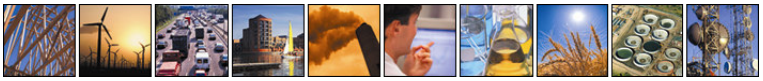
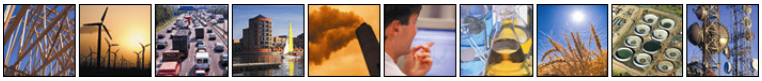
Appendix A
Glossary of Terms

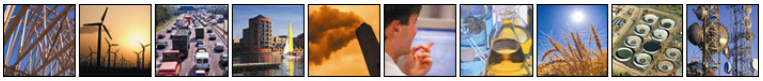
Abstraction license	a licence granted under the Water Resources Act 1991, as amended by the Water Act 2003, to abstract untreated water from a source of supply.
Asset Management Period (AMP)	Five year period in which water companies implement planned upgrades and improvements to their asset base. Activities are subject to funding review.
Biochemical Oxygen Demand (BOD)	a widely used measure of polluting potential - a measure of oxygen use, or demand, by bacteria breaking down the biodegradable load in sewage treatment plants or environmental waters.
Biodiversity Action Plan Priority Habitat	each Local Biodiversity Action Plan works on the basis of partnership to identify local priorities and to determine the contribution they can make to the delivery of the national Species and Habitat Action Plan targets.
Catchment Abstraction Management Strategy (CAMS)	the assessment of how much water can be extracted to meet its many economic uses – agriculture, industry, and drinking water supply – while leaving sufficient water in the environment to meet ecological needs.
Catchment Flood Management Plan (CFMP)	a strategic planning tool through which the Agency will seek to work with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management.
Code for Sustainable Homes	signals a new direction for building standards. Wherever practical DCLG intend to develop and introduce a system of sustainable building standards based on voluntary compliance.
Core Strategy	a Development Plan Document setting out the spatial vision and strategic objectives of the planning framework for an area, having regard to the Community Strategy (see also DPDs).
County Council	the local authority that is responsible for waste and minerals planning functions in non-unitary, and non-national park, local authority areas. A county council may provide advice and proposals on strategic planning issues to the Regional Planning Body.
Department for Environment, Food and Rural Affairs (DEFRA)	department that brings together the interests of farmers and the countryside; the environment and the rural economy; the food we eat, the air we breathe and the water we drink.
Development Plan Document (DPD)	details the spatial representation of housing and employment land allocations in response to the regional spatial strategy.
Dry Weather Flow (DWF)	
EA flood zone	flood zones on the maps produced by Environmental Agency providing an indication of the likelihood of flooding within all areas of England and Wales, assuming there are no flood defences.
EC Freshwater Fisheries Directive	protects and improves the quality of rivers and lakes to encourage healthy fish populations.
Environment Agency (EA)	A government body that aims to prevent or minimise the effects of pollution on the environment and issues permits to monitor and control activities that handle or produce waste. It also provides up-to-date information on waste management matters and deals with other matters such as water issues including flood protection advice.
Environmental capacity	the ability of the physical environment to accommodate urban development and population growth without causing a deterioration in environmental quality.
Flood Estimation Handbook (FEH)	document produced by Centre for Ecology and Hydrology, Wallingford (formerly the Institute of Hydrology).
Flood Risk Assessment (FRA)	An assessment of the likelihood of flooding in a particular area so that development needs and mitigation measures can be carefully considered.
General Quality Assessment	the Agency's method for classifying the water quality of rivers and canals is known as the General Quality

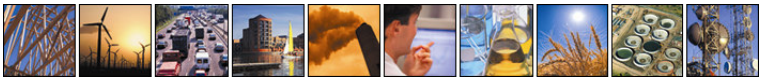


(GQA) Programme	Assessment scheme (GQA). It is designed to provide an accurate and consistent assessment of the state of water quality and changes in this state over time.
Geographical Information System (GIS)	is a system for capturing, storing, analyzing and managing data and associated attributes which are spatially referenced to the earth.
Habitats Directive	an EU Directive which seeks to ensure the conservation or restoration of habitats.
Hydro-ecology	the science of water in relation to wetland wildlife habitats and of how plant and animal communities interact with their supporting soil water, surface water and ground water systems.
Interim Code of Practice for SuDS	document produced by CIRIA, which aims to facilitate the implementation of sustainable drainage in developments in England and Wales by providing model maintenance agreements and advice on their use. It provides a set of agreements between those public organisations with statutory or regulatory responsibilities relating to SuDS.
Local delivery Vehicle (LDV)	partnership that brings the public and private sectors together to deliver large-scale social, economic and environmental change to deliver the Government's Sustainable Communities Plan.
Local Development Framework (LDF)	a folder of local development documents that outlines how planning will be managed in the area.
Local Planning Authority (LPA)	the local authority or council that is empowered by law to exercise planning functions. Often the local borough or district council. National parks and the Broads authority are also considered to be local planning authorities. County councils are the authority for waste and minerals matters.
Natural England	is formed by bringing together English Nature, the landscape, access and recreation elements of the Countryside Agency and the environmental land management functions of the Rural Development Service.
OFWAT	The Water Services Regulation Authority. Ofwat regulate how much money a water company can is required to spend over each five year planning period, and regulate the amount of money the water companies can charge from their customers.
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic.
Per capita	a Latin phrase meaning 'for each head'
Periodic Review or price review (PR)	One of Ofwat's main tasks is to set price limits for the water and sewerage companies in England and Wales. Ofwat do this in order to protect consumers from the monopoly providers of these services. However it is also our duty to enable efficient companies to finance their functions. They make sure that consumers receive reliable services and value for money and that each company is able to meet its environmental obligations now and in the future. We review price limits every five years. Prices were set at the price review in 2004 for the 2005 – 2010. This current price review (PR09) covers the five years from April 2010.
Planning Gain Supplement Obligations	the planning gain supplement is a proposed mechanism by which landowners or land developers will contribute to off site infrastructure.
Planning Policy Statements (PPS) and Planning Policy Guidance (PPG)	set out the Government's national policies on different aspect of planning. The policies in these statements apply throughout England and focus on procedural policy and the process of preparing local development documents.
Receiving water	watercourse, river, estuary or coastal water into which the outfall from Combined Sewer Overflow (CSO), surface water or other sewer discharges.
Regional Assembly	each of the English regions outside of London has a regional chamber that the regions generally call Regional Assemblies (not to be confused with the term Elected Regional Assemblies). They are responsible for developing and coordinating a strategic vision for improving the quality of life in a region. The assembly is responsible for setting priorities and preparing certain regional strategies, including the Regional Spatial Strategy.
Regional Development Agency	the nine Regional Development Agencies (RDAs) set up in the English regions are nondepartmental public bodies. Their primary role is as a strategic driver of regional economic development in their region.
Regional Spatial Strategy (RSS)	a broad development strategy for a region for a 15 to 20 year period prepared by the Regional Planning Body.
Restoring Sustainable Abstraction Programme	identifies abstraction licences causing problems, and reviewed them with the purpose of rectifying the problems by reducing the volume extracted, altering licence conditions, and relocating abstraction points.



(RSAP)	
River Ecosystem class (RE)	classification which uses a six-fold classification (five RE classes and an unclassified level for the very polluted rivers). This classification reflects the chemical status of the water, as an indication general health of the water.
River Quality Objective (RQO)	agreed by Government as targets for all rivers in England and Wales when the water industry was privatised in 1989. The targets specify the water quality needed in rivers if we are to be able to rely on them for water supplies, recreation and conservation.
RQP	Environment Agency River Quality Planning Software
S106	a legal agreement under section 106 of the 1990 Town & Country Planning Act. Section 106 agreements are legal agreements between a planning authority and a developer, or undertakings offered unilaterally by a developer, that ensure that certain extra works related to a development are undertaken.
Wastewater Treatment Works (WWTW)	separates solids from liquids by physical processes and purifies the liquid by biological processes. Discharge from Wastewater Treatment Works may contain a range of pollutants and need to be carefully monitored.
SIMCAT	catchment based water quality model developed by Environmental Agency.
Site of Special Scientific Interest (SSSI)	a site identified under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000) as an area of special interest by reason of any of its flora, fauna, geological or physiographical features (basically, plants, animals, and natural features relating to the Earth's structure).
Special Areas of Conservation (SAC)	a site designated under the European Community Habitats Directive, to protect internationally important natural habitats and species.
Special Protection Area (SPA)	sites classified under the European Community Directive on Wild Birds to protect internationally important bird species.
Strategic Flood Risk Assessment (SFRA)	document that informs the planning process of flood risk and provides information on future risk over a wide spatial area. It is also used as a planning tool to examine the sustainability of the proposed development allocations.
Strategic Water Resources Plan, or statutory water resources management plan	It is now a statutory duty for water companies to prepare, consult, publish and maintain a water resources management plan under new sections of the Water Industry Act 1991, brought in by the Water Act of 2003. This plan is then kept under yearly review.
Super Output Areas (SOA)	a new national geography created by the Office for National Statistics (ONS) for collecting, aggregating and reporting statistics.
Sustainable Drainage Systems (SuDS)	Sustainable drainage systems or sustainable (urban) drainage systems: a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques (may also be referred to as SuDS or SDS).
The First Secretary of State	the lead Minister for all policies relating to Town & Country Planning, having powers of intervention on Development Plans and Planning Casework under certain circumstances.
United Kingdom Technical Advisory Group (UKTAG)	supporting the implementation of the European Community (EC) Water Framework Directive (Directive 2000/60/EC). It is a partnership of the UK environment and conservation agencies. It also includes partners from the Republic of Ireland.
Urban Regeneration Company	a dedicated body through which different people combine to co-ordinate the delivery of urban regeneration projects such as major mixed-use developments.
Water Cycle Study	
Water Framework Directive (WFD)	A European Union directive which commits member states to making all water bodies (surface, estuarine and groundwater) of good qualitative and quantitative status by 2015.
Water resource zone	defined by the water supply/demand balance in the region such that all customers within it receive the same level of service in terms of reliability of water supply.





Appendix A

Appendix B
Planning Context

The Planning and Compulsory Purchase Act 2004 came into force from September 2004. This Act amended the Town and Country Planning Act 1990 and, in part, introduced new legislation including a new statutory policy framework for planning. Under Section 38 of The 2004 Act, the determination of planning applications must now be in accordance with the approved development plan unless material considerations indicate otherwise. Other changes to the 1990 Act included the replacement of Regional Planning Guidance with new statutory Regional Spatial Strategies (RSS), the abolition of Structure Plans and the replacement of Local Plans with spatially orientated Local Development Frameworks (LDF). Whilst the Development Plan Documents which make up the LDFs are being prepared interim arrangements exist whereby certain Structure and Local Plan policies will continue to apply provided that upon Direction of the Secretary of State they were saved before 27th September 2007[1]. New statements of government planning policy (PPS) have, and are, being prepared to replace Planning Policy Guidance notes (PPG) and to provide an up to date national planning policy framework.

1.1 National Policy

1.1.1 PPS 1 – Delivering Sustainable Development

Planning Policy Statement 1 (PPS1) was published in January 2005 and sets out the Government's overarching planning policies on the delivery of sustainable development through the planning system. The policies set out in the PPS need to be taken into account by regional planning bodies in the preparation of regional spatial strategies and by local planning authorities in the preparation of local development documents. The Government considers Sustainable development is the core principle underpinning planning and in its objectives for the planning system reiterates the four aims set out in its 1999 strategy[2]. These are:

- social progress which recognises the needs of everyone;
- effective protection of the environment;
- the prudent use of natural resources; and,
- the maintenance of high and stable levels of economic growth and employment.

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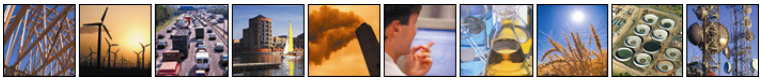
[1] Paragraph 1(3) of Schedule 8 to the Planning and Compulsory Purchase Act 2004

[2] A Better Quality of Life - A Strategy for Sustainable Development for the UK 1999



National policies and regional and local development plans are seen as providing the framework for planning for sustainable development and ensuring development is effectively managed. The PPS advises that amongst the key principles to ensure development plans and decisions taken on planning applications contribute to the delivery of sustainable development is the adoption of an integrated approach. Regional planning bodies and local planning authorities should ensure that development plans promote outcomes in which environmental, economic and social objectives are achieved together over time and contribute to global sustainability by addressing the causes and potential impacts of climate[3].

It advises that in protecting and enhancing the environment planning authorities should seek to enhance the environment as part of development proposals; avoid significant adverse impacts and pursue alternative options. Where adverse impacts are unavoidable, planning authorities and developers should consider possible mitigation measures and where these are not possible, compensatory measures may be appropriate[4].

Development plan policies should take account of environmental issues *such as the protection of groundwater from contamination and the potential impact of the environment on proposed developments by avoiding new development in areas at risk of flooding and sea-level rise, and as far as possible, by accommodating natural hazards and the impacts of climate change*[5]. The policies should also minimise the consumption of new resources by making more efficient use or reuse of existing resources. The PPS advises that Regional planning authorities and local authorities should promote amongst other things the sustainable use of water resources and the use of sustainable drainage systems in the management of run-off[6].

In delivering sustainable economic development the Government advises that Planning authorities should r*ecognise the wider benefits of economic development and consider these alongside adverse local impacts, ensure that suitable locations are available for developments, actively promote and facilitate good quality development, which is sustainable and consistent with their plans, ensure the provision of sufficient, good quality, new homes in suitable location, ensure that infrastructure and services are provided to support new and existing economic development and housing and ensure that development plans take account of the regional economic strategies of Regional Development Agencies, regional housing strategies, local authority community strategies and local economic strategies*[7]. Sufficient land of a suitable quality in appropriate locations needs to be brought forward to meet the expected needs taking into account issues such as *the need to avoid flood risk and other natural hazard* and *to address the management of pollution and natural hazards, the safeguarding of natural resources, and the minimisation of impacts from the management and use of resource*[8]*s*.

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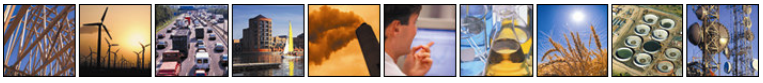
[3] Paragraph 13 of PPS 1
[4] Paragraph 19 of PPS 1
[5] Paragraph 20 of PPS 1
[6] Paragraph 22 of PPS 1
[7] Paragraph 23 of PPS 1
[8] Paragraph 27 of PPS 1



The supplement to PPS1: *Planning and Climate Change* published in December 2007 seeks to set out how planning should contribute to reducing carbon emissions and stabilising climate change.

1.1.2 PPS 12 – Creating Strong Safe and Prosperous Communities through Local Spatial Planning

Planning Policy Statement 12 (PPS 12) was published in June 2008. It explains local spatial planning and its benefits; and outlines the key components of local spatial plans and the key government policies on how they should be prepared. It should be taken into account by local planning authorities in preparing development plan documents and other local development documents. It should be noted that transitional arrangements apply until 1 September 2008.

With regard to infrastructure it states *the core strategy should be supported by evidence of what physical, social and green infrastructure is needed to enable the amount of development proposed for the area, taking account of its type and distribution. This evidence should cover who will provide the infrastructure and when it will be provided. The core strategy should draw on and in parallel influence any strategies and investment plans of the local authority and other organisations*[9].

1.1.3 PPS 25 – Development and Flood Risk

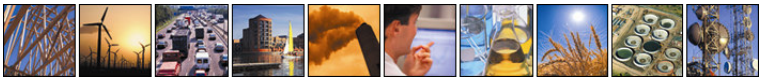
Planning Policy Statement 25 (PPS 25) was published in December 2006. Its aims are to ensure that flood risk is taken into account in the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk. Where, in exceptional circumstances, new development is necessary in such areas then the aim is to make it safe without increasing flood risk elsewhere and, where possible, to reduce flood risk overall[10].

Regional planning bodies (RPBs) and local planning authorities (LPAs) are advised that they should prepare and implement planning strategies that assist in delivering sustainable development by appraising the risk, managing the risk and reducing the risk. In so doing they should specifically:

- identify land at risk and the degree of risk of flooding from river, sea and other
- sources in their areas;
- prepare Regional Flood Risk Appraisals (RFRAs) or Strategic Flood Risk Assessments (SFRAs) as appropriate, as freestanding assessments that contribute to the Sustainability Appraisal3 of their plans;

[9] Paragraph 4.8 of PPS 12

[10] Paragraph 5 of PPS 25



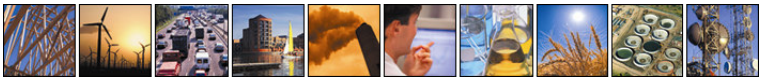
- frame policies for the location of development which avoid flood risk to people and
- property where possible, and manage any residual risk, taking account of the impacts of climate change;
- only permit development in areas of flood risk when there are no reasonably
- available sites in areas of lower flood risk and benefits of the development outweigh the risks from flooding;
- safeguard land from development that is required for current and future flood
- management eg conveyance and storage of flood water, and flood defences;
- reduce flood risk to and from new development through location, layout and design,
- incorporating sustainable drainage systems (SuDS);
- use opportunities offered by new development to reduce the causes and impacts of
- flooding eg surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SuDS; re-creating functional floodplain; and setting back defences[11].

RPBs and LPAs are further advised that they should work with the Environment Agency and other stakeholders to make the best use of their expertise and information.

In preparing planning strategies RPBs and LPAs are advised to adopt the following principles:

- Regional Spatial Strategies (RSSs) include a broad consideration of flood risk from all sources and set out a strategy for managing it. This should be consistent with RFRAs and SFRAs, the policies in this PPS and Shoreline Management Plans, Catchment Flood Management Plans and River Basin Management Plans prepared by the Environment Agency under the Water Framework Directive;
- Local Development Documents (LDDs) set out policies for the allocation of sites and the control of development which avoid flood risk to people and property where possible and manage it elsewhere, reflecting the approach to managing flood risk in this PPS and in the RSS for their region;
- Where climate change is expected to increase flood risk so that some existing;development may not be sustainable in the long-term, LPAs should consider whether there are opportunities in the preparation of LDDs to facilitate the relocation of development, including husing4 to more sustainable locations at less risk from flooding;

[11] Paragraph 6 of PPS 25



- Flood risk should be considered alongside other spatial planning issues such as;transport, housing, economic growth, natural resources, regeneration, biodiversity, the historic environment and the management of other hazards. Policies should recognize the positive contribution that avoidance and management of flood risk can make to the development of sustainable communities, including improved local amenities and better overall quality of life. They should be integrated effectively with other strategies of material significance such as Regional Economic Strategies; and

- the sustainability appraisal of RSSs and LDDs should incorporate or reflect the RPB's RFRA and the planning authority's SFRA, so as to ensure that the planning strategies for the area support the Government's objectives for development and flood risk set out in this PPS[12].

In addition, LPAs should in determining planning applications:

- have regard to the policies in this PPS and, as relevant, in the RSS for their region, as material considerations which may supersede the policies in their existing development plan, when considering planning applications for developments in flood risk areas before that plan can be reviewed to reflect this PPS;

- ensure that planning applications are supported by site-specific flood risk assessments (FRAs) as appropriate;

- apply the sequential approach at a site level to minimise risk by directing the most vulnerable development to areas of lowest flood risk, matching vulnerability of land use to flood risk;

- give priority to the use of SuDS; and

- ensure that all new development in flood risk areas is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed[13].

The PPS advises that a risk-based approach should be adopted at all levels of planning to avoid adding to the causes or "sources" of flood risk, managing flood "pathways" and reducing the adverse consequences of flooding. It advises that Flood Risk Assessment should be carried out, having regard to climate change, and to inform the application of the sequential approach which is central to the policy statement[14].

Regional Planning Bodies (RPBs) are advised that when developing Regional Spatial Strategies they should apply the sequential approach when establishing spatial criteria for regionally significant land uses, including the identification of broad locations. Local planning authorities should apply the sequential approach as part of the identification of land for development in areas at risk of flooding[15]. Similarly the PPS advises LPAs that in

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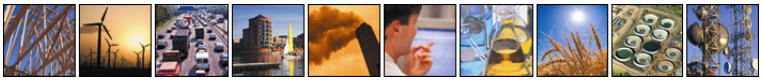
[12] Paragraph 7 of PPS 25

[13] Paragraph 8 of PPS 25

[14] Paragraph 9 of PPS 25

[15] Paragraph 15 of PPS 25



allocating land in LDDs for development they should apply the Sequential Test[16] to demonstrate that there are no reasonably available sites in areas with lower probability of flooding that would be appropriate to the type of development or land use proposed[17]. Where there is the risk of flooding then development should be located in Flood Zone1 and, if there is no reasonably available site in Flood Zone 1, Flood Zone 2 and then Flood Zone 3. Within each Flood Zone new development should be directed to sites at the lowest probability of flooding from all sources as indicated by the SFRA[18]. If, following application of the Sequential Test, it is not possible for the development to be located in zones of lower probability of flooding then in appropriate circumstances, the Exception Test[19] can be applied which provides a method of managing flood risk while still allowing necessary development to occur[20].

The PPS advises that the RPB should take flood risk into account *in determining strategic planning considerations in the RSS for its region, including the criteria to be used for selecting and determining broad strategic locations for housing provision and transport infrastructure. Its RFRA should identify the risk to its regionally strategic locations. The RPB should consult the Environment Agency and other operating authorities on flood risk issues when preparing its RSS*[21].

Similarly LPAs should consult the Environment Agency and other relevant bodies *(including adjacent LPAs), when preparing policies in their LDDs on flood risk management and in relation to areas potentially identified as at risk of flooding. Their sustainability appraisals, land allocations and development control policies should all be informed by a SFRA carried out in liaison with the Environment Agency*[22].

1.2 Regional Spatial Strategy

The East of England Plan (RSS) was produced in May 2008 and has replaced Regional Planning Guidance. It establishes the broad development strategy for the region providing a framework within which local development documents and local transport plans can be prepared for the period to 2021 in accordance with the Government's most recent planning statements and guidance.

The RSS has a key role in contributing to the sustainable development of the region. Its objectives are:

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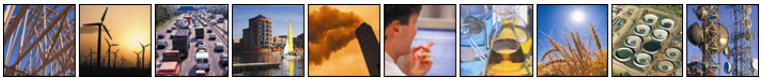
[16] Annex D and Table D.1 of PPS 25
[17] Paragraph 16 of PPS 25
[18] Paragraph 17 of PPS 25
[19] Paragraphs D9–D14 of PPS 25
[20] Paragraph 18 of PPS 25
[21] Paragraph 24 of PPS 25

[22] Paragraph 25 of PPS 25



(i): To reduce the region's impact on, and exposure to, the effects of climate change:

(ii): To address housing shortages in the region:

(iii): To realise the economic potential of the region and its people:

(iv): To improve the quality of life for the people of the region:

(v): To improve and conserve the region's environment:

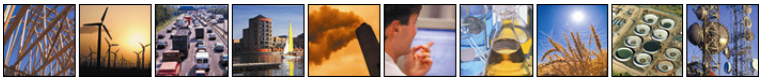
As well as providing the strategic planning guidance for the Region the East of England Plan places specific targets on the District for the delivery of housing and employment growth for the period up to 2021 and beyond which include a further 4,340 new dwellings for the period 2006-2021, projected to 5,510 for the period to 2025, at a rate of 290 per annum; and to contribute towards a Central and North Essex economic sub-region new job provision of 42,000

The Plan includes the following specific policies relating to water:

Policy WAT1: The Government will work with the Environment Agency, water companies, OFWAT, and regional stakeholders to ensure that development in the spatial strategy is matched with improvements in water efficiency delivered through a progressive, year on year, reduction in per capita consumption rates. Savings will be monitored against the per capita per day consumption target set out in the Regional Assembly's monitoring framework.

Policy WAT2: The Environment Agency and water companies should work with OFWAT, EERA and the neighbouring regional assemblies, local authorities, delivery agencies and others to ensure timely provision of the appropriate additional infrastructure for water supply and waste water treatment to cater for the levels of development provided through this plan, whilst meeting surface and groundwater quality standards, and avoiding adverse impact on sites of European or international importance for wildlife. A co-ordinated approach to plan making should be developed through a programme of water cycle and river cycle studies to address the issues of water supply, water quality, wastewater treatment and flood risk in receiving water courses relating to development proposed in this RSS. Complementing this approach, Local Development Documents should plan to site new development so as to maximise the potential of existing water/waste water treatment infrastructure and minimise the need for new/improved infrastructure.

Policy WAT3: Local planning authorities should work with partners to ensure their plans, policies, programmes and proposals take account of the environmental consequences of river basin management plans, catchment abstraction management strategies, groundwater vulnerability maps, groundwater source protection zone maps, proposals for water abstraction and storage and the need to avoid adverse impacts on sites of European importance for wildlife. The Environment Agency and water industry should work with local authorities and other partners to develop an integrated approach to the management of the water environment.



Policy WAT4: Coastal and river flooding is a significant risk in parts of the East of the England. The priorities are to defend existing properties from flooding and locate new development where there is little or no risk of flooding.

Local Development Documents should:

- • use Strategic Flood Risk Assessments to guide development away from floodplains, other areas at medium or high risk or likely to be at future risk from flooding, and areas where development would increase the risk of flooding elsewhere;
- • include policies which identify and protect flood plains and land liable to tidal or coastal flooding from development, based on the Environment Agency's flood maps and Strategic Flood Risk Assessments supplemented by historical and modelled flood risk data, Catchment Flood Management Plans and policies in Shoreline Management Plans and Flood Management Strategies, including 'managed re-alignment' where appropriate;
- • only propose departures from the above principles in exceptional cases where suitable land at lower risk of flooding is not available, the benefits of development outweigh the risks from flooding, and appropriate mitigation measures are incorporated; and
- • require that sustainable drainage systems are incorporated in all appropriate developments.

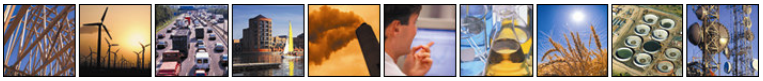
Areas of functional floodplain needed for strategic flood storage in the Thames Estuary should be identified and safeguarded by local authorities in their Local Development Documents.

1.3 Local Development Framework

Until such time as the Braintree Development Plan Documents (DPDs) are adopted then the Braintree Local Plan Review 2005 will, in respect of its saved policies, continue with the RSS (and saved Structure Plan policies[23]) to comprise the Development Plan.

Braintree is in the process of preparing its Core Strategy DPD and this emerging document is obliged to conform to the Regional Spatial Strategy. As such it is the means by which strategic policy will be transposed to the local level and, when adopted, then it will provide local policy and replace the relevant parts of the Local Plan. The Core Strategy DPD is the key development plan document which will provide the overarching strategy for policy and development within the District for the Plan period. Other Local Development Documents will build on this strategy and deliver the detail although within this framework there is a degree of flexibility on how this is done.

[23] And policies replaced by East of England Plan



1.3.1 Braintree Core Strategy DPD

Braintree District Council published its Core Strategy Issues and Options in a consultation document dated April 2007[24]. It identifies what it considers to be the key issues, in particular directions for growth where it outlines five options. In addition it includes the issue of contributions for community services and infrastructure.

1.4 Policy Requirements placed on the Local Development Framework

The core strategy is required to set out the long term spatial vision for a Local Authority's area and the strategic policies required to deliver that vision[25]. It is therefore the key document in the Braintree Local Development Framework for providing the planning policy framework for the District, particularly within the context of delivering housing growth targets.

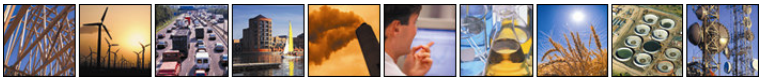
Braintree is in the early stages in the preparation of its LDF; and its Core Strategy and other Local Development Documents will continue to evolve as part of the information gathering and adoption processes. However they will need to include policies to address the issues of water management, infrastructure and flood risk and the following table identifies the topics that need to be included and the relationship with national and emerging regional planning policy. It should, however, be noted that there are options as to how this is best achieved.

Table B.1 Local policy relating to water management, infrastructure and flood risk

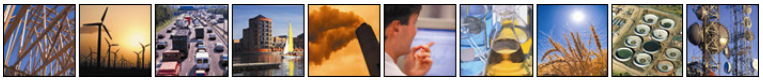
PPS25	RSS	LDF
Identify land at risk and the degree of risk of flooding	Local Development Documents should include policies which identify and protect flood plains and land liable to tidal or coastal flooding from development, based on the Environment Agency's flood maps and Strategic Flood Risk Assessments supplemented by other data/plans (WAT4)	Requirement that development proposals are accompanied by flood risk assessments in line with PPS 25
Prepare Regional Flood Risk Appraisals (RFRAs) or Strategic Flood Risk Assessments (SFRAs)		
Policies for the location of development which avoid flood risk where possible, and manage any residual risk, taking account of the impacts of climate change	Local Development Documents should use Strategic Flood Risk Assessments to guide development away from floodplains, other areas at medium or high risk or likely to be at future risk from flooding (WAT4)	Avoidance of flood risk and requiring the Sequential Approach to development

[24] Braintree 2025 Issues and Options Document - Braintree District Council April 2007

[25] Paragraph 4.1 Planning Policy Statement 12: creating strong safe and prosperous communities through Local Spatial Planning June 2008



PPS25	RSS	LDF
Only permit development in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and benefits of the development outweigh the risks from flooding	Local Development Documents should only propose departures from the above principles in exceptional cases where suitable land at lower risk of flooding is not available, the benefits of development outweigh the risks from flooding, and appropriate mitigation measures are incorporated (WAT4)	
Safeguard land from development that is required for current and future flood management	Local Development Documents should include policies which identify and protect flood plains and land liable to tidal or coastal flooding from development, based on the Environment Agency's flood maps and Strategic Flood Risk Assessments supplemented by other data/plans (WAT4)	Safeguarding land for flood management and regard given to other Plans and Strategies
Reduce flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SuDS)	Local Development Documents should require that sustainable drainage systems are incorporated in all appropriate developments (WAT4)	SuDS and other water retention and flood storage measures to minimise direct surface run–off
Use opportunities offered by new development to reduce the causes and impacts of flooding Policies for the allocation of sites and the control of development which avoid flood risk to people and property where possible and manage it elsewhere, reflecting the approach to managing flood risk in this PPS and in the RSS for their region	-	Flood storage area and associated measures to contribute to green infrastructure networks
Where climate change is expected to increase flood risk, LPAs should consider whether there are opportunities in the preparation of LDDs to facilitate the relocation of development, including housing to more sustainable locations at less risk from flooding	-	Re-location of development having regard to effects of climate change
	A co-ordinated approach to plan making should be developed through a programme of water cycle and river cycle studies to address the issues of water supply, water quality, wastewater treatment and flood risk in receiving water courses relating to development proposed in this RSS. Complementing this approach, Local Development Documents should plan to site new development so as to maximise the potential of existing water/waste water treatment infrastructure and minimise the need for new/improved infrastructure	Local Development Documents should plan to site new development so as to maximise the potential of existing water/waste water treatment infrastructure and minimise the need for new/improved infrastructure.



PPS25	RSS	LDF
	(WAT2).	
	Local planning authorities should work with partners to ensure their plans, policies, programmes and proposals take account of the environmental consequences of river basin management plans, catchment abstraction management strategies, groundwater vulnerability maps, groundwater source protection zone maps, proposals for water abstraction and storage and the need to avoid adverse impacts on sites of European importance for wildlife. The Environment Agency and water industry should work with local authorities and other partners to develop an integrated approach to the management of the water environment (WAT3)	Local planning authorities should ensure their plans, policies, programmes and proposals take account of the environmental consequences.
	The Environment Agency and water industry should work with local authorities and other partners to develop an integrated approach to the management of the water environment (WAT3)	Integrated approach to the management of the water environment

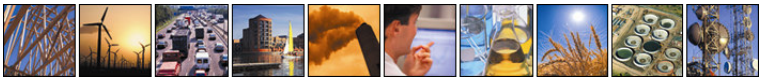
1.5 Infrastructure Contributions

The provision of water infrastructure will involve significant costs and there will be an expectation from the Local Authorities and stakeholders that developers will contribute towards these costs. Currently Section 106 obligations provide opportunities to secure water infrastructure, or contributions towards such infrastructure, on the back of the grant of planning permissions provided they fulfil the legal tests[26] but, most importantly, are necessary in planning terms. There are options to introduce a tariff arrangement similar to that operated by Milton Keynes Partnership[27] or to operate a tailored approach to individual applications. The Planning Bill currently before Parliament would introduce the option for Community Infrastructure Levies (CIL), fixed contributions set by the Local Authorities and based on adopted Infrastructure Plans[28].

[26] Circular 05/2005: Planning Obligations

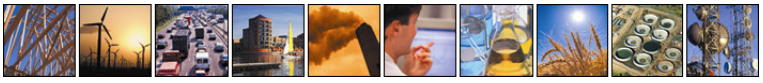
[27] The Milton Keynes Tariff: English Partnerships and Milton Keynes Partnership

[28] The Community Infrastructure Levy: Department for Communities and Local Government January 2008



However, whatever the approach that is to be adopted, it is necessary that there is an up to date policy base which provides for securing such benefits[29]. It is therefore suggested that policies need to be included within the Core Strategies which allow specifically for the delivery of such benefits with regard to water infrastructure. It is also likely to be appropriate to provide detail within other LDDs both to specify/justify the requirements and to provide guidance in which case a Supplementary Planning Document would appear to be most appropriate.

[29] B25 Annex B Circular 05/2005: Planning Obligations



Appendix C
Water Resource Availability

Water Resource Availability - CAMS Status of Catchments

The Environment Agency has published assessments of water availability within individual catchments in the CAMS documents. The CAMS documents classify water resource availability for surface water and groundwater into the following categories:

- Water available. There is water available within the catchment for abstraction licensing;
- No water available. The water that is present is already fully allocated;
- Over licensed. This means that if abstractors used their full allocation they would have the potential to cause unacceptable environmental impact at low flows. Additional water may be available at high flows with appropriate restrictions; or
- Over abstracted. This means that existing abstraction is causing unacceptable environmental impact at low flows. Additional water may be available at high flows with appropriate restrictions.

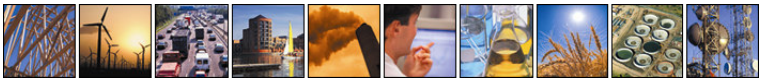
Where the Environment Agency assesses a catchment as being over-abstracted, the Environment Agency's licensing strategy will seek to secure downward variations to abstraction licences under its existing powers when abstraction licences are renewed.

The Habitats Directive and the Water Framework Directive and the Environment Agency's Restoration of Sustainable Abstraction (RSAP) programmes have the potential to impact on water abstractions across the country. Where it can be demonstrated that abstractions are having a detrimental impact upon the environment then the Environment Agency will seek to reduce abstractions at those sites.

The public water supply licences were granted as 'Licences of Right' to abstract water under the 1963 Water Act. No consideration was given to the environmental impact of these abstractions at the time the licences were issued, and they are often licensed at abstraction rates that exceed the capacity of abstraction equipment or the capability of the aquifer to provide the licensed yield. Consequently, there are areas within the catchment that have been assessed as over abstracted.

If the Environment Agency were to consider licensing new licences the applicant would need to demonstrate that:

- Environmental sustainability is not in question;
- There is justification for the need of the licence; and
- Water is used efficiently.



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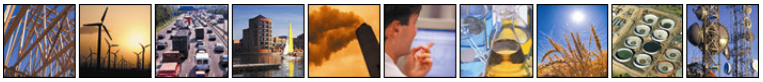


Appendix C

Appendix D
Water Demand Calculation – Methodology

The water demand forecast for Braintree District has been calculated using data supplied by Anglian Water and Essex and Suffolk Water as part of their Draft Water Resource Management Plans (WRMP) 2008. A Microsoft Excel spreadsheet model was created that calculated the total demand based on individual demand components reported by the water companies.

Sources of Information

Data for forecast household numbers and non –household floor space values have been provided by the Local Authority. Table D.1 below details the individual elements of demand that have been recalculated for Braintree District and the information sources used.

Table D.1 Household demand components and sources of onformation

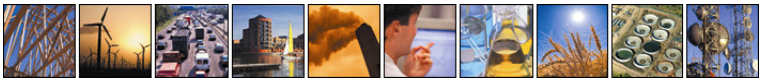
Demand Component	Number of households	Household occupancy Rate	Per Capita Consumption
Existing Household	Local Authority	Local Authority	Draft WRMP
Forecast Household (new households)	Local Authority	Local Authority	Draft WRMP and Code for Sustainable Homes

Table D.2 Non-household components and sources of information

Demand Component	Floor space	Consumption
Existing Non-Household		Draft WRMP (proportioned by area)
Forecast Non-Household	Local Authority	Calculated using published information

Growth Forecasts

The draft WRMPs include allowances for demand for water from new housing and business growth. The following section reviews the growth allowances within the draft WRMPs to determine the extent to which the growth allowances made by the water companies reconcile with the housing scenarios and forecast occupancy rates that have been provided by Braintree District Council for this study.

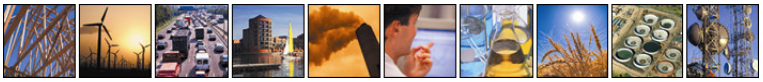


Growth Scenarios in this Water Cycle Study

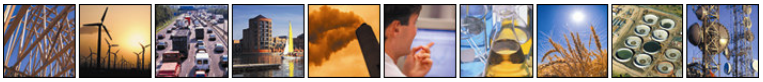
The total number of existing dwellings in the study area in 2006 has been provided by Braintree District Council and St. Edmundsbury Borough Council. The figures in Table D.3 are derived from 2001 census figures plus completed housing developments between 2001 and 2006.

Table D.3 Total housing numbers in the study area 2006

Area	Housing Stock (2001 Census)	Completions Since 2001	Total Housing Stock (2006)
Alphamstone	88	0	88
Ashen	141	1	142
Bardfield Saling	75	0	75
Belchamp Otten	72	0	72
Belchamp St Paul	155	9	164
Belchamp Walter	96	-4	92
Birdbrook	155	1	156
Black Notley	763	130	893
Borley	47	-1	46
Bradwell	207	3	210
Braintree, Bocking and Great Notley*	17535	2241	19776
Bulmer	262	6	268
Bures Hamlet	337	0	337
Castle Hedingham	519	11	530
Coggeshall	1967	61	2028
Colne Engaine	380	10	390
Cressing	677	26	703
Earls Colne	1466	135	1601
Fairstead	77	1	78
Faulkbourne	39	0	39
Feering	789	13	802
Finchingfield	560	5	565
Foxearth	125	2	127
Gestingthorpe	176	3	179
Gosfield	639	0	639



Area	Housing Stock (2001 Census)	Completions Since 2001	Total Housing Stock (2006)
Great Bardfield	543	13	556
Great & Little Henny	71	0	71
Great Maplestead	143	2	145
Great Saling	121	7	128
Great Yeldham	721	8	729
Greenstead Green & Halstead Rural	268	1	269
Halstead	4886	237	5123
Hatfield Peverel	1819	10	1829
Helions Bumpstead	180	0	180
Kelvedon	1443	14	1457
Lamarsh	81	2	83
Liston	23	0	23
Little Maplestead	110	1	111
Little Yeldham	125	2	127
Middleton	60	2	62
Ovington	23	0	23
Panfield	358	6	364
Pebmarsh	203	8	211
Pentlow	93	0	93
Rayne	806	8	814
Ridgewell	226	0	226
Rivenhall	303	2	
Shalford	322	2	324
Sible Hedingham	1608	38	1646
Silver End	1394	4	
Stambourne	172	2	174
Steeple Bumpstead	617	36	653
Stisted	242	6	248
Sturmer	184	8	192
Terling	310	2	312
Tilbury Juxta Clare	61	0	61
Toppesfield	218	-1	217



Area	Housing Stock (2001 Census)	Completions Since 2001	Total Housing Stock (2006)
Twinstead	71	0	71
Wethersfield	523	9	532
White Colne	186	11	197
White Notley	222	3	225
Wickham St Paul	139	0	139
Witham total	9570	934	
Total Braintree District	55,792	4,030	59,822
Haverhill	9,348	396*	10,641
Clare	897		
Study Area	66,037	4,426	70,463

*Number of completions provided by St. Edmundsbury Council are not disaggregated between Haverhill and Clare

Forecasts of population are estimated by applying forecast occupancy rates to housing growth targets. The data presented in Table D.5 are provided by Braintree District Council and reconciled with the water resource zone scale data. Braintree District Council provided two alternative housing growth scenarios of 300 or 500 new homes per year until 2025/26 and two alternative forecast occupancy rates specific to the housing growth rates. St Edmundsbury Borough Council provided one set of growth figures for Haverhill and Clare.

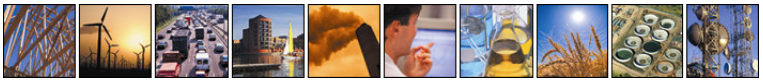
Forecasts of population are estimated by applying forecast occupancy rates to housing growth targets. These data have been provided by Braintree District Council and reconciled with the water resource zone scale data. Braintree District Council reports that the current average household occupancy rate in Braintree District is 2.37.

St Edmundsbury Borough Council has provided one set of growth figures for Haverhill and Clare. Braintree District Council has provided two alternative housing growth scenarios of 300 or 500 new homes per year until 2025/26 and two alternative forecast occupancy rates specific to the housing growth rates:

300 new homes per annum scenario: occupancy rate of 2.11 by 2021

500 new homes per annum scenario: occupancy rate of 2.16 by 2021

The forecast occupancy rates provided by the councils are similar to those presented by Anglian Water, Essex and East Suffolk Water, Three Valleys Water, and Thames Water in the draft Water Resource Management Plans.



Growth in the Water Company Plans

Anglian Water has produced its demand forecasts using the Environment Agency best practice guidance for this purpose (Environment Agency 2007d). The distribution of new properties is based on the locations published in Regional Spatial Strategies and Local Development Plans (Anglian Water, 2008). This results in the following allowances at the water resource zone level:

- 1,500 dwellings per year in Cambridgeshire and West Suffolk WRZ, with an increase in population of around 55,000 people.
- 2,500 dwellings per year in East Suffolk and Essex WRZ, with an increase in population of around 80,000 people.

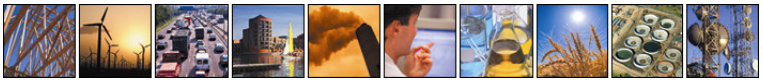
Essex and Suffolk water has also based its estimates on the same best practice approach and have allowed for 5,000 to 6,000 new homes per year to be built during the planning period. Essex and Suffolk Water state that the proposed changes to the East of England Plan would see a further 1,500 homes per year built in Essex by 2016. These additional new homes are not currently included in the draft WRMP. However, the company states that it will include these additional homes in their final WRMP, published in April 2009, should the amendments to the East of England Plan be adopted (Northumbrian Water, 2008).

Proportioning Water Resource Zones to the Study Area

To determine water demand specific to Braintree District, existing and forecast household numbers and forecast non household properties data were provided by the Local Authorities. To estimate existing non-household water demand data has been taken from the draft WRMP 2008 tables and apportioned to the Braintee District. This is necessary as the water companies produce their data based on Water Resources Zones (WRZs) and the geographical areas of these WRZ's do not match the Local Authority boundaries. ArcGis was used to calculate the areas of the Local Authority boundary and the individual WRZs from which an apportioning factor could be derived. These factors are shown in Table D.4. These apportioning factors could then be applied to the Draft WRMP data to derive Existing Non-Household Demand.

Table D.4 Water resource zone apportioning factors

Polygon	Area in Braintree District (m2)	WRZ Areal Apportioning Factor
Braintree District	631,941,118.85	n/a
Cambridge and West Suffolk WRZ	24,874,084.53	1.12%
East Suffolk and Essex WRZ	573,430,910.00	27.52%
Essex WRZ	33,636,124.32	2.16%



Household Demand

The water demand from the existing households was calculated using the standard water industry approach shown below:

$$D = H \times O \times C$$

where :

D = Water Demand
H = Households (provided by Local Authorities)
O = occupancy rate (persons per property, provided by Local Authorities)
C = per capita consumption (WRMP l/h/d)

This calculation was conducted for two different building types, existing measured households and existing unmeasured households as per standard WRMP methodology. The water companies include an allowance for leakage from "Void" households (i.e. unoccupied properties connected to the water supply system). The same allowance has been included in this assessment.

Existing household numbers were supplied by Braintree District and St Edmundsbury councils (see Table D.3) along with household occupancy rates. These figures were factored against the draft WRMP data to ensure that the same measured and unmeasured population proportions were used as those used by the relevant water companies. This was necessary as measured and unmeasured properties have different per capita consumption (pcc) values attributed to them.

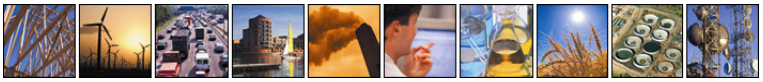
Table D.5 Local Authority household occupancy rates

Occupancy Rate (p/hh)	2001/02	2006/07	2021
Braintree District (500 new builds scenario)	2.371	2.319	2.162
Braintree District (300 new builds scenario)	2.371	2.306	2.112
Clare and Haverhill		2.312	2.137

Data for Braintree as provided by Braintree District Council. Limited population and property data was provided by St. Edmundsbury Council and so occupancy rates for Clare and Haverhill are a central estimate from the scenario forecasts. Data for intervening and subsequent years was interpolated and extrapolated using a flat profile.

Per Capita Consumption

The WRMP pcc values used are shown in Table D.6. Figure D.1 illustrates existing pcc and the variation in per capita consumption across the Braintree District area. There are many reasons why per capita consumption levels



vary geographically. Lifestyle attributed to personal affluence is considered to be a key contributing factor. The majority of people in the Braintree District area (91%) live in the East Suffolk and Essex WRZ and their average per capita consumption is 151.2 l/person/day.

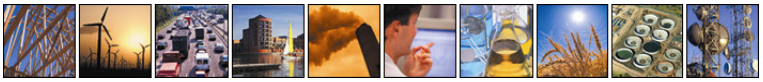


Table D.6 Draft WRMP existing household per capita consumption (average litres/head/day)

l/h/d	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Cambridge and West Suffolk WRZ	138.60	136.95	136.90	136.62	136.69	136.30	136.08	135.78	135.62	135.42	135.27	135.04	134.62	134.34	133.80	133.64	133.49	133.40	132.93	132.93
East Suffolk and Essex WRZ	151.21	149.10	148.54	147.51	146.45	145.44	144.47	143.45	142.56	141.80	141.22	140.54	139.84	139.04	138.57	138.22	137.90	137.43	137.17	136.91
Essex WRZ	167.13	166.38	165.84	165.45	164.95	164.33	163.47	162.63	161.83	160.97	160.05	159.20	158.36	157.46	156.53	155.92	156.03	156.22	156.41	156.50

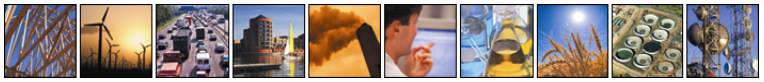
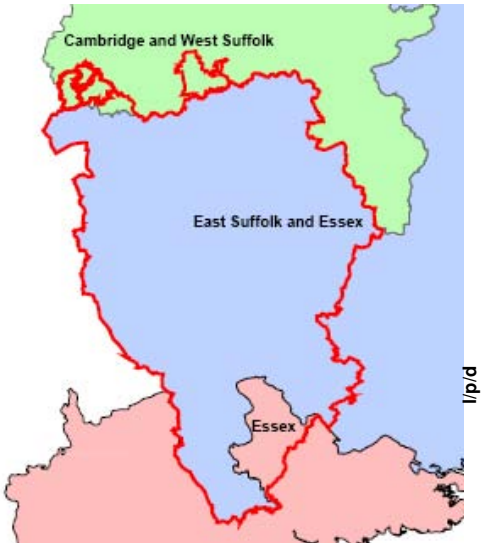
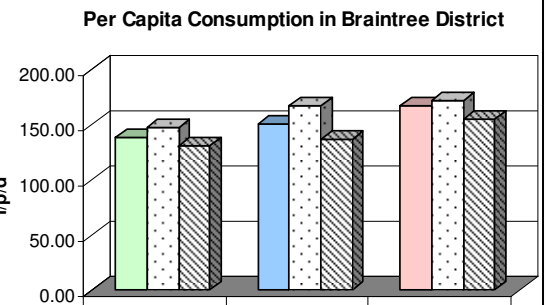


Figure D.1 Existing per capita consumption levels across Braintree District





	Cambs and West Suffolk	East Suffolk & Essex	Essex
Average PCC	138.60	151.21	167.13
unmeasured PCC	147.55	167.52	171.6
measured PCC	131.2	137.61	155.95

*Data Source: Anglian Water draft Water Resource Management Plan WRP tables

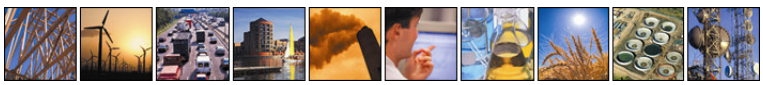
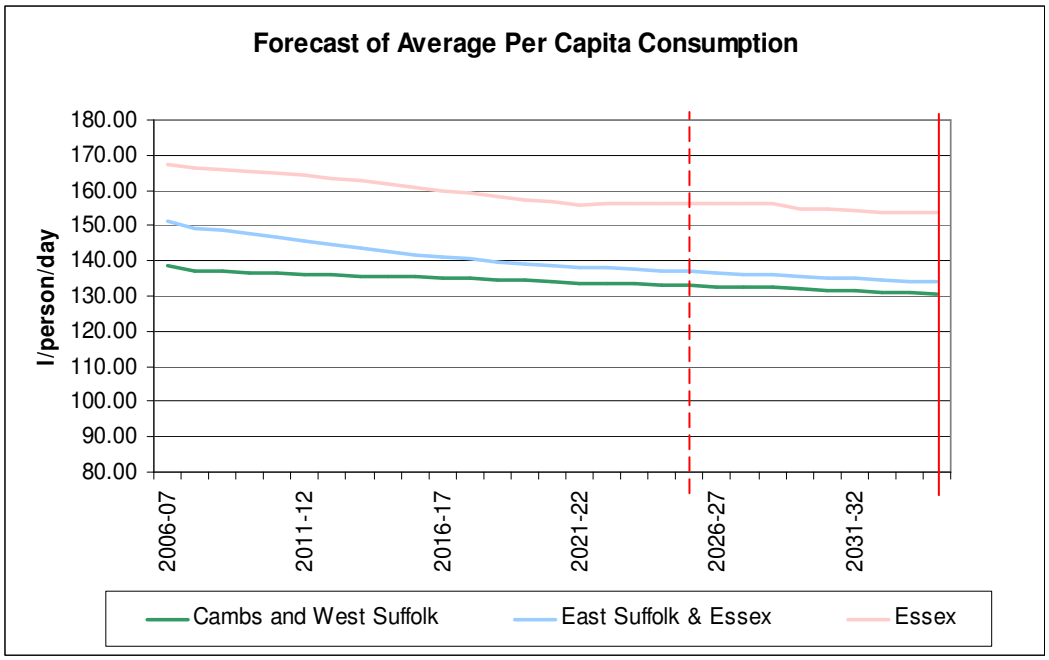


Figure D.2 Change in per capita consumption over time

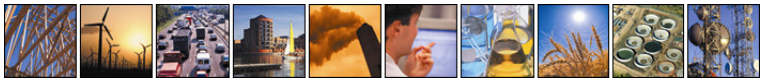


Forecast Household Demand (New Households)

Forecast household demand was calculated using the same formula as shown for existing households. Forecast household numbers as supplied by the Local Authority were used along with Local Authority occupancy rates. Several different pcc values were then applied to give results that related to different house type scenarios. These values are shown in Table D.7.

Table D.7 Forecast household pcc values

Description	Per Capita Consumption Allowance (l/h/d)	Comment
Cambridge and West Suffolk WRZ	132 -142 l/h/d	Pcc varies over time in accordance with allowances in draft WRMP.
East Suffolk and Essex WRZ	132 -142 l/h/d	Pcc varies over time in accordance with allowances in draft WRMP.
Essex WRZ	142 – 145 l/h/d	Pcc varies over time in accordance with allowances in draft WRMP.
Regulatory Minimum	125 l/h/d	Remains constant over time
CSH 1/2	120 l/h/d (+ 4.8 l/hh/d outdoor use)	Remains constant over time
CSH 3/4	105 l/h/d (+ 4.2 l/hh/d outdoor use)	Remains constant over time
CSH 5/6	80 l/h/d (+ 3.2 l/hh/d outdoor use)	Remains constant over time



Non-Household Demand

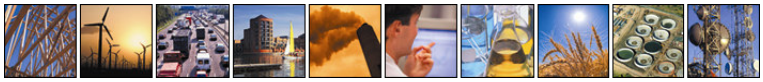
Existing non-household demand data was taken from the relevant Draft WRMP tables and apportioned using the areal factors as shown in **Table** D.8. This was done for the base year to derive the existing non-household consumption value. This value was assumed to remain constant throughout the planning period. Both billed measured and billed unmeasured values were apportioned to give one overall existing non-household demand figure.

Table D.8 Existing non-household demand for WRZ and Local Authority.

	Water Resource Level Consumption (Ml/d)	Braintree District apportioned consumption (Ml/d)
Cambridge and West Suffolk WRZ		
Billed unmeasured non-household consumption	0.19	0.00
Billed measured non-household consumption	19.43	0.22
East Suffolk and Essex WRZ		
Billed unmeasured non-household consumption	0.30	0.08
Billed measured non-household consumption	24.04	6.61
Essex WRZ		
Billed unmeasured non-household consumption	1.62	0.03
Billed measured non-household consumption	75.79	1.64
Total (Braintree District) non household consumption		**8.6 Ml/d**

Forecast Non-Household Demand

The demand from forecast non-household developments was calculated using forecast annual non-household floor space areas supplied by the relevant Local Authority. The data supplied was subdivided by standard planning use classification codes. A demand figure was then applied. These demand values were derived from several published sources. This is a necessary departure from the water company planning approach. The water companies forecast demand from non-households using forecasts of economic growth for industrial and commercial sectors and apply



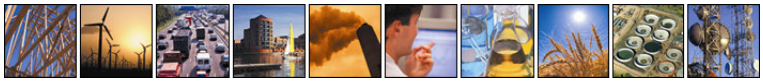
these trends at the Water Resource Zone Level. Unlike the approach to forecasting household demand, the water companies do not make allowances for consumption for different property types at the water resource zone level.

Table D.9 details values used and the source of each value. A figure for average water use per employee per day was used alongside employment density figures to derive a water demand/m^2 value where appropriate. Water consumption values on a l/bed/year value were used for building types where this data was provided by the Local Authority.

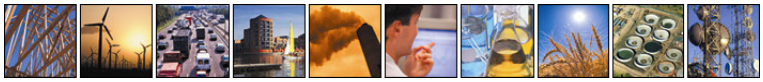
Table D.9 Water demand per m^2 and data sources

Use Class	Water Demand per unit	Units	Density Factor (1)	LA data supplied Format	Water consumption allowance data Source (2)
A1	9300	(l/p/yr)	20 (m^2/person)	m^2	Entec Unpublished Estimate
A3	3200	(l/building/day)	Average building size 200 m^2	m^2	Water Mark (OGCb 2003)
B1	600	(l/m^2/yr)	N/A	m^2	Water Mark (OGCb 2003)
B1a	600	(l/m^2/yr)	N/A	m^2	Water Mark (OGCb 2003)
B1c	600	(l/m^2/yr)	N/A	m^2	Water Mark (OGCb 2003)
B2	9300	(l/p/yr)	34 (m^2/person)	m^2	Entec Unpublished Estimate
B8	9300	(l/p/yr)	50 (m^2/person)	m^2	Entec Unpublished Estimate
C1	40000	(l/Bed/yr)	20% of floor space unused, and 30m2 per bedroom.	m^2	Water Mark (OGCb 2003)
D1	332	(l/m^2/yr)	N/A	m^2	Water Mark (OGCb 2003)
D2	3200	(l/building/day)	Average building size 15000 m^2	m^2	Water Mark (OGCb 2003)
D1,D2 & D3 Mixed	332	(l/m^2/yr)	N/A	m^2	Entec Unpublished Estimate
Sui Generis	600	(l/m^2/yr)	N/A	m^2	Water Mark (OGCb 2003)
Support/core	600	(l/m^2/yr)	N/A	m^2	Water Mark (OGCb 2003)
C1 (Beds)	40000	(l/Bed/yr)	N/A	Beds	Water Mark (OGCb 2003)
C2 (Beds)	60000	(l/Bed/yr)	N/A	Beds	Water Mark (OGCb 2003)
1 FE	3850	(l/Pupil/yr)	210 pupils/school	Number of buildings	Water Mark (OGCb 2003)
2 FE	3850	(l/Pupil/yr)	420 pupils/school	Number of buildings	Water Mark (OGCb 2003)

(1) English Partnerships (2001) Employment Densities: A Full Guide. London. English Partnerships.



Where no data is available, Entec has derived water use estimates based on water use estimates per device and frequency of use information drawn from published data.



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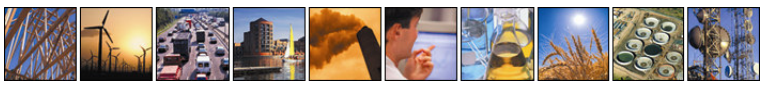


Appendix D

Appendix E
Water Efficiency

Much of the Anglian region, including the supply areas of Anglian Water (encompassing Braintree) has been classified by the Environment Agency as an area of "Serious" water stress[30]. This means that the Environment Agency has classified the area as requiring the highest level of water efficiency activity, which could include allowing compulsory metering of properties across the area. A recently published Environment Agency report showed that most challenging levels of water efficiency in the CSH would only be achievable through the implementation of water recycling or rainwater harvesting technology[31].

An indicative assessment of the potential yield from rainwater harvesting in Braintree District is presented in Table E.1. The long term average rainfall in the Braintree area is approximately 600mm per year[3].

The potential rainwater available for harvesting has been estimated for three property types with differing assumptions about roof area. It should be noted that the average rainfall figure does not take into account rainfall variability over the year; during summer months there will be some periods when no rainfall is available, and conversely during periods of heavy rainfall and depending on the storage capacity of the system installed, it may not be possible to collect all the rainwater. Further detailed analysis will be needed at design stage to specify the systems required, and determine their reliable supply.

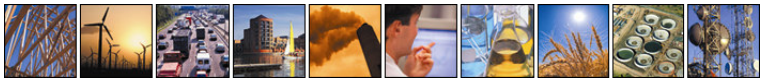
Table E.1 Rainwater harvesting, indicative yield assessment

Property type	Assumed roof area (m^2)	Potential rainwater available (l/head/day)
Terraced house	47	27.0
Semi detached house	65	37.6
Detached house	90	52.1

Assessment is based on a runoff factor of 0.9 and a filter loss factor of 0.9. The household occupancy rate of 2.3 persons per property has also been used.

[30] Areas of Water Stress: Final classification (Environment Agency, undated)

[3] Hydrological Data UK (2003).



Rainwater and Greywater Harvesting

Rainwater Harvesting

Rainwater harvesting systems collect and store rainwater from roof areas or hard standing to replace mains water use within the home where potable-standard water is not required (usually toilet flushing, washing machines and outdoor use). Wider benefits include the attenuation of stormwater flows, and thus rainwater systems can form part of an integrated approach to water management in new developments.

Individual Properties or Collective Schemes

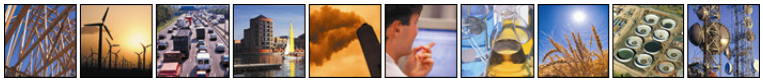
Rainwater harvesting can be installed for individual households, or on a larger scale where water is collected from a number of properties (for example one or more streets), treated centrally then pumped to individual households for reuse. The advantages of a collective scheme are that surface water runoff from the development site is collected, so increasing the volumes of recycled water, and reducing the risk of flooding during storms. There may also be a cost saving by installing a collective system rather than individual household units (discussed below). A disadvantage is that if surface water runoff is collected this will require additional treatment to remove pollutants from roads, whereas if water from roofs only is collected a simple filtration system is usually all that is required.

The incorporation of rainwater harvesting systems into larger new developments such as those in the Braintree District area may present the opportunity for economies of scale when compared to the implementation at the individual property level. In addition, development-scale systems present the opportunity for more reliable systems than at the household level as a suitable maintenance contractor could be appointed. These economies of scale are often referred to within published documentation (MTP 2007), although recent studies have found no published data to support this (Environment Agency 2007e). It should be noted that the available area for rainwater catchment will not necessarily be significantly greater at the development-level when compared to the individual household level.

Rainwater harvesting has been incorporated in the design of an increasing number of new build non-domestic buildings such as schools, community centres and other similar buildings. The technology tends to be less well advanced in domestic new builds mainly due to long payback periods and issues over maintenance once the systems are installed.

Constraints

The constraining factors in the development of rainwater systems are the availability of rainfall and catchment area for the system (e.g. roof and or hardstanding area). If insufficient rainfall is available and the catchment area too small the system will not meet demand and thus will need to be supported by additional mains water. Clearly this is an issue in the East of England due to the relatively low rainfall.



Other issues that need to be considered include the energy and carbon footprint of the systems. Studies have demonstrated that in theory the pumping requirements for rainwater systems could result in a greater energy demand from these systems than that required to provide mains water to a site.

Feasibility in Braintree

To determine the feasibility of rainwater systems in Braintree District it is recommended that the following work (outside the scope of this study) is undertaken the Phase 2 detailed Water Cycle Study, which requires detailed knowledge of the site development plans is available:

- Assessment of the potential catchment area for rainwater systems
- Quantify the average rainfall specific to Braintree District

If it is determined that there is sufficient rainfall and catchment area within the developments, a rainwater harvesting system manufacturer/installer should be consulted to determine site-specific costs and the wider implications to integrated water management within the development.

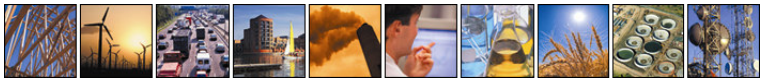
An indicative assessment of the potential yield from, and costs of rainwater harvesting in Braintree District is presented in Appendix F.

Greywater Recycling

Grey water recycling systems capture and store water that has been used for bathing (either shower or bath use) and from hand basins. The water is filtered and treated using a simple disinfectant treatment process so that is can be used for non-potable purposes such as toilet flushing and, in some cases, garden watering.

New build houses probably offer the greatest opportunity for grey water recycling technology as the system can be designed into the property. There are a number of issues that recur in published documentation on grey water systems, the main ones being high costs and high maintenance requirements. Costs of the systems are comparable to those of rainwater harvesting systems at the individual property level, although the requirement for simple treatment means that the ongoing maintenance costs are likely to be higher than those for rainwater harvesting systems.

A report by the Environment Agency concluded that if grey water systems are to be acceptable to the general public then reliable systems that operate on a “fit and forget” basis will be required. It is unclear whether current designs can be considered a reliable, cost-effective and publicly acceptable solution (Environment Agency, 2005).



Demand Management in Existing Properties

Relevant Studies on Demand Management in Growth Areas

The Environment Agency has published a number of studies examining the potential to retrofit existing buildings with water efficiency measures. Of particular relevance to this water cycle study are the findings in the Thames Gateway Water Neutrality study (Environment Agency, 2007e). This report examines how development within a Growth Area can be water neutral (i.e. no net increase in demand for water after development is completed). At the same time the Environment Agency also published its report examining opportunities and constraints to retro-fit water efficient devices and systems in existing homes in the South East of England (Environment Agency 2007h).

Both studies demonstrate the potential to achieve significant water savings by implementing simple retrofit options (such as low flush toilets, low flow showerhead and tap inserts) in existing homes, at a cost comparable to other water resource developments and demand management options (Environment Agency, 2007e).

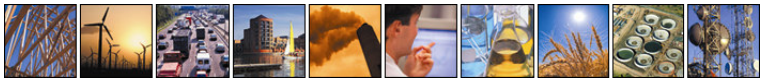
Potential Cost and Water Savings from Retro-fitting Existing Households

The Water Neutrality study showed that for an estimated cost of £100 per house a dual flush toilet device, a low flow showerhead and low flow tap inserts could be retrofitted in an existing home. This could result in a saving of approximately 40 litres per property per day, or around 10% of existing household demand.

In the Braintree District area there are approximately 70,000 households. Applying the data from the Environment Agency studies indicates retrofitting existing homes could have the potential to deliver up to 2.8 Ml/d at a cost of £7 million. This is approximately equivalent to the demand that might be generated by new households in the Braintree District at a growth rate of 300 houses per year.

Uncertainty and Constraints

It should be noted that there are a number of limitations to this assessment that result in considerable uncertainty in the delivery of savings from retrofitting. The high level assessment presented here is based on the assumption that all houses use the same volume of water and that they would make the same demand reduction on installation of the devices. In reality, water use varies with the number of people in a house and the appliances, fixtures and fittings installed in the property. A further consideration is that retrofitting existing homes would require the consent of the owners of the building to install water efficient devices, and that once installed, the owners would not replace them with fixtures and fittings that consume a larger volume of water. The Environment Agency concluded that household retrofits may best be delivered through organisations such as Housing Associations, where access to larger numbers of properties could be gained through a central organisation (Environment Agency, 2007i).



Retrofitting Existing Non Households

In the case of existing non-household buildings there is published information available from organisations such as Envirowise indicating that savings of 20-50% could be achieved through the implementation of simple water efficiency measures in non-household buildings (www.envirowise.gov.uk). The Water Neutrality study also acknowledged the limited information available on which to base an assessment of the potential savings in that study area, and adopted a conservative approach assuming a 10% reduction in existing non-household demand through retrofitting. The uncertainties surrounding building types mean that it is very difficult to assess the likely costs to implement these measures. However, costs are unlikely to be significant (tens to hundreds of pounds per property, rather than thousands) for smaller retail, commercial or industrial buildings.

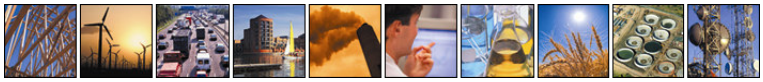
The overview assessment presented in this section illustrates that there may be potential to offset demand from new development through the retrofitting of existing buildings. However, issues over accessing buildings to install devices and maintaining the savings mean that there is considerable uncertainty in delivery of the estimated demand savings.

Indicative Costs for Water Efficient New Households

Indicative costs have been produced for the housing scenarios based on work published by the Environment Agency and summarised in **Error! Reference source not found.** (Environment Agency, 2007g). This shows that constructing an individual house to a standard equivalent to the water consumption standard in Level 3/4 of the Code for Sustainable Homes costs around £82 more than constructing a new home to a standard equivalent to CSH Level 1/2. The cost of constructing a new home to the most challenging level of water efficiency would cost around £2,560 more than CSH Level 3/4.

Table E.2 Indicative costs of building new homes to the Code for Sustainable Homes standards (water fittings only)

Code for Sustainable Homes Standard	Cost per house (£)	Present value cost of scenario (£ per annum)	
		300 new builds per annum	500new builds per annum
Level 1/2	£1,385	£415, 500	£692, 500
Level 3/4	£1,467	£440, 100	£733, 500
Level 5/6	£4,024	£1.2M	£2.0M



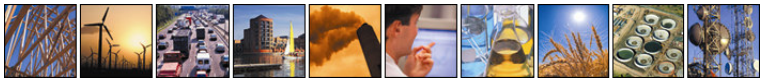
Improvements in Water Efficiency in New Non Household Buildings

Non household buildings vary widely in nature and include buildings such as schools, hospitals, offices, hotels and retail units. The buildings have very different functions and water uses, with some buildings having an element of "residential" or "domestic" type water uses (e.g. hospitals and hotels), and others having "industrial" or "commercial" water uses (e.g. manufacturing process water use). For these reasons, the Government is not minded to set a whole building standard for non-domestic buildings (equivalent to the Code for Sustainable Homes) and is instead intending to rely on setting standards for key fittings via the Water Supply (Water Fittings) Regulations (CLG, 2007).

For "domestic-type" water uses in non-household buildings such as drinking, washing and cleaning and toilet flushing many of the fixtures and fittings that can be implemented in the home can also be installed in non-household buildings. The Government maintains a website providing information about the Enhanced Capital Allowance Scheme for Water Technologies. This scheme enables businesses to claim 100% first year capital allowances on investments in technologies and products that encourage sustainable water use, and the website lists those technologies that attract the ECA.

Rainwater harvesting technologies can be better suited to non-household buildings. These buildings often have large roof areas and areas of hardstanding (such as car parks) where rainwater can be captured.

Demand reductions and the cost of implementing the measures will vary due to the scale of the building being constructed and the number of fixtures and fittings within the building. For these reasons, it is not possible to estimate the costs for constructing an "average" non-household building to improved standards of water efficiency.



Appendix F
The Code for Sustainable Homes and Water Consumption

Water consumption standards in the Code for Sustainable Homes

The Government has launched the Code for Sustainable Homes (CSH), which introduces whole-building performance standards against which new homes can be rated. For water, performance against the CSH is measured in terms of per capita consumption or pcc, expressed in litres per head per day (l/h/d). There are three standards for water efficiency in the CSH as follows:

- CSH Level 1/2 120 l/h/d
- CSH Level 3/4 105 l/h/d
- CSH Level 5/6 80 l/h/d

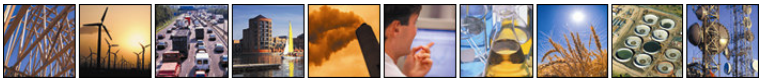
It should be noted that the pcc figures quoted above exclude an allowance for water use outside the home (for example, for car washing or garden water use). The Department for Communities and Local Government (or CLG, the Government department responsible for the CSH) estimate that the outdoor element of water use is approximately 4% of indoor use. The CSH is currently voluntary, although from April 2007 and 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. This has been set at 125 l/h/d (including external water use) and will be introduced through amendments to the Building Regulations in 2008 (CLG, 2007). The regulatory minimum is approximately equal to the CSH Level 1/2 standard, when an allowance for external use is included.

Costs of achieving water consumption standards in the Code for Sustainable Homes

The following tables present a breakdown of the costs for the fixtures and fittings required to deliver a new home to the CSH standards. These estimates are based on information from published reports[31]. To achieve the more challenging water consumption standards of CSH Level 5/6 requires the installation of rainwater harvesting

[31] Environment Agency (2007g) Assessing the cost of compliance with the Code for Sustainable Homes. Environment Agency, Bristol



technology, adding considerably to the cost when compared to constructing a new home to the standards in CSH Level 3/4.

Table F.1 Cost of fixtures and fittings required to deliver new home to the 125 l/h/d pcc standard (equivalent to CSH Level 1/2)

Micro-component of demand	Flow rate or capacity	Cost per item	Number per property	Cost per property
WC	6/3 litre dual flush	£119	2	£238
Basin taps	3 litres/min	£20	2	£40
Shower	8 litres/min	£209	1	£209
Bath	160 litres capacity	£198	1	£198
Kitchen sink taps	3 litres/min	£60	1	£60
Washing machine	45 litres/cycle	£280	1	£280
Dishwasher	12 litres/cycle	£350	1	£350
Outdoor Tap		£10	1	£10
TOTAL				£1385

Table F.2 Cost of fixtures and fittings required to deliver new home to the 105 l/h/d pcc standard (CSH Level 3/4)

Micro-component of demand	Flow rate or capacity	Cost per item	Number per property	Cost per property
WC	4.5/3 litre dual flush	£120	2	£240
Basin taps	1.7 litres/min	£60	2	£120
Shower	6 litres/min	£209	1	£209
Bath	160 litres capacity	£198	1	£198
Kitchen sink taps	3 litres/min	£60	1	£60
Washing machine	45 litres/cycle	£280	1	£280
Dishwasher	12 litres/cycle	£350	1	£350
Outdoor Tap		£10	1	£10
TOTAL				£1,467

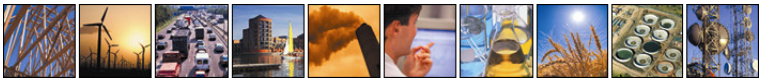
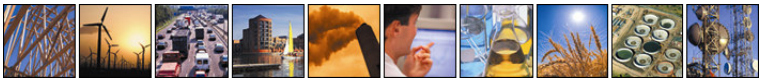


Table F.3 Cost of fixtures and fittings required to deliver new home to the 80 l/h/d pcc standard (equivalent to CSH Level 5/6)

Micro-component of demand	Flow rate or capacity	Cost per item	Number per property	Cost per property
WC	4.5/3 litre dual flush	£120	2	£240
Basin taps	1.7 litres/min	£60	2	£120
Shower	6 litres/min	£209	1	£209
Bath	140 litres capacity	£455	1	£455
Kitchen sink taps	1.7 litres/min	£60	1	£60
Washing machine	45 litres/cycle	£280	1	£280
Dishwasher	12 litres/cycle	£350	1	£350
Rainwater harvesting	-	£3,200	1	£3,200
Outdoor Tap		£10	-	-
TOTAL				£4,024



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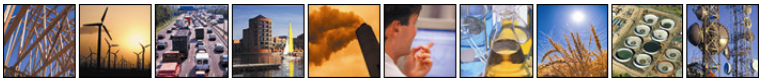

Appendix F

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Appendix G
Water Quality

Table G.1 Descriptions of Biology, Chemistry, and Nitrate GQA category

GQA Biology	The best quality is indicated by a diverse variety of Families, especially those sensitive to pollution. Poorer quality can be indicated by a reduction in the number of families sensitive to pollution, or an increase in dominance of Families that tolerate pollution		
	EQI for ASPT	**EQI for Taxa**	**Characteristics**
a - Very Good	1.00	0.85	Biology similar to, or better than, expected for an average, unpolluted river of this size, type & location.
b - Good	0.90	0.70	Biology falls a little short of that expected - may be a small reduction in the number of Families sensitive to pollution and a moderate increase in those that tolerate pollution.
c - Fairly Good	0.77	0.55	Biology worse than expected - many sensitive Families absent or number of individuals reduced. Marked rise in numbers of individuals that tolerate pollution.
d - Fair	0.66	0.45	Biology shows big differences from that expected. Sensitive Families scarce & only small numbers of individuals. May be a range of Families that tolerate pollution & some may have high numbers of individuals.
e - Poor	0.50	0.30	Biology restricted to animals that tolerate pollution with some families dominant in terms of numbers of individuals. Sensitive Families
f - Bad	-	-	Biology limited to a small number of very tolerant Families, which may be present in very high numbers. In the worst case no life may be present.

GQA Chemistry	The grade is determined by indicators of pollution that apply to all rivers because of the ubiquitous nature of the risk of pollution from sewage or farms, and because of the general desire that rivers should sustain healthy populations of fish.			
	DO (% Saturation) 10-percentile	**BOD (mg/l) 90-percentile**	**Ammonia (MgN/l) 90-percentile**	**Likely Uses & Characteristics**
A - Very Good	80	2.5	0.25	All abstractions,very good salmon fisheries, cyprinid fisheries, natural ecosystem
B - Good	70	4.0	0.6	All abstractions, salmonid fisheries, cyprinid fisheries, ecosystem at or close to natural
C - Fairly Good	60	6.0	1.3	Potable supply after advanced treatment, other abstractions, good cyprinid fisheries, a natural ecosystem, or one corresponding to a good cyprinid fishery
D - Fair	50	8.0	2.5	Potable supply after advanced treatment, other abstractions, fair cyprinid fishery, impacted ecosystem
E - Poor	20	15.0	9.0	Low grade abstraction for industry, fish absent, sporadically present, vulnerable to pollution, impoverished ecosystem
F - Bad	<20	-	-	Very polluted rivers which may cause nuisance, severely restricted ecosystem

GQA Nitrate

"High" descriptions are used for grades where the average concentration is above 30 mg/l. This roughly corresponds with the 95-percentile limit of 50 mg/l used in the EC Drinking Water & Nitrate Directives.

	Nitrate mg NO3/l Average
1 - Very Low	<=5
2 - Low	>5 to 10
3 - Moderately Low	>10 to 20
4 - Moderate	>20 to 30
5 - High	>30 to 40
6 - Very High	>40

GQA Phosphate

"High" descriptions are used for all grades where the average is more than 0.1 mg/l. This is the concentration considered indicative of existing or future eutrophication. High concentrations of phosphate do not necessarily mean that the river is eutrophic. Other factors have to be taken into account, such as the amount of algae present, flow rates and DO concentration.

	Phosphate mg P/l Average
1 - Very Low	<= 0.02
2 - Low	> 0.02 to 0.06
3 - Moderate	>0.06 to 0.1
4 - High	>0.1 to 0.2
5 - Very High	>0.2 to 1.0
6 - Excessively High	> 1.0

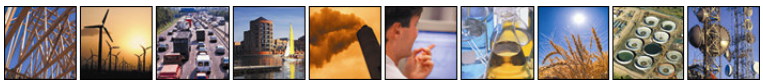


Table G.2 **Breakdown of river grades in Braintree study area**

Chemistry

Key	Length in Grade (Km) 2002	2003	2004	2005	2006
Very Good	11.4	18.3	0.0	15.2	11.7
Good	85.2	67.4	67.9	67.1	63.4
Fairly Good	39.6	29.5	50.0	37.5	43.6
Fair	7.0	20.1	17.2	15.4	21.4
Poor	1.8	9.7	9.9	9.9	4.9
Bad	0.0	0.0	0.0	0.0	0.0
Total Length	145.0	145.0	145.0	145.0	145.0

	Percent Length in Grade 2002	2003	2004	2005	2006
Very Good	7.88	12.63	0.00	10.47	8.05
Fair	58.76	46.49	46.84	46.26	43.73
Fairly Good	27.29	20.37	34.49	25.82	30.07
Fair	4.81	13.84	11.85	10.63	14.77
Poor	1.25	6.67	6.82	6.82	3.37
Bad	0.00	0.00	0.00	0.00	0.00

Phosphate

Key	Length in Grade (Km) 2002	2003	2004	2005	2006
Very Low	0.0	0.0	0.0	0.0	0.0
Low	1.9	1.9	1.9	1.9	1.9
Moderate	13.1	15.9	15.9	7.6	7.6
High	7.1	8.8	8.8	8.8	17.1
Very High	108.4	105.9	105.9	120.7	108.6
Excessively High	14.5	12.5	12.5	6.0	9.8
Total Length	145.0	145.0	145.0	145.0	145.0

	Percent Length in Grade 2002	2003	2004	2005	2006
Very Low	0.00	0.00	0.00	0.00	0.00
High	1.32	1.32	1.32	1.32	1.32
Moderate	9.03	10.97	10.97	5.26	5.26
High	4.91	6.06	6.06	6.06	11.78
Very High	74.74	73.04	73.04	83.22	74.89
Excessively High	9.99	8.61	8.61	4.15	6.76

Biology

Key	Length in Grade (Km) 2002	2003	2004	2005	2006
Very Good	75.5	64.3	63.0	57.5	39.3
Good	54.3	65.7	67.1	72.3	90.7
Fairly Good	14.1	12.9	15.0	15.0	14.8
Fair	1.2	0.0	0.0	0.0	0.0
Poor	0.0	0.0	0.0	0.0	0.0
Bad	0.0	0.0	0.0	0.0	0.0
Total Length	145.0	142.9	145.0	144.8	144.8

	Percent Length in Grade 2002	2003	2004	2005	2006
Very Good	52.03	44.99	43.41	39.72	27.14
Fair	37.47	46.00	46.25	49.92	62.66
Fairly Good	9.69	9.01	10.34	10.36	10.20
Fair	0.81	0.00	0.00	0.00	0.00
Poor	0.00	0.00	0.00	0.00	0.00
Bad	0.00	0.00	0.00	0.00	0.00

Nitrate

Key	Length in Grade (Km) 2002	2003	2004	2005	2006
Very Low	0.0	0.0	0.0	0.0	0.0
Low	0.0	0.0	0.0	0.0	0.0
Moderately Low	1.9	6.4	6.4	6.4	6.4
Moderate	33.0	28.5	27.4	24.6	24.6
High	36.5	29.5	25.4	25.5	28.2
Very High	73.6	80.6	85.9	88.6	85.9
Total Length	145.0	145.0	145.0	145.0	145.0

	Percent Length in Grade 2002	2003	2004	2005	2006
Very Low	0.00	0.00	0.00	0.00	0.00
Moderate	0.00	0.00	0.00	0.00	0.00
Moderately Low	1.32	4.41	4.41	4.41	4.41
Moderate	22.76	19.67	18.86	16.93	16.93
High	25.14	20.37	17.52	17.60	19.45
Very High	50.78	55.56	59.21	61.06	59.21

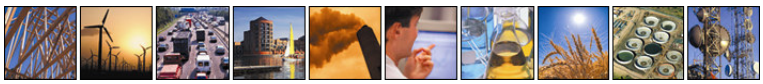


Table G.3 River ecosystem classification

The River Ecosystem Scheme

The River Ecosystem (RE) scheme provides a nationally consistent basis for setting water quality targets or River Quality Objectives (RQOs) for rivers.

Targets are used for planning improvements to, or protection of existing river water quality. They give a defined level of protection and help to sustain the use of river for recreation, fisheries and wildlife, and protect the interests of abstractors.

There are five RE classes relecting the chemical quality requirements of communities of plants and animals in our rivers. The standards defining these classes reflect differing degrees of pollution by organic matter and other common pollutants.

The 5 RE classes can be summarised as follows:

		Class Criteria						
		DO	BOD	Ammonia	Unionised Ammonia	Copper	Zinc	pH
Class	Description	* Q10	Q90	Q90	Q95	Q95	Q95	Q5 - Q95
RE1	Water of very good quality suitable for all fish species	80%	2.5	0.25	0.021	112	500	6 - 9
RE2	Water of good quality suitable for all fish species	70%	4	0.6	0.021	112	500	6 - 9
RE3	Water of fair quality suitable for high class coarse fish populations	60%	6	1.3	0.021	112	2000	6 - 9
RE4	Water of fair quality suitable for coarse fish populations	50%	8	2.5	-	112	2000	6 - 9
RE5	Water of poor quality which is likely to limit coarse fish populations	20%	15	9	-	-	-	-

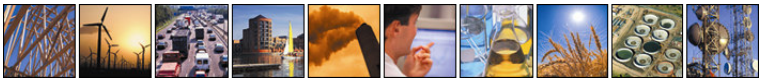
*Q10 - 10 percentile, Q90 - 90 percentile, Q95 - 95-percentile, Q5 - 5 percentile

RE Compliance

A stretch is only classes as failing to meet its RE target if we are at least 95% certain that it has failed. This is termed a *significant failure*. If we are between 50% and 95% certain of failure then this is classed as marginal and with less than 50% certainty it is classed as a pass.

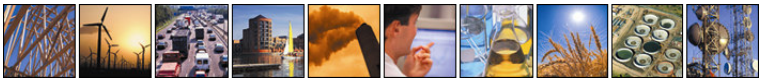
The length of compliant river is the total of those stretches classed as a marginal or pass. Failing river is the total length of those stretches classed as significant failures.

Compliance is assessed using a rolling three year data set.



Entec

Creating the environment for business



Appendix G

Appendix H
Wastewater Treatment Works and Sewerage Catchments

This appendix introduces the Wastewater Treatment Works and their capacities in relation to the catchment areas that they serve. Table H.1 summarises the characteristics of the catchment networks in the Study Area.

1.5.1 Braintree Sewage Treatment and Catchment

There are several proposed developments in the catchment. Anglian Water has anticipated an increase of 3,520 PE due to new development to 2016, which despite a forecast fall in per capita water consumption will slightly increase the DWF and significantly increase the loading to the works, which struggles to maintain compliance based on existing flows.

Upgrade work is forecast to be required at the WWTW to support this increased loading and maintain compliance to 2016. A future option could be to divert some of the flows to Bocking WWTW will be investigated under AMP5.

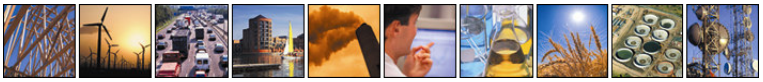
The current consented DWF is 6,860 m^3/d and is currently not exceeded and headroom calculations show sufficient capacity in all process units. However, the PE in the June return is currently under review and is likely to increase. This would clearly erode any available headroom. The Capital Solution considered by Anglian Water to alleviate current compliance issues is to provide alternative primary tanks (FFT of 237 l/s), pass the flow through trickling filters (currently on-site but disused), then settle the filtrate in the existing settlement tanks, prior to feeding the Kaldness tanks. This will relieve the loading on the Kladness process by providing sufficient primary treatment.

The existing footprint at Braintree WWTW would enable the capacity of the works to be increased to accommodate additional flows.

The catchment is predominantly served by a separate sewer system performance is currently fair, with occasional issues of localised flooding and overflow.

Several large development sites have recently been constructed or are being proposed in the catchment. These have been assessed by Anglian Water as part of their Periodic Review process (PR09). The future growth identified is mainly concentrated in the west of the Braintree town, which means that flows will drain to Notley Road Pumping Station. The current pumping station already operates in an unsatisfactory manner with an unconsented overflow operating as both an Emergency Overflow (EO) and a CSO. Continued growth will increase the rate of spills and increase the risk of pollution of the River Brain.

A number of strategic options are being considered; the most viable ones are to:



- Reinforce the existing system by undertaking a number of actions, such as upsizing pipe diameters (e.g. Rayne Road, west side of town to Notley Road PS), providing overflow storage at Notley Road PS (or upsizing the PS), and increasing capacity at Braintree WWTW.
- Divert flow direct to Braintree WWTW (e.g. Garden Village could be re-directed straight to the WWTW to relieve pressure on Notley road PS)
- Divert flows to other catchments (e.g. flows draining to Notley Road PS could be diverted to Bocking via a new rising main and tunnel)

1.5.2 Bocking Sewage Treatment and Catchment

Bocking WWTW serves the northern half of the town of Braintree. Anglian Water has planned for an increase of 1,100 PE due to new development during the review period, along with a reduction of 40 PE by 2016 due to forecast fall in per capita water consumption.

However, no upgrade work is required to support any increase in flow from growth and maintain compliance to 2016. However, as mid- and long-term growth forecasts will put Braintree WWTW under pressure and additional flows may be diverted to Bocking WWTW. Anglian Water intends to investigate the implications of this during AMP5, and Braintree DC should remain actively involved in this investigation to inform the Phase 2 detailed WCS.

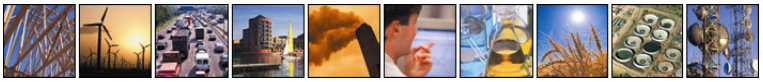
Headroom calculations show ample headroom at all treatment stages. This has also been confirmed by EA sampling data. In addition two further filters (currently redundant) are available on-site.

The sewer system is largely separate, with some partially separate areas, back roofs and the rear of the properties drain to the foul system while the front roofs, driveways and roads drain to the surface water system. Five incidents of sewer flooding have been reported due to either blockages or a bottleneck due to a change in pipe diameter, all of which are currently being addressed by Anglian Water.

Anglian Water has also assessed the implications of the proposed development of 500 dwellings in the north east of Braintree, near Panfield Road). The proposed development would result in additional flows passing to one of the pumping stations (Bocking Bradford Bridge), which currently serves a PE of 11,600. However, Anglian Water estimate that as the pumping station already handles combined flows from the catchment, the overall impact of separate flows from the new development will be minimal.

1.5.3 Rayne Sewage Treatment and Catchment

Rayne WWTW serves the Rayne Parish, 4km west of Braintree. It discharges to a headwaters of the River Brian and as such receives minimal dilution and has been set relatively tight consent conditions. An increase of 111 PE is expected by 2016 due to growth during the review period, along with a further increase of 168 PE as a result of a development of 76 dwellings in the east of Rayne.



Current performance issues identified include:

- Failures in water quality samples (suspended solids and BOD) in 2006 have been linked to secondary settlement and tertiary treatment process problems.
- Headroom deficiency in the humus tanks (insufficient capacity).

The current consented DWF is 650m^3/d; it is understood that only 70% of the consented DWF capacity is being used. No consent changes are forecast. Upgrade work will be required at the WWTW to provide sufficient secondary settlement and support the increased flows from growth to 2016. Anglian Waters preferred option is to provide additional secondary settlement, a third humus tank to reduce the risk of non-compliance and pollution incidents.

The following sewer flooding incidents have been reported in Rayne:

- Two incidents from foul sewers due to blockages
- A further incident at Rayne Pumping Station as a result of high storm flows

Anglian Water has assessed the implications of the proposed redevelopment of a foundry site in the west of Rayne (76 dwellings). It is forecast that, although the proposed development would result in additional flows to the WWTW, it would not affect the sewerage system which has sufficient capacity.

1.5.4 White Notley Sewage Treatment and Catchment

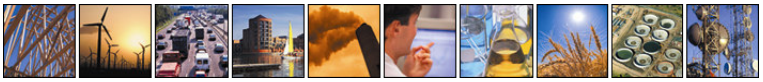
White Notley WWTW serves the villages of White Notley, Cressing, and part of Black Notley, and is located approximately 5 km south-east of Braintree. Although no major future development is forecast, there has been a recent in increase in PE due to the redevelopment of the Black Notley Hospital site.

The current consented DWF is 660m^3/d an application has been made to increase this to 1,225 m^3/d. No tightening of water quality standards is expected.

Anglian Water have identified issues with the hydraulic capacity of key components and there ability to accommodate the storm response in the catchment. The following upgrades are required to address these issues:

- Increase capacity of inlet to 91 l/s peak flow.
- Increase storm overflow capacity to 69.5 l/s.
- Provide additional biological filter media of 989m^3.

If these current issues are addressed and there is no change in the consent conditions further works are not envisaged during the period 2010 – 2015.



The catchment is partially separate, with new developments being on separate systems and surface water being discharged to tributaries of the River Brain. Due to significant growth in the last 10 years in Black Notley, storm storage was provided in the sewer system (comprising an offline tank with a pumped return).

The following flooding incidents have been reported in White Notley:

- 11 Category 3 pollution incidents, none of which required further investigation
- 1 external flooding incident (under investigation)
- Overflow discharges from the White Notley Pumping Station under storm conditions, partly due to the capacity of the inlet works.

Increasing the pump rate to 75 l/s (as per original design) at White Notley Pumping Station is required to reduce risk of pollution. However, this cannot be achieved until the inlet at the WWTW has sufficient capacity.

1.5.5 Witham Sewage Treatment and Catchment

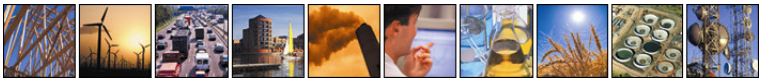
Witham WWTW serves Witham (by gravity) and Hatfield Peverel (pumped flows). Anglian Water has made an allowance for an increase of 3,000 PE due to new development to 2016; however, no increase to the DWF arriving at the works is forecast due to falling occupancy rates and per capita water consumption. The current consented DWF is 8,100 m^3/d; measured flow records show that the annual DWF is well below this figure (around 58% of the consented DWF). Therefore no upgrade work is forecast to support the proposed growth and maintain compliance. Current capacity and treatment performance is good, with the aeration system taking 70% of the flow to the works following recent refurbishment. Headroom calculations indicate spare capacity in all areas of the plant.

Some flooding issues exist due to flow restriction within the inlet pumping station and the preliminary treatment stream. These issues are not associated with capacity / growth and currently under investigation.

Essex and Suffolk Water is responsible for the outfall pipe from Witham WWTW, a box culvert, since it is used to transfer treated effluent to the Blackwater Estuary downstream of the intake at Langford for water supply purposes. It is understood that there are capacity issues associated with this pipe although these need and any plans to increase capacity need to be clarified with Essex and Suffolk Water.

The catchment is served by an almost entirely separate sewer system. The performance of the network is generally good, with some hydraulic incidents reported along Hatfield Road/Bridge Street and from the Chipping Hill area, as well as just upstream of the WWTW. It should be noted that the restricted capacity at the WWTW inlet works is primarily responsible for surcharge and flooding problems and these are currently being investigated.

The proposed development is focused along the south-west boundary of the sewerage catchment. Network modelling was carried out to study the effects from sites identified for specific proposed development to 2016. Details of these are provided below:



- South Maltings Lane and Maltings Lane

A population of 2054 was added to the model to represent the current situation, and a further 630 to represent the likely future growth to 2016. The model illustrates the minimal influence of an increase in population. However, when additional runoff surfaces are applied to represent "urban creep", a large amount of flooding is predicted. In order to overcome predicted problems, upsizing of diameter of various sewers is proposed, as well as sealing of manholes and increasing the capacity of inlet to the WWTW to pass forward the additional flow. Separate sewer systems and the appropriate use of Sustainable Drainage Systems (SuDS, see Section 7) could further help to mitigate sewer flooding.

- Bridge Hospital Site

The inclusion of this development results in a significant increased flooding adjacent to the development and along the main trunk sewer. The solution is to upsize 400 m of sewer (from 225 mm diameter to 300 mm), together with changes to the inlet to the WWTW and manhole sealing as per Maltings Lane solution.

- Land between Constance Close and A12

Unless flows are discharged directly to the WWTW inlet works, the development will have an impact on the system immediately upstream of the WWTW. This can be relieved by increasing the capacity of the inlet to the WWTW and sealing manholes, as per solutions in West Braintree, and also by increasing the capacity in the local sewer (from 150 mm diameter to 225 mm).

The increased flooding highlighted by the model based assessment is primarily a result of increased impermeable area at the sub-property level termed urban creep and future connections to the foul system. Options to mitigate against increased flood risk involve local sewer upsizing and an increase in the pass forward flow to the WWTW. Adoption of SuDs also offer the potential to mitigate the deleterious impact of urban creep.

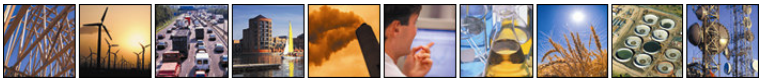
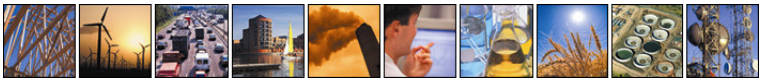


Table H.1 Characteristics of the Sewage Treatment Networks in the Study Area

Component	Unit	Braintree WWTW	Bocking WWTW	Rayne WWTW	White Notley WWTW	Witham WWTW
Drainage area	Hectare		580	62	5,433	unknown
Connected population in 2008	Population Equivalent (PE)	19,429	20,002	2,647	16.9	31, 105
Foul sewer length	Km	73.4	45.5	9.1	1.3	94.6
Surface water sewer length	Km	66.8	38.6	2.3	0	77.4
Combined sewer length	Km	1.89	0	0	2 + 1 (storm storage return)	3.4
Pumping stations	Number	21 (5 private)	5	2	3	9
Consented overflows	Number	4	1	2	0	0



Appendix I
Drainage

The use of infiltration techniques across the study area is likely to be limited due to the low permeability soils and clay geology. The greatest potential for such systems is in the north of the area, underlain by chalk. A more detailed review of the soils will be required at a site specific level to determine the potential for use of infiltration techniques.

Outside of the SPZs infiltration can discharge to the underlying aquifer, whilst this may not be in a water supply catchment many aquifers have protected status and discharges are still restricted. **Table I.** shows the development types that can discharge to major and minor aquifers.

Table I.1 Acceptability for discharges to protected resources

Impermeable Area	Major Aquifer	Minor Aquifer	Non-Aquifer
Roof Drainage	No objection	No objection	No objection
Public/Amenity	Acceptable	Acceptable	Acceptable
Large Car Parks	Acceptable (with interceptor)	Acceptable (with interceptor)	Acceptable (with interceptor)
Lorry Parks	Acceptable (with interceptor)	Acceptable (with interceptor)	Acceptable (with interceptor)
Garage Forecourts	Acceptable (with interceptor)	Acceptable (with interceptor)	Acceptable (with interceptor)
Major Roads	Acceptable (subject to investigation and with interceptor)	Acceptable (subject to investigation and with interceptor)	Acceptable (with interceptor)
Industrial Sites	Acceptable only if investigation favourable and with adequate precautions	Acceptable (subject to investigation and with interceptor)	Acceptable (subject to investigation and with interceptor)

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