

5. Water Resources and Public Water Supply

5.1 Water Resources Management - Data Compilation and Review

Water resources are managed by the Environment Agency in England and Wales, in the form of granting (or refusing) abstraction licences to abstract water for various purposes. Once water has been abstracted from the environment, the responsibility for managing it is transferred to the water undertakers who have a statutory duty to provide water supplies. Anglian Water is responsible for the supply of potable water in the study area.

5.2 Public Water Supply

5.2.1 Water Company Water Resource Management Plans

In addition to the Strategic Asset Management Plans (see Section 3.2), the water companies must submit a Water Resources Management Plan (WRMP) to Defra, for review by the Environment Agency, acting as advisor to Defra on the plans. These plans set out in detail how the water companies plan to balance supply and demand for water in their supply area over a 25 year period and take into account the economic, environmental and social implications of these plans. These plans, previously known as Water Resources Plans (WRPs) are reviewed and updated on a five yearly basis. The last WRP was produced in April 2004. Since that time the plans have become a statutory requirement under the Water Act 2003. The next WRMP is due to be completed in 2009, although the water companies have prepared and published a draft WRMP for consultation in May 2008.

Levels of Service, Water Resource Zones and Water Company Planning

When planning future water resources the water companies aim to achieve 'levels of service' for customers that are agreed with the water regulator, OFWAT. Each company has its own levels of service, which state how frequently the companies can impose water use restrictions during periods of water shortage. For example, Anglian Water plans to impose hosepipe bans no more frequently than once in ten years (Anglian Water, 2008). Levels of service are important as they determine the investment required to maintain secure supplies of water and prevent more frequent restrictions than the companies' stated levels of service.

In the WRMPs, the water companies set out their plans for water resource provision at the sub-company level, in areas called water resource zones (WRZs). A WRZ is defined as "*the largest possible zone in which all resources, including external transfers, can be shared (the zone in which all customers experience the same risk of supply failure from a resource shortfall*" - Environment Agency, 2007a, p24-3).



It is important to be aware that the water company plans are based on theoretical circumstances. For each water resource zone the water companies produce plans under a 'dry year' scenario, ensuring that demand for water can be met for the agreed levels of service during a dry or drought period. All water companies produce plans to ensure that the annual average demand for water can be met during a dry year. The water companies use records of actual demand data and carry out a statistical process to 'normalise' this data and then they apply uplift factors to create a theoretical dry year annual average (in which the same demand is planned for every day of the year). Where water companies identify that the ability to meet short-term peaks in demand in a dry year is a driver for additional water supply investment, companies may also submit plans for a WRZ under peak or 'critical period' conditions.

The forecast situation, constrained by existing policies and supply sources, is known as the 'baseline'. Where a shortfall in supply capability is identified in the baseline, the water company identifies schemes to resolve the situation. These schemes are generally a combination of demand management and resource development, in line with the 'twin-track' approach to water management. It should be noted that, to ensure secure water supply, the water companies take uncertainties into account in their Water Resource Management Plans. These uncertainties include, for example, how climate change may affect demand and resource availability in the future.

5.3 Water Resource Availability

5.3.1 Catchment Abstraction Management Strategies (CAMS)

The Environment Agency uses a consistent national approach of Catchment Abstraction Management Strategies (CAMS) as a tool to inform licensing policy. The CAMS assessment process determines how much water is available for abstraction and how much water is required by the environment in each catchment. When completed, the Environment Agency will have produced a Catchment Abstraction Management Strategy for every river catchment within England and Wales, setting out a strategy of how the balance between the needs of people and the environment will be managed over time. Where the CAMS process identifies that the current volume of water licensed for abstraction (or the actual volume that is abstracted) exceeds the environmental requirements, the CAMS sets out how the Environment Agency will seek to redress this balance.

The CAMS documents are reviewed on a six yearly cycle to tie in with the requirements of the Water Framework Directive, which requires that a River Basin Management Plan be produced and reviewed at the same six yearly frequency.

Local CAMS documents need to be considered within a Water Cycle Strategy. The documents detail the availability of water resources within the strategy area, identifying where there may be more water available to meet the needs of new development, or where there is no water available and the demands of new developments may need to be met from elsewhere. CAMS are also important to wastewater service provision, since the availability of water within rivers is important for maintaining sufficient dilution of wastewater discharges.



5.3.2 Restoring Sustainable Abstraction Programme

In 1999 the Environment Agency established the Restoring Sustainable Abstraction (RSA) Programme to identify sites that are designated (such as EU Habitats Directive and Sites of Special Scientific Interest) and locally important sites that may be at risk from unsustainable water abstraction. If investigations show detrimental affects on these sites from water abstraction, the Environment Agency will attempt to reduce the impact. This may be through actions such as helping to develop alternative sources away from the affected sites. The RSA Programme may be important to a WCS where locally important water supply sources are subject to investigations and possible reductions in licensed volumes.

5.3.3 Water Stress

The Department of Environment, Food and Rural Affairs (Defra) has established a Water Savings Group (WSG), set up to establish how best to target water efficiency activities to achieve a balance between water supply, demand and the environment. The WSG developed a methodology based on current and forecast per capita demand for water, forecast population growth and current and forecast resource availability to classify the ‘water stress’ of water company supply areas. The assessment has three levels of water stress classification, Low, Medium and Serious. The whole of Anglian Water’s region, including King’s Lynn, is designated as an area of ‘serious’ water stress (Environment Agency, 2007b). This means that the WSG has classified the area as requiring the highest level of water efficiency activity, which could include allowing compulsory metering of properties across the area (Environment Agency, 2007c).

5.3.4 Climate Change

Entec has reviewed the published Water Resources Management Plan (WRMP) to confirm that Anglian Water has incorporated the most likely impacts of climate change into its resource and demand forecasts. The water supply component of this WCS is based on the data provided by Anglian Water. The impacts of climate change are inherently included within that data and therefore, are also inherently included in this study. Anglian Water has also used good practice to take account of the uncertainties associated with climate change.

Analysis of the climate change models and the existing water resource system indicates that rainfall will increase in winter and reduce in the summer with an increase in temperatures. This will reduce the length of the winter recharge season and potentially increase the demand for water. The Company has forecast that the climate change will reduce deployable output (supply) in the Fenland water resource zone by 4.8Ml/d by 2030/31, and that the rate of reduction will be greatest up to 2020/21. Anglian Water has reported that these changes pose the biggest risk to the Company over the next 25 years. Anglian Water has based its climate change assumption on the advice of the UK Climate Impacts Programme (UKCIP). However, the water company has stated that it may need to “*reflect changes to the estimates of water resource availability when the outputs from the latest climate change models are published in late 2008 [now 2009]*”.



The key point is that this future reduction in supply has been forecast and the Company has developed a plan to successfully balance future demand with future supply, managing the impacts of climate change by mitigation and adaptation. At a strategic level, the principal element of the supply plan will be to store more runoff from winter rainfall and to enhance natural groundwater recharge. The Fenland zone is forecast to benefit from transferring water within the zone and from neighbouring zones.

5.4 Sustainable Development

5.4.1 Code for Sustainable Homes

The Code for Sustainable Homes (see also Appendix E) is a national voluntary standard for the sustainable design and construction of new homes. This is an important consideration when assessing the water demand from new homes, and thus the demand from new developments, as there is now a commitment to construct a proportion of new homes to minimum performance standards for water use.

There are six performance levels in the Code for Sustainable Homes. Water performance against the CSH is measured in terms of three per capita consumption (pcc) standards. These are shown in Table 5.1.

Table 5.1 Water Performance Standards in the Code for Sustainable Homes

Code Level	Per Capita Consumption (l/h/d)*
Level 1 and Level 2	120 l/h/d
Level 3 and Level 4	105 l/h/d
Level 5 and Level 6	80 l/h/d

Note: that the performance standards in the Code for Sustainable Homes exclude water use outside the home (e.g. garden watering)

Although introduced as a voluntary standard, from April 2007 all housing built on English Partnerships' land, and from April 2008 all social housing funded through the Housing Corporation, has to be built to CSH Level 3.

Following the publication of the CSH, the Government has committed to the introduction of a minimum regulatory standard for water consumption in new homes which will be introduced through amendments to the Building Regulations, and due to come into force on 6 April 2010 (CLG, 2007; CLG, 2009). The regulatory minimum has been set at 125 l/h/d including water use outside the home and is approximately equal to the least stringent standard of the Code for Sustainable Homes (Levels 1/2).

A recent study completed by Entec for the London Development Agency has assessed the different measures that could be implemented in new homes to meet the CSH standards. The study has shown that level 3/4 water



consumption can be met using standard products that are already on the market, and which offer acceptable levels of performance. There are numerous combinations of fittings that can be installed to meet the standard, allowing for different priorities. Table 5.2 indicates the type of combinations that can be considered. This should not be used as a definitive guide to achieving the CSH levels in new developments in Kings Lynn. The feasibility of water efficiency measures is dependent on numerous factors including the type of development. It is recommended that further investigation is made in a detailed water cycle study.

Table 5.2 Combinations of water fitting types for meeting CSH level 3/4

Water fitting	Option A	Option B	Option C
WC flush	4.5/2.6 litre	6/4 litre	6/4 litre
Greywater	0	0	0
Basin taps	4 litre	4 litre	4 litre
Bath capacity	180 litre	180 litre	0
Shower flow rate	10 litre	8 litre	10 litre
Kitchen taps	8 litre	6 litre	8 litre
Washing machine	6.1 litre/kg	6.1 litre/kg	6.1 litre/kg
Dishwasher	0.7 litre/ps	0.7 litre/ps	0.7 litre/ps
l/head/day	105	102	104
*75% of WC daily demand			
**Inappropriate as exceed minimum standard but fail to meet desired standard			
ps – place setting			

The same study has also shown that a rainwater or greywater system is required for a new home to achieve level 5/6 without resorting to water fittings that are unacceptable to the end user. Additional features such as water butts to supply garden watering, and measures to reduce waste within the home, e.g. reducing dead legs in household plumbing, do not gain credits within the CSH assessment but these should also be implemented where possible.

5.5 Water Resources and Public Water Supply in the Study Area

Annual average rainfall in the UK is 1,100mm/year although the average for England is 828mm/year, based on data 1961-1990 (Met Office, online). Hydrometric records show that average rainfall in the Borough of King's Lynn and West Norfolk is below average, between 587mm/year and 689mm/year (as recorded at Ely Ouse at the Denver Complex, and Babingley at West Newton Mill respectively, CEH 2009). Water resources across the East and South East are under great pressure from the demands of people and the environment and climate change may further reduce the amount of water available to supply.



5.5.1 Water Resource Availability and CAMS in the Study Area

The King's Lynn and West Norfolk District lies within the North West Norfolk CAMS, the Old Bedford (including Middle Levels) CAMS, and the Cam and Ely Ouse (including South Levels) CAMS (Figure 5.1). The Environment Agency has completed its assessment of water availability and the impacts of existing abstraction on the aquatic environment in this area.

In the North West Norfolk CAMS, 42% of the water licensed for abstraction is allocated to public water supply. Land use is predominantly agricultural, and demand for general agriculture and spray irrigation accounts for approximately 28% of licensed abstraction volume. The remaining 30% of abstracted water is shared between industry, and fish farms. Private water supply and abstraction for environmental purposes makes up less than 1%.

The proportion of abstraction licence volumes allocated to public water supply varies around England and Wales but proportions of up to 90% are not uncommon. The proportions are highly dependent on the rural/urban composition of the catchment and this varies significantly. Similarly, the proportion allocated to agricultural use (and spray irrigation) is dependent on land use composition but also the local climate. A review of CAMS assessments from across England and Wales suggests agricultural demand (licensed quantity) ranges from less than 5% up to 30%. This highlights the local significance of agricultural water demand on water resources in this area.

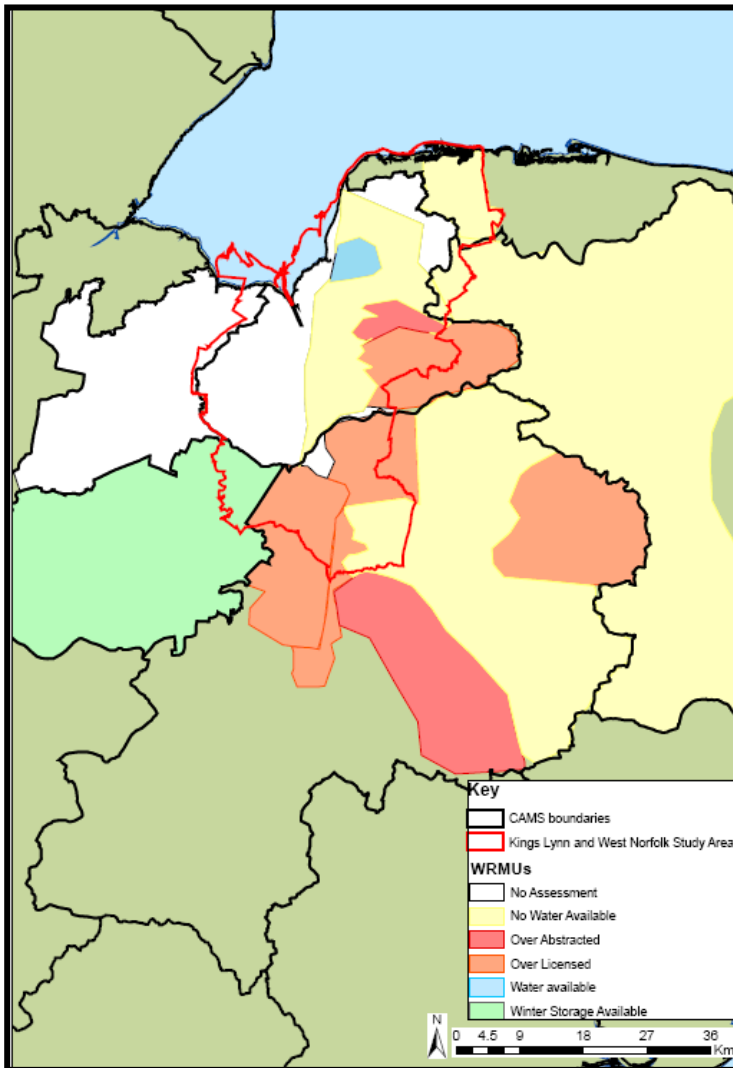
The CAMS process defines resource availability using four categories:

Resource Availability Status	Definition
Water available	Water likely to be available at all flows including low flows, although some restrictions may apply.
No water available	No water available for further licensing at low flows although water may be available at higher flows with appropriate restrictions. This means that all the water is already fully allocated.
Over licensed	Current actual abstraction is resulting in no water available at low flows. If existing licences were used to their full allocation, they would have the potential to cause unacceptable environmental impact at low flows. Water may be available at high flows with appropriate restrictions.
Over abstracted	Existing abstraction is causing unacceptable environmental impact at low flows. Water may still be available at high flows with appropriate restrictions.

Where the Environment Agency assesses a catchment as being over-abstracted, the Environment Agency's licensing strategy will seek to secure downward variations to abstraction licences under its existing powers when abstraction licences are renewed.



Figure 5.1 CAMS Water Availability Status



The result of the North West Norfolk catchment assessment shows that the majority of the surface and groundwater sub-catchments have either no water available, are over licensed, or even over abstracted.

To the south, in the Cam and Ely Ouse, the situation is the same with many sub-catchments already overlicensed or overabstracted. The Environment Agency has identified that there is potential to make use of winter rainfall by developing winter storage facilities in the Old Bedford CAMS.

With the exception of a very small pocket of water available in the Dersingham area, the wider picture illustrates the lack of additional water that would be available for abstraction if additional demand, exceeding Anglian Water's current licensed supplies, were to occur.

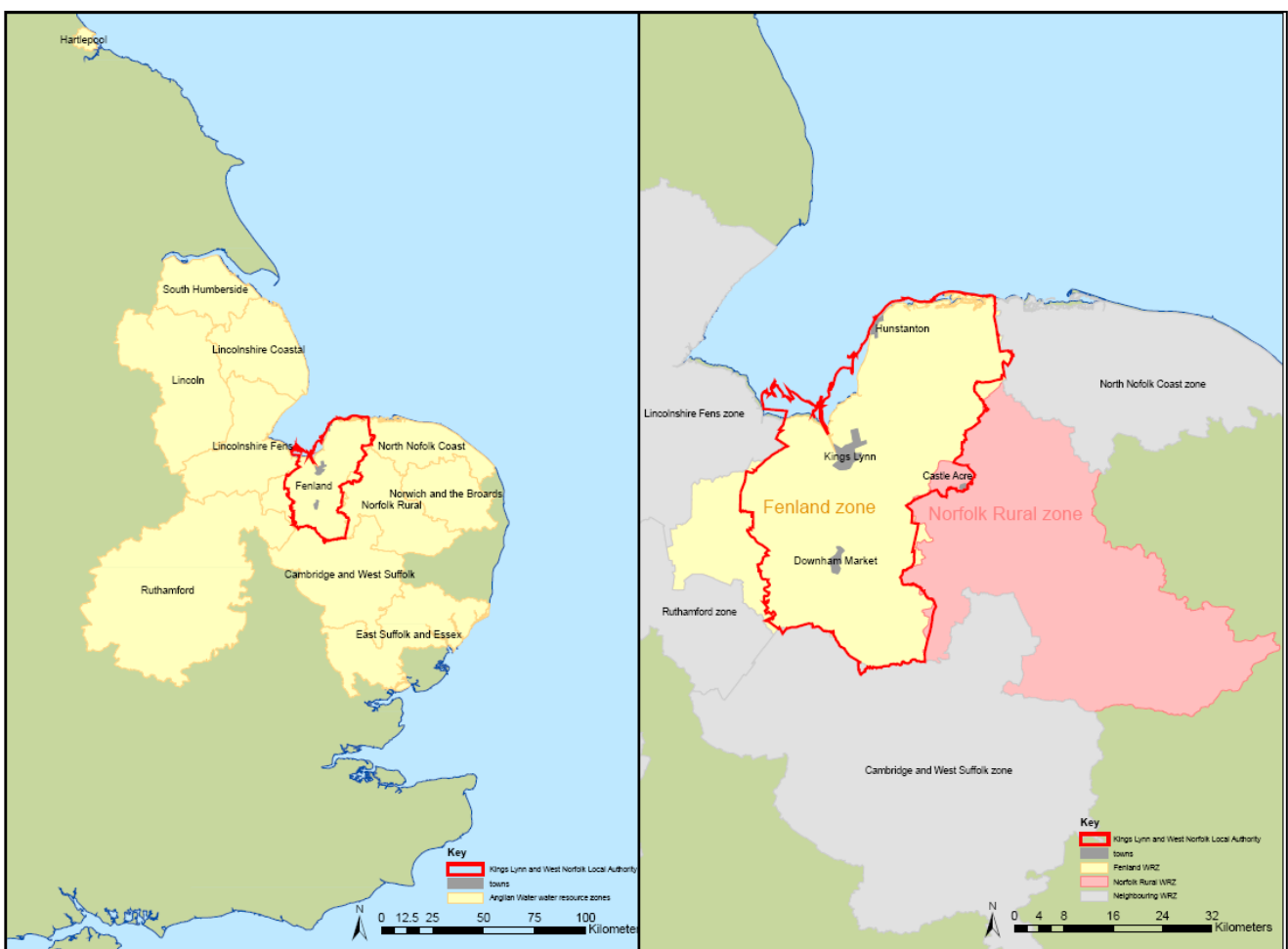
The CAMS documents demonstrate that there is limited environmental capacity to support further abstraction to meet demand from new development. Increasing resource availability is largely limited to making more efficient use of existing resources. Detail on the catchment resource assessments in and around the King's Lynn and West Norfolk District area is reported in the North West Norfolk CAMS report (Environment Agency, 2005). Resource assessments in adjacent areas are reported in the Cam and Ely Ouse CAMS (Environment Agency, 2006), and the Old Bedford CAMS (Environment Agency, 2006). Further information on the CAMS assessment process is available in Appendix C.



5.5.2 Public Water Supply

Anglian Water is the public water supply undertaker (and wastewater and services provider) in the King's Lynn and West Norfolk area. Anglian Water operates eleven zones over a large area of Eastern England. Figure 5.2 illustrates the full extent of Anglian Water's company area and shows the Kings Lynn and West Norfolk area in relation to this. The two boundaries are similar because previously the water undertaker was the local authority (North West Norfolk Water Board until 1974 and then Anglian Water Authority until 1989). During this time the structure of the supply system has remained unchanged.

Figure 5.2 Full Extent of Anglian Water Company Area



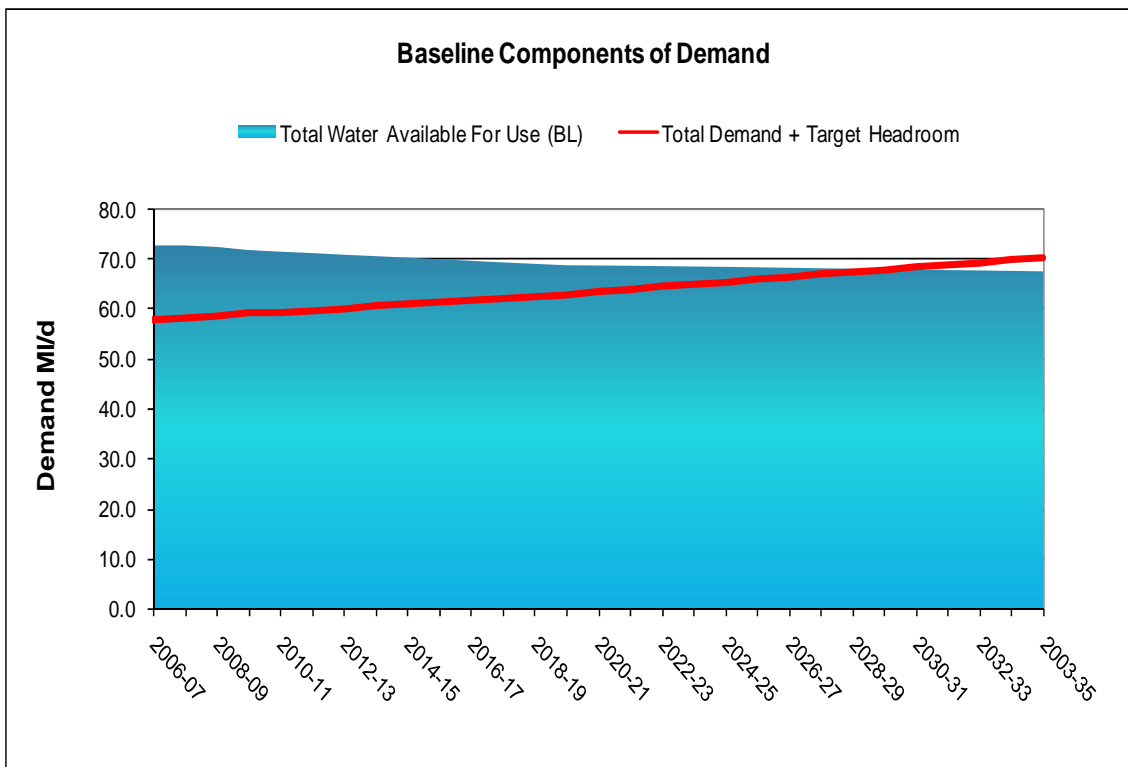
Almost the entire local authority area is within the Fenland water resource zone. However, one village is located within the Norfolk Rural water resource zone, Castle Acre, in the East of the local authority district area. This



village is connected to a different supply distribution network with different sources of water. Due to the very small nature of this village and the lack of any significant development planned in its locality, it was agreed that detailed water resource zone analyses relevant to Castle Acre would not add value to this study.

The baseline forecast for the Fenland zone (under dry year annual average conditions) illustrated in Figure 5.3 shows a declining surplus with supply exceeding demand until 2030-31.

Figure 5.3 Baseline Supply-Demand Balance in Fenland Water Resource Zone



This forecast is based on the following assumptions of housing and non household growth, and per capita consumption.

- Total new houses in zone (2007-08 to 2030-31): 22,857
- Annual average housing growth rate: 952
- Total number of households (new and existing) in 2030-31: 102,948
- Change in non household properties: No change, constant at 6,384



- Change in non household consumption (total for all properties): 24.3 MI/d in 2006/07 to 25.8 MI/d in 2030/31 (increase of 1.5 MI/d)

This forecast includes the area of Wisbech which is outside of the study area. However, Fenland District Council has provided information on the housing growth which it forecasts for the Wisbech area. The total forecast housing growth for the Kings Lynn and West Norfolk District, and the Wisbech area of Fenland District have been compared with the housing total for the equivalent area of Anglian Water's Fenland water resource zone. Further details on the reconciliation between local authority growth forecasts and Anglian Water's growth forecast are presented in section 5.5.4.

5.5.3 Water Company Options to Strengthen the Baseline Supply-Demand Balance

Anglian Water does not forecast the Fenland zone to fall into deficit until 2030-31. Despite this the Company has considered it prudent to consider a small number of water management investment options to strengthen this position. These options are predominantly designed to make better use of existing resources, encouraging customers to be more water efficient and transferring water to areas with demand needs, rather than by developing new resources. The CAMS assessments presented in Section 5.5.1 highlight the lack of additional water that would be available for abstraction, and the unlikelihood that the Environment Agency would grant additional abstraction licences. If the options in Anglian Water's WRMP are approved by OFWAT, and the Plan can be implemented, then the zone will not fall in to deficit. The impact of climate change and sustainability reductions will reduce the existing surplus of 17 MI/d gradually to approximately 8 MI/d by 2019-20. The following year improvements in the production side of Anglian Water's water management operations will augment supply by approximately 6 MI/d if required.

Communication between Anglian Water and the Borough Council will be necessary beyond the publication of the final WRMP and the OFWAT Price Determination to ensure that both the local authority and the water company are kept up to date with actual and planned developments so that management plans can be followed and/ or adapted as necessary. It is particularly important that the water company is kept up to date with the delivery of large scale developments as the infrastructure that is required can require lengthy lead in times.

5.5.4 Reconciling Water Company and Local Authority Housing Growth Data

The Borough of King's Lynn and West Norfolk area is similar to the Fenland water resource zone that Anglian Water uses to manage water supply and demand in this locality. Whilst the study area makes up the majority of the Fenland zone, the town of Wisbech and its surrounding villages are also part of the Fenland zone system. The water company develops its zonal housing growth forecasts based on the data provided in the East of England Plan, setting out the minimum housing growth targets for each local authority. The water company forecast does not disaggregate growth into specific localities. The water companies state that their final WRMPs to be published in 2009 will take account of the updated figures in the Revised East of England Plan.



There are two key issues that must be reconciled in relation to growth. Firstly, the local authority requires assurance that its forecast growth and associated demand has been fully taken into account by the water company, and that the water company has the capacity to manage the supply and demand situation. Secondly the local authority must be assured that the water company has made provision to deliver water supply services to new developments as and when they are realised. For King's Lynn and West Norfolk the healthy supply-demand balance in the zone means water resources are currently less of an issue. However, network developments will still require careful and timely planning and implementation. This is an important issue which is likely to require further investigation in Phase 2 of the study

Forecast Demand

The housing figures are only one component of the demand calculation. The other key variables are occupancy rate and the per capita consumption of people living in those houses. For the purpose of this study the occupancy rate has been taken from Anglian Water's draft WRMP. Per capita consumption is significantly influenced by whether or not the household is on a metered or unmeasured charge. Anglian Water has derived average measured and unmeasured per capita consumption figures and these have been used in the water demand assessment for this water cycle study. The water company's forecasts are considered reasonably robust as they are based on well established methodologies for forecasting supply and demand. Demand in the study area is calculated by multiplying the household demand figures with the number of households in the area.

Non household demand forecast has been taken from Anglian Water's draft WRMP. This existing data is sourced from non-household/commercial revenue meters and the billing database. The local authority has not provided information on forecast changes in the non household sector.

Sensitivity Testing Forecast Demand

The impact that growth will have on demand for public water supply depends on several factors; the number of new houses built and their forecast occupancy rate (population), the expected per capita consumption of water of the population in the new properties, which is influenced by the sustainable design of the buildings (Code for Sustainable Homes), the size of the existing population and the per capita consumption of people living in existing homes, influenced by the uptake of domestic water meters, water efficiency education and incentives to save water.

A number of scenarios have been tested to examine the possible range of impacts on demand that could arise from development within the District. The scenarios highlight the uncertainty surrounding the uptake of future water efficiency measures in new and existing homes. The scenarios are based on daily household consumption rates provided in the Code for Sustainable Homes, the Building Regulations, and use data provided in the water companies' draft Water Resource Management Plans.

Both the Local Authority and the Water Company use the Regional Spatial Strategy data as the basis for their housing growth forecasts. However, it is essential to compare their outputs to ensure that there is no significant difference. Anglian Water has taken account of the uncertainty in its housing growth forecast within its headroom



calculation (the buffer of additional water that may be needed if the core WRMP forecasts are inaccurate). As the growth forecasts are estimates it is prudent to test the sensitivity that different growth rates may have upon the water company's water resource management plan. Anglian Water has taken account of these uncertainties in its calculation of headroom. Table 5.3, below, summarises how the alternative housing growth rates compare with Anglian Water's best estimate.

- Growth scenario 1: Borough of King's Lynn and West Norfolk Council preferred growth forecast.
- Growth scenario 2: Upper growth forecast as set out in the Regional Spatial Strategy supporting documents (906 per annum).
- Growth scenario 3: GVA growth forecast as set out in the Regional Spatial Strategy supporting documents (584per annum).

Table 5.3 Comparison of Local Authority and Water Company Housing Forecasts

	2010/11	2015/16	2020/21	2025/26	2030/31
Total houses (existing and new) in Fenland WRZ	84,009	88,793	94,289	98,392	102,948
Growth Option 1					
Total houses (existing and new) in King's Lynn and West Norfolk	70,392	74,908	78,002	80,435	83,507
Total houses (existing and new) in Wisbech*	11,785	12,765	13,744	14,532	15,032
Total houses forecast by Local Authorities in WRZ zone area	82,177	87,673	91,746	94,967	98,539
Conclusion	In growth scenario 1 the water company projection and its plans to maintain the supply-demand balance exceed the sum of the local authority forecasts. No problems anticipated.				
Growth Option 2					
Total houses (existing and new) in King's Lynn and West Norfolk	71,612	76,142	80,672	85,202	89,732
Total houses (existing and new) in Wisbech*	11,785	12,765	13,744	14,532	15,032
Total houses forecast by Local Authorities in WRZ zone area	83,397	88,907	94,416	99,734	104,764
Conclusion	Under this high growth scenario the total number of houses planned by the local authorities will exceed that forecast by Anglian Water by 2015/16 and the difference will become greater over time. This would have implications in terms of the volume of water demand and the plans to manage this, but also the timing of options planned by Anglian Water. It might require strategic options, such as water transfers being brought forward. The local authorities would need to work closely with Anglian Water to ensure that infrastructure enhancements for large developments could be planned and implemented appropriately and timely.				



Growth Option 3					
Total houses (existing and new) in King's Lynn and West Norfolk	70,646	73,566	76,486	79,406	82,326
Total houses (existing and new) in Wisbech*	11,785	12,765	13,744	14,532	15,032
Total houses forecast by Local Authorities in WRZ zone area	82,431	86,331	90,230	93,938	97,358
Conclusion	In growth scenario 3 the water company projection and its plans to maintain the supply-demand balance exceed the sum of the local authority forecasts. No problems anticipated.				

These results indicate that under the preferred and lower growth scenarios, Anglian Water's draft WRMP includes housing provision that exceeds the local authority estimates. This means that there would be some flexibility within the water resource capacity to increase housing growth. However, the timing and location of all developments still require close communication with the water company to ensure that adequate lead times for infrastructure enhancements can be accommodated. In contrast, the higher growth rate could lead to problems quite early on in the planning period as under this scenario housing growth slightly exceeds the water company's forecast by 2015 and this difference increases to approximately 2000 homes by 2030/31.

It is recommended that the Borough Council continues to work with Anglian Water to ensure that the final WRMP has taken into account the preferred growth rates.

Water Efficiency Scenarios

Nine scenarios have been selected to represent a range of per capita consumption scenarios from highly efficient new homes (meeting high levels of the Code for Sustainable Homes) combined with significantly reduced per capita consumption in existing homes, to much lower levels of water efficiency in both new and existing homes. There is no equivalent to the Code for Sustainable Homes for non households and there is no data on which to base assumptions of alternative future demands. Therefore, the sensitivity tests focus on the impact on total demand of households only (Anglian Water's PCC forecasts are provided in Appendix D).

Each of these scenarios has been applied to the three alternative growth rates. The results presented in Figure 5.3 summarise the results displaying total demand in the worst case scenario (highest growth, least water efficient), a best estimate (expected growth, moderately water efficient), and the best case scenario (lowest growth, highest water efficiency). The worst and best case scenarios are expected to represent the most extreme possible situations and the water company's delivery plan can be assessed in the context of this envelope of uncertainty. The complete set of 27 scenario results is available in Appendix D.

Data from Anglian Water's draft WRMP has been incorporated into the analysis to forecast demand in the study area applying the company's assumptions to each of the growth rates (RSS and the upper and lower variants). The nine scenarios cover the range of demand management targets and aspirations that have been presented by Defra and within the Regional Economic Strategy. Table 5.3 presents the demand management scenarios that have been



considered. This has created a framework within which it is possible to consider the impact of a range of alternative policies, targets and aspirations.

Table 5.4 Summary of Water Efficiency Scenarios Used in Sensitivity Analysis

HIGHLY WATER EFFICIENT		Scenario in relation to policy targets and aspirations
Existing household pcc is 10% below water company forecast* Forecast households:		
1a. 35% at 80 l/h/d	65% at 105 l/h/d	
1b. 35% at 105 l/h/d	65% at 120 l/h/d	Most closely reflects RES target of 120l/h/d new build and existing customers
1c. 35% at 125 l/h/d	65% at 130 l/h/d	
MODERATELY WATER EFFICIENT		
Existing households use water company pcc forecast* Forecast households:		
2a. 25% at 80 l/h/d	75% at 105 l/h/d	
2b. 25% at 105 l/h/d	75% at 120 l/h/d	Closely aligns with the RES target for new homes to meet 115l/h/d
2c. 25% at 125 l/h/d	75% at 130 l/h/d	Closely represents Defra aspiration of 130l/h/d for all new homes. Demand forecast between 2c and 3c represents Business As Usual (new households pcc 132 – 142, without uplifted existing pcc)
LEAST WATER EFFICIENT		
Existing household pcc is 10% above water company forecast* Forecast households:		
3a. 45% at 105 l/h/d	55% at 120 l/h/d	
3b. 45% at 120 l/h/d	55% at 125 l/h/d	
3c. 45% at 130 l/h/d	55% at 150 l/h/d	
*See Appendix D AWS PCC Forecasts		



Figure 5.4 Total Demand Within King's Lynn and West Norfolk District - Scenarios

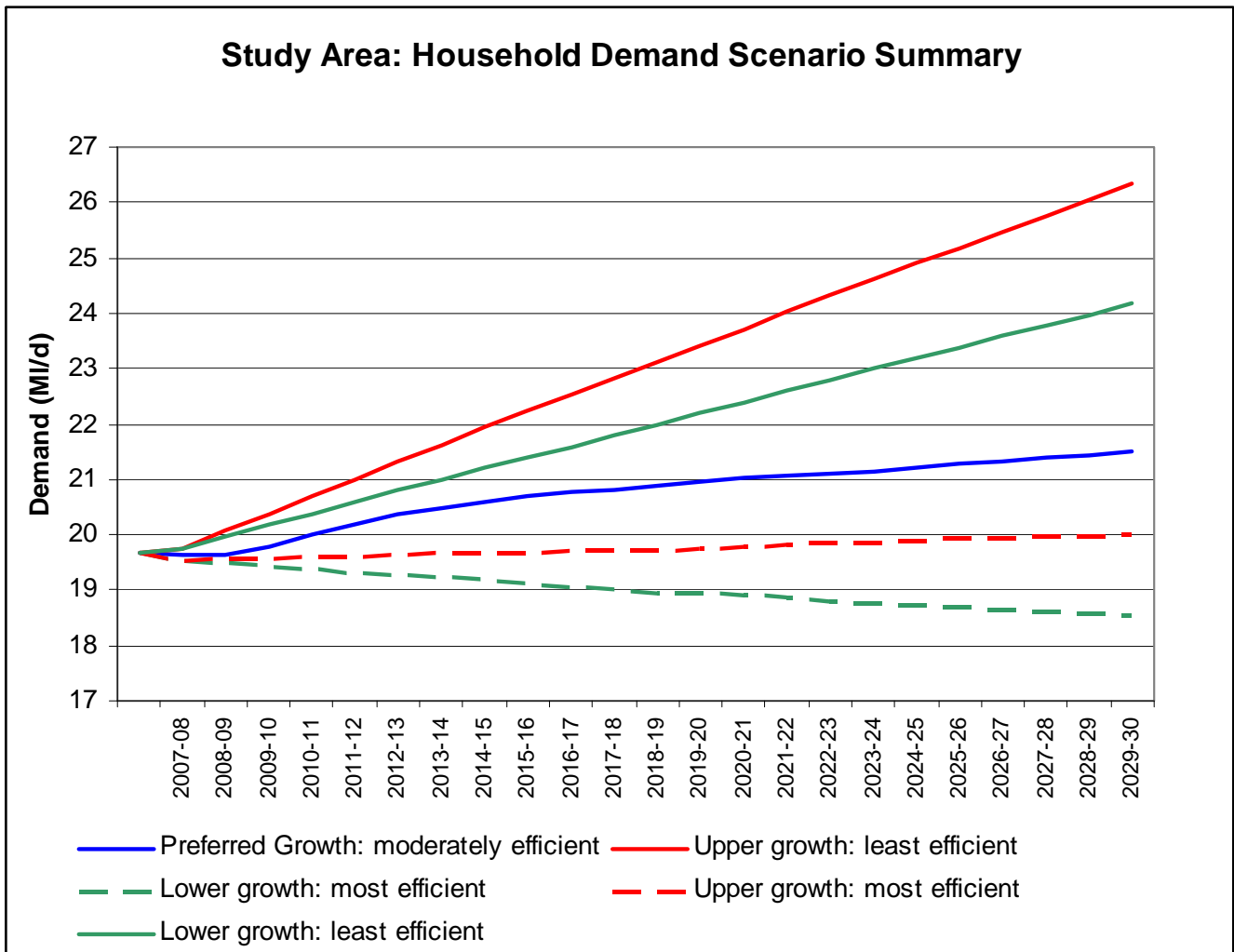


Figure 5.4 shows the range in demand based on the three categories of water efficiency that have been tested. The blue line is demand as calculated using Anglian Water’s pcc forecast, and the Council’s preferred housing growth rate (based on RSS and is Anglian Water’s forecast). The green and red lines show demand as it would be using alternative housing growth rates and alternative pcc forecasts. The key point is that by considering alternative growth and pcc forecasts, the water cycle study analysis shows that by 2025/26 demand in the study area could be either 2MI/d less or up to 4MI/d more than the forecast based on Anglian Water’s assumptions.

By 2025/26 the range in demand generated by these scenarios is 6.5 MI/d, and the potential range increases to 7.8 MI/d by 2030/31. The Preferred forecast (moderately efficient) using water company forecasts and moderate uptake of CSH in new housing (25% aiming for level 2/3 105 litres per person per day), is the most likely outcome, generating a total household demand of 21.3 MI/d by 2025/26, and 21.5 MI/d by 2030/31. Calculated data covering the period 2022 to 2027 have been extrapolated to generate forecast demands up to 2031/31. The most water



efficient scenario combined with the lower growth forecast is shown to have the potential to reduce demand below existing levels. A reduction in existing customers' per capita consumption by 10% lower than the water company forecast, combined with low growth and pcc in all new homes of no more than 105 litres per person per day would reduce household demand by 1.2 MI/d by 2030/31.

Non Household Demand

No information has been made available by the Borough Council regarding the forecast change in non household properties and demand from this sector, therefore, it is not possible to model the impact of the building regulations (requirement of 125l/h/d in new non households). Anglian Water has included a forecast in its draft WRMP and this shows that in the Fenland resource zone there are 6,384 non household properties. Assuming non household properties are shared between King's Lynn and West Norfolk District, and the Wisbech area of Fenland District, in the same proportion as households (86%), there are approximately 5,490 non household properties in the King's Lynn and West Norfolk area. Total non household demand (Fenland zone) was 24.3 MI/d in 2006/07 increasing to 25.8 MI/d in 2030/31 (increase of 1.5 MI/d). In the absence of more detailed information it is assumed that this demand is shared equally between all non households and in turn this equates to a non household demand of 20.9 MI/d increasing to 22.2 MI/d in the study area.

5.6 Impacts of Water Abstractions on Habitats

Surface and ground water abstractions have the potential to impact on habitats which have been assessed by the Environment Agency in their Habitats Directive Review of Consents and Restoring Sustainable Abstraction programmes. Any issues that require action have been identified in the draft River Basin Management Plans (Table 3.2). This identifies East Walton and Adcock's Common as requiring an investigation to determine impact of abstraction on the site. The Environment Agency has indicated that any modifications to the abstractions affecting this site (Marham and Gayton) will not affect their deployable output. The Environment Agency also indicated that a management arrangement has been agreed with Anglian Water in relation to the Sandringham Sands licence with regard to its impact of Roydon Common SSSI which specifies a modified abstraction pattern between boreholes under drought conditions but again this will not affect the deployable output. (The impact of climate change on deployable output of sources has been considered in the AWS Water Resources Plan, as discussed in Section 5.3.4). The Habitats Review of Consents for the other European sites in the Borough does not identify adverse effects from the water supply licences related to water supply in the Borough. Overall, therefore, impacts on habitats will not restrict water supply within the Borough and current resource planning.

5.7 Drinking Water Quality

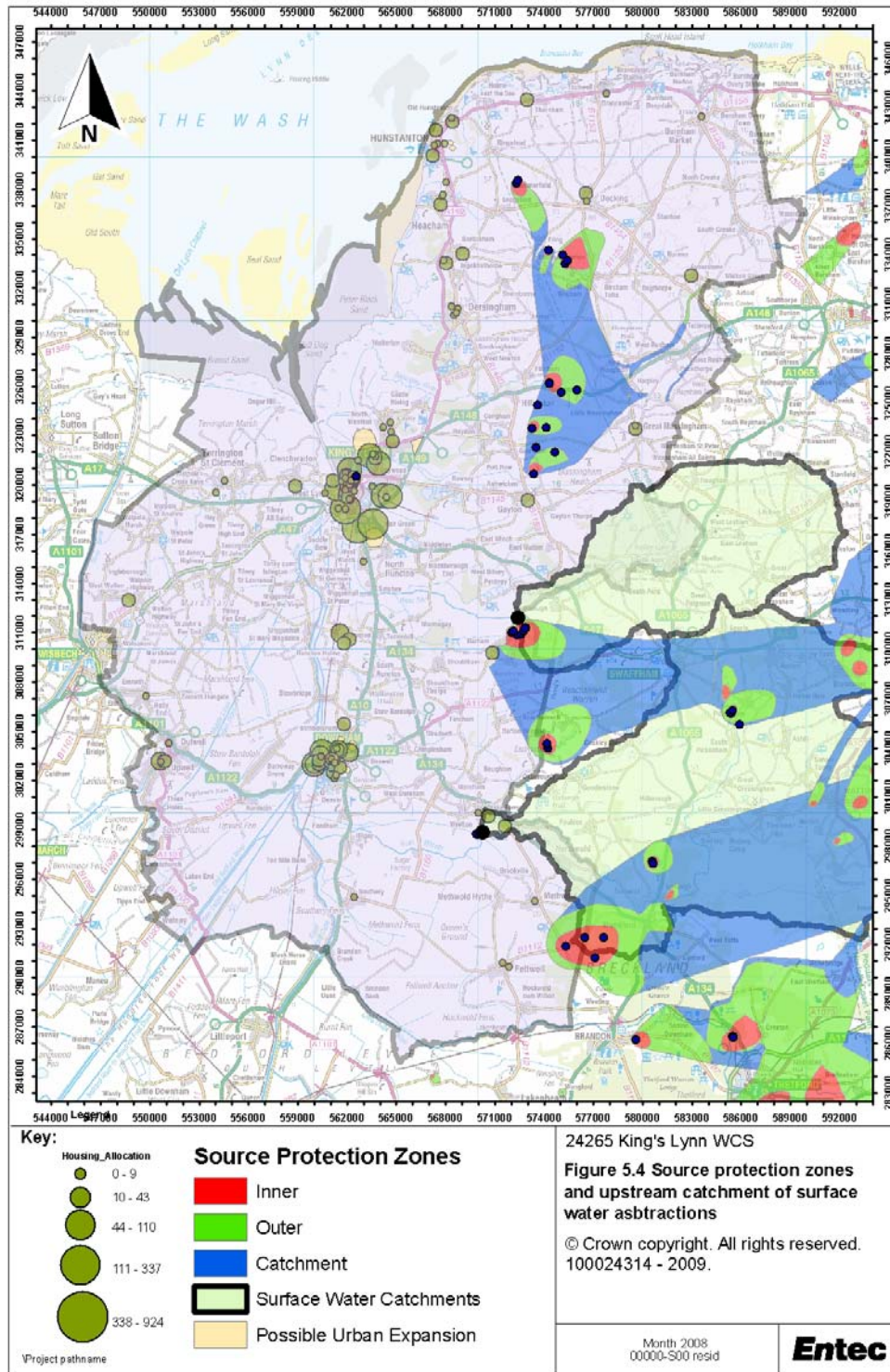
Housing development may affect water quality of the water supply by affecting pollution in the catchment areas of the sources. This might require Anglian Water to restrict supply or upgrade treatment at its water treatment works. Figure 5.4 compares the source protection zones (SPZ) for the groundwater water supply sources and catchment areas of the surface water sources (Marham and Stoke Ferry) with the location of the proposed housing



development. None of the housing developments are in the SPZs and only minor developments are upstream of Marham and Stoke Ferry. Consequently, impacts of drinking water quality are not an issue with regard to housing growth.



Figure 5.5 Source Protection Zones and Upstream Catchment of Surface Water Abstraction



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5.8 Interactions with Neighbouring Council Areas

Water supply in King's Lynn and West Norfolk is currently sourced from within the Borough from the surface water sources at Marham on the River Nar and Stoke Ferry on the River Wissey and the groundwater boreholes in the Sandringham Sands and Chalk aquifers. Of these sources the Stoke Ferry and Marham surface water abstractions and boreholes at Denton Lodge, Marham and Beachamwell (actually in Breckland) have catchments that extend into the Breckland Council area so may be affected by housing growth and changes to abstraction in this area. However, Breckland is also an area of water stress and it is, therefore, unlikely that the Environment Agency will allow abstraction to increase. Water supply issues in Breckland are due to be considered in more detail in the Phase 2 Breckland WCS which is currently being commissioned. Anglian Water manages resources at a regional level so interaction between council areas is unlikely to be an issue. This would also apply to imports of water from other supply zones that may be required in the future to meet demand in the Borough.

5.9 Interim Conclusion

Q. Is water supply a constraint to growth in the King's Lynn and West Norfolk District?

Anglian Water has informed the study that the availability of water resources will not constrain the proposed development. However, the actual levels of water efficiency achieved will directly affect competing demands for water and the pressure on the water environment and the cost and carbon footprint of providing this service.

In its draft WRMP Anglian Water demonstrates that its demand forecast is based on housing growth projections within the Regional Spatial Plan. King's Lynn and West Norfolk Borough Council has used these same data to project housing growth rate at the Local Authority scale. Based on a housing forecast in line with the RSS Anglian Water has forecast household demand to be just under 26MI/d by 2030/31. This includes the volume required to take account of uncertainty, 6.7MI/d.

Anglian Water plans to increase its volume of Water Available For Use (WAFU) by an extra 6MI/d (9MI/d during the peak demand period) by improving its production methods, namely extending the Stoke Ferry plant and transfer. This option will make better use of Anglian Water's existing resources. Therefore, Anglian Water has demonstrated that it will be able to meet demand (even in the higher growth, least efficient scenario) without developing a new source, and/or requiring a new abstraction licence.

Recommended Policies

New Households

It is recommended that King's Lynn and West Norfolk Borough Council includes policy recommendations for all new developments to meet at least Code for Sustainable Homes' level 3 or 4 with regard to water efficiency in order to reduce the pressure as far as possible on the region's water resources. Level 3/4 equates to a daily per capita consumption of 105 litres. The Council may wish to consider taking on a role to advise on water efficiency



measures in new build and maintenance work. Anglian Water supports the recommendation for Kings Lynn and West Norfolk District Council to have a policy for CSH levels 3 / 4 (105 l/h/d) in its planning approvals process.

Even with new buildings designed to this standard, future alterations to bathroom and kitchen suites may increase water consumption, for example by installing power showers. Currently there is no way to avoid this altogether but it can be prevented by ensuring water fittings in new homes offer acceptable performance standards. This is increasingly manageable as manufacturers respond to an increasingly competitive and demanding market. Retro fitting water efficiency measures into existing buildings will be equally if not more important, as the majority of demand in 2026 will be generated from houses that have already been built.

Existing Households

Anglian Water has a water efficiency strategy targeting existing households, aimed at reducing per capita consumption towards levels recommended by the Government (130 l/h/d) (Defra, 2008). These strategies incorporate metering as a central theme to encourage customers to be more aware of their consumption, and to use water more wisely. It is recommended that King's Lynn and West Norfolk Borough Council develops policies to facilitate the implementation of these water efficiency strategies. Options that the Council may wish to consider include the following.

- Hosting or co-sponsoring annual events to promote water conservation. The annual Water Festival co sponsored by Hampshire County Council is a good example. For information and ideas see the Hampshire Water Festival website.
- A voluntary water efficiency labelling scheme is being operated by the Bathroom Manufacturers Association (BMA) which sets standards of water efficiency against which manufacturers' appliances can be tested. Once approved, the appliances are awarded a water efficiency label and entered onto a database. The Council may wish to investigate the option to provide rebates to tax payers who purchase appliances that have been approved under this scheme.
- Some local governments in other parts of the world that are also experiencing severe water stress, such as Australia, are working with the water undertakers to audit and retrofit selected households with water efficient products such as showerheads, taps and flow controllers. This is an option that King's Lynn and West Norfolk Borough Council may also wish to consider in the future.
- A scheme to support householders wishing to retrofit their homes with rainwater harvesting systems, or greywater recycling systems.

Council Establishments

The Council may choose to lead by example by employing policies to minimise the unnecessary use of resources in its own buildings, vehicles and in all its activities. This may include a water audit (survey) of council establishments and cost effective water saving measures identified. This could include Council offices, and public facilities such as council operated leisure centres, Typical activities include:

- Monitor water consumption on a regular basis and compare against benchmarks;



- Encourage water meter readings to be taken on a regular basis;
- Promote the efficient use of water through regular newsletters and publications;
- Make account holders aware of supplier's policy on water leaks;
- Maximise the claims for rebates due to leaks detected and repaired.

Recommended Actions

Due to the strategic nature of water resource zones, “*in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall*” the absolute amount of water available for use (supply) is not a constraint to development. However, development may be constrained temporarily by the availability of infrastructure to move water to new areas.

It is recommended that King’s Lynn and West Borough District Council maintains its communications with Anglian Water to enable both organisations to develop their Plans in line with one another. It is also recommended that the Borough Council takes a proactive approach to ensure that the zonal demands for water take account of the demand that will be generated by development in the three target towns, King’s Lynn, Hunstanton, and Downham Market, and that the housing developments and water infrastructure enhancements are planned together, and phased accordingly.

The Council may find it beneficial to develop its own water efficiency strategy, working with Anglian Water, to support the development of its own water efficiency policies.

