater	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Hart_015	SHL167	Land between M3 and Railway	Murrell Green	43.3	265	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	10	8	21	61	64	8	28	River Whitewater	Bedrock- Unproductive; Superficial- Secondary A	N/A	Low	Space for surface attenuation SuDS may be limited within FZ 3.	Site unlikely to be impacted by odour from a WwTW
Hart_016	SHL184	Winchfield Park	Murrell Green	19.8	400	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	<1	<1	2	98	100	0	0	River Whitewater	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Hart_017	SHL123	Land at Murrell Green	Murrell Green	0.7	33	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	<1	<1	3	97	100	0	0	River Whitewater	Bedrock- Unproductive	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Hart_018	SHL186	Shapley Lake & surrounds	Murrell Green	14.0	50	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	4	2	10	84	100	0	0	River Whitewater	Bedrock- Unproductive	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Hart_019	SHL204	Shapley Ranch	Murrell Green	0.5	14	HARTLEY WINTNEY	Low	Reinforcement identified between Sandhurst and Fleet and Fleet and Greywell and to Murrell Green	0	0	0	100	100	0	0	River Whitewater	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_001	119	Aldershot Urban Extension	Aldershot	144.0	3830	CAMP FARM (MOD)	Status of network unknown. Network currently privately owned by the Grainger plc until adoption by Severn Trent Services.	Reinforcement from Hale to Farnborough	1	2	7	90	100	0	0	Basingstoke Canal	Bedrock -Secondary A / Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_002	15	Civic Quarter Area (comprising Elles Hall, Westmead House (and car park), Farnborough Library, Farnborough Police Station, Farnborough Leisure Centre and Sulzers Roundabout, Farnborough	Farnborough	5.7	700	CAMBERLEY	Low	Reinforcement from Hale to Farnborough	1	5	21	73	100	0	0	Cove Brook	Bedrock -Secondary A / Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_003	518	IBM Offices, Meudon House Meudon Avenue, GU14 7NB and rear 115 to 117 Farnborough Road	Farnborough	3.3	350	CAMBERLEY	High	Contribution to Hale to Farnborough transfer depending on timing	5	7	9	79	100	0	0	Cove Brook	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_004	14	Rushmoor Borough Council Offices, Farnborough	Farnborough	1.8	150	CAMBERLEY	High	Contribution to Hale to Farnborough transfer depending on timing	4	2	7	87	100	0	0	Blackwater River	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_005	516	The Crescent, Southwood Business Park	Farnborough	4.3	150	CAMBERLEY	Low	Possibly local	3	5	13	79	100	0	0	Cove Brook	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_006	554	The Galleries Shopping Centre, Aldershot	Aldershot	0.8	150	ALDERSHOT	Low	Local	0	0	0	100	100	0	0	Blackwater River	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_007	572	Blandford House, Shoe Lane, Aldershot	Aldershot	6.8	150	CAMP FARM (MOD)	Very High	Local	0	0	0	100	100	0	0	Basingstoke Canal	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_008	572	Blandford House, Shoe Lane, Aldershot	Aldershot	1.7	150	CAMP FARM (MOD)	Very High	Local	0	0	0	100	100	0	0	Basingstoke Canal	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_009	556	Farnborough Town Centre - St Modwen	Farnborough	0.4	111	CAMBERLEY	Low	Contribution to Hale to Farnborough transfer depending on timing	14	51	23	12	100	0	0	Blackwater River	Bedrock- Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_010	113	Land to NW of Victoria Rd and Windsor Way junction, Aldershot	Aldershot	0.5	100	ALDERSHOT	Low	Local	3	7	29	61	100	0	0	Blackwater River	Bedrock - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_011	515	BT building / Telephone Exchange, Ordnance Road, Aldershot, GU11 2AH	Aldershot	1.2	100	CAMP FARM (MOD)	Low	Local	0	1	4	95	100	0	0	Blackwater River	Bedrock - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
Rushmoor_012	552	Aldershot police station, Wellington Avenue, Aldershot GU11 1NZ	Aldershot	0.8	100	CAMP FARM (MOD)	Very High	Local	0	8	16	76	100	0	0	Blackwater River	Bedrock - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_001	184	Princess Royal Barracks 2 Brunswick Road Deepcut	Deepcut	0.67	685	CAMBERLEY	Low	Reinforcement on the east side of Camberley (Maultway) and from Heatherside into site	2	2	7	89	100	0	0	Basingstoke Canal	Bedrock - Secondary A ; Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_002	567	Princess Royal Barracks 1, Brunswick Road	Deepcut	0.37	375	CAMBERLEY	Low	Reinforcement on the east side of Camberley (Maultway) and from Heatherside into site	1	1	5	93	100	0	0	Trulley Brook	Bedrock - Secondary A ; Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_003	436	Princess Royal Barracks 3 Brunswick Road Deepcut	Deepcut	0.10	140	CAMBERLEY	Low	Reinforcement on the east side of Camberley (Maultway) and from Heatherside into site	0	0	2	98	100	0	0	Basingstoke Canal	Bedrock - Secondary A ; Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_004	36	FC Brown Ltd	Bisley	0.04	113	CHOBHAM	Low	No further contribution required	1	3	17	79	100	0	0	Basingstoke Canal	Bedrock - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_005	557	Land west of Sturt Road	Frimley Green	0.03	100	CAMBERLEY	Low	May require contribution to Princess Royal Barracks and/or some in Old Bisley Road	6	9	24	61	100	0	0	Blackwater River	Bedrock - Secondary A ; Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_006	604	The Ridgewood Centre, Old Bisley Road	Heatherside	0.04	100	CAMBERLEY	Low	No further contribution required	5	6	17	72	100	0	0	Trulley Brook	Bedrock - Secondary A ; Superficial - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_007	446	Land at Notcutts London Road and west of Hawkesworth Drive Bagshot	Lightwater	20.47	165	LIGHTWATER	Low	Local	0	0	1	99	100	0	0	Windle Brook	Bedrock - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_008	178	Housing Reserve Site Benner Lane West End	West End	14.29	400	CHOBHAM	Low	Local	2	3	6	89	100	0	0	The Bourne	Bedrock - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW
SurreyHeath_009	560	Housing Reserve Site Kings Road/Beldam Bridge Road West End	West End	3.37	195	CHOBHAM	Low	Local	11	3	6	80	98	2	0	The Bourne	Bedrock - Secondary A	N/A	Low	No restrictions	Site unlikely to be impacted by odour from a WwTW

Appendix J. Wastewater Network Capacity Assessment

Hart, Rushmoor and Surrey Heath Water Cycle Study
Predicted Pipe Volume Capacity Model for a 1 in 2 Year Rainfall Event

Legend

Predicted Pipe Volume Capcity Model

- No Calculated Value
- Low
- Medium
- High
- Very High

N

0 1,850 3,700 7,400

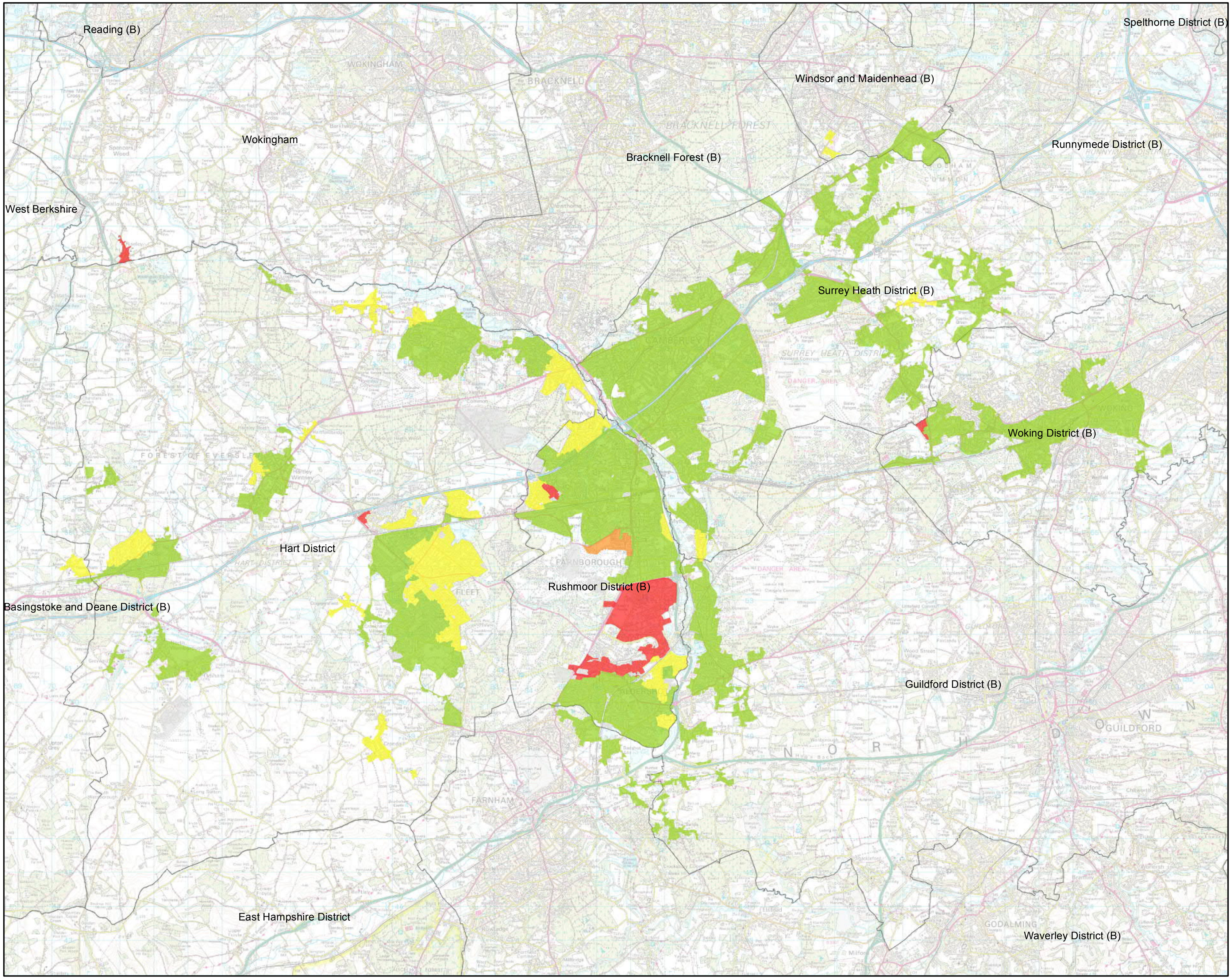
Meters

Disclaimer:
The Pipe Volume Capacity Model has been calculated for a 1 in 2 year rainfall event for a duration of 2 hours.

The position of the apparatus and boundaries shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed.

Based on the Ordnance Survey Map with the Sanction of the Controller of H.M Stationery

No liability of any kind whatsoever is accepted by Thames Water for any error or omission.



Thames Water

Date Printed: 20/10/2016 Printed By Zeshan Alli

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Midpoint
Alençon Link
Basingstoke
Hampshire
RG21 7PP
United Kingdom
+44 1256 310200