HEREFORDSHIRE COUNCIL

A water cycle study will examine tensions between growth proposals and environmental requirements, and identify potential solutions to addressing them. Effective planning and close cooperation between all parties involved is essential to the success of a water cycle strategy.

LOCAL DEVELOPMENT FRAMEWORK

OUTLINE WATER CYCLE STUDY
Technical Report
Drawings & Appendices
2nd Edition – Final Report Issued

REPORT QUALITY CONTROL

Report 1110-TR1-C – Herefordshire Outline Water Cycle Study

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REVISION HISTORY

Issue	Details	Media	Date	Circulation List
DRAFT	DRAFT 2 copies issued to Herefordshire Council	H/c+PDF	06-07-9	KS; JW; GD; MD; MJ;
FINAL	FINAL – consultation responses from DCWW, EA, Natural England, CCW all incorporated. Additional sections on Water Efficient Buildings, Diffuse Agricultural Pollution and Catchment Sensitive Farming Initiative added. Appendices on general infrastructure constraints from DCWW added.	H/c+PDF to: HC EA DCWW	24-09-9	KS; GD; MD

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EXECUTIVE SUMMARY

The Regulatory Framework

There is a finite capacity within the environment, and it cannot simply provide more and more water arising either through increased consumption rates or overall demand because of increasing housing requirements. Equally, there is a limit to the amount of waste water that can be safely returned to rivers and the sea without having a detrimental impact on the environment. Extreme rainfall can overwhelm surface water drainage and overtop flood defences.

Climate change is bringing fresh challenges as patterns of rainfall are predicted to change, with more intense rainfall events, and possibly much drier summers. Planning for water has to take into account these natural constraints, and factors such as the timing and location imposed by the development itself.

A Water Cycle Strategy provides a plan and programme of Water Services Infrastructure implementation, taking into account the fundamental requirements of a sustainable water environment. It is determined through an assessment of infrastructure capacity for:

- water resources and supply
- sewage disposal and treatment
- surface water drainage and flood risk management

It should also consider the impact of efficiency measures and provide an overall estimate of cost for the identified solution(s) and of the identified infrastructure improvements required. This approach to development is now a requirement of Government Regional Spatial Strategies and Sub-regional Strategies.

Standards and legislation to protect water and the environment are changing in a way that requires a partnership approach to deliver infrastructure through strategic ways of working. In particular, Planning Policy Statements 1, 3, 12, 23 and 25 all emphasise the importance of environmental sustainability and delivering water infrastructure to achieve it.

Specifically, Growth Areas and Growth Points such as Herefordshire must undertake Water Cycle Studies and Strategic Flood Risk Assessments as part of their Growth Point status.

The Water Framework, Habitats Directive, Urban Wastewater Treatment Directive and the forthcoming Flood and Water management Bill are the principal regulatory frameworks influencing future use of water in Herefordshire.

This study is essentially Geographic Information System (GIS) and database driven. Significant effort has been expended in assimilating all available information into powerful and visually informative GIS layers that can be used in an infinite variety of ways to inform the Planning Authority about water cycle issues and constraints in relation to emerging spatial strategies for new housing. The A3 summary Figures at the end of each Chapter are termed ‘Evidence Maps’, and whilst informative in themselves, are intended only to illustrate the type of information that can be displayed through the considerable power and flexibility of GIS type systems. All of the data files and GIS layers are compatible with the MapInfo™ GIS software.

The Environment Baseline

There are 14 identified waterbodies within Herefordshire at Poor Ecological status. A further 4 are at Bad ecological status. These will be subjected to close scrutiny by the Environment Agency in order to achieve a status of ‘Good’ by 2016.

The Environment Agency RoC process has identified 30 sites in the River Wye catchment where current discharge Consent licenses cannot be shown to have no adverse effect. Of these 16 are within Herefordshire (incorporating Presteigne STW) and are of direct relevance to water services infrastructure. 14 of the sites are related to Sewage Treatment Works (STW) performance, which will require urgent further scrutiny. The River Arrow and the Lugg from Leominster to Hereford are principally affected.

37 sites are further identified which relate to water resources adverse impacts, and of these 32 are within Herefordshire. The lower Lugg (Leominster to Hereford) and the lower Wye (Hereford to Monmouth) are principally affected.

There are 5 Environment Agency defined Water Resource Management Units (WRMUs) in Herefordshire (4 in the Wye system, 1 in the Teme). For resource assessment purposes, the groundwater units are contiguous with the defined surface water units in every case.

The CAMS process has determined that each of the five WRMUs is at 'No Water Available' status. This means that at the fully licensed uptake scenario, the ecological river flow objective would be compromised.

Hence, there are two issues arising:

1) Increases in the licensed quantity during low flows are unlikely to be available to any abstractor in the future. Climate change impacts will therefore have to be accommodated by a range of measures, including: source development, demand reduction, increased water use efficiency and increased infrastructure.
2) New abstraction licenses are unlikely to be granted in any WRMU according to the Environment Agency. Where they are granted, they are likely to be either seasonally dependent or have significant 'Hands Off Flow' conditions associate with them. In this instance prospective abstractors will have to engage in Water Licence Trading, or cooperate with established abstractors in the form of collective water user groups, who in combination can demonstrate that overall consumption is not increased between several licenses.

Catchment scale flood risk, in three categories of a) General surface water flooding b) Fluvial flooding by floodplains c) Historical flooding reports has been identified in detail in the accompanying report **Herefordshire Strategic Flood Risk Assessment**.

This identifies the villages of Dorstone, Peterchurch, Kington and Aston Ingham as higher risk localities with respect to general surface water flooding.

Fluvial flooding from adjacent floodplains is prevalent for properties adjacent to the Wye, Red Brook, Yazor Brook and Withy Brook in Hereford, Pinsley Brook and River Lugg in Leominster, Eardisland on the River Arrow, and the River Lugg at Bodenham, Mordiford and Hampton Bishop.

Historically, Hereford, Lower Bullingham and Hampton Bishop report the greater number of repeatedly flooded properties. S. Leominster, Stoke Prior, Hope-u-Dinmore, Bodenham, Marden, Sutton St Nicholas, Withington Marsh, Hampton Bishop and Mordiford are also higher risk locations.

The River Teme, Leadon and Wye are all designated Sensitive Waters (susceptible to eutrophication) under the Urban Wastewater Treatment Directive. Tertiary standards of treatment therefore apply to all STWs serving populations greater than 10,000 p.e. (population equivalent). UKCIP02 climate change projections, superseded by UKCP09, consistently suggest that reductions in summer rainfall of up to -20 to -40% may be likely. The Environment Agency has postulated in its assessment that summer river flows by 2050 will be some -20% less than at present in the Severn River Basin.

Water availability is very likely to be 20% less for all licenses in order to offset climate change impacts on ecological river flow objectives, with a concomitant potential increase in potable water consumption and agricultural water use.

Housing Pressures

The Regional Spatial Strategy 'Spatial Options, January 2008) requires Herefordshire Council to provide in the order of 16,600 dwellings from 2006 – 2026 (Option 1). Of these, some 8,300 will be in and around Hereford.
A further option proposed by Government Office West Midlands (GOWM, December 2008) is to provide for an additional 1200 dwellings in rural areas (RSS Phase 2 Revision – Government Representation on the Draft).

Accounting for 5062 houses already constructed, committed or allocated in the UDP in the period 2006 - 2008, this leaves a balance of 11538 houses to be found in Strategic and non-Strategic sites from 2009 onwards. We currently believe there is a large unexplained discrepancy between the household and population figures provided by DCWW and those estimated by Herefordshire Council.

Based on data at end of 2006, DCWW estimate a total population in the 6 relevant Water Resource Zones of some 175,000. However, Herefordshire sourced data (ONS and LLPG) estimates that there is a population of 175,500 in Herefordshire alone.

WRZ household and population figures are also not in agreement particularly for all of the WRZs falling entirely within Herefordshire where one would expect close agreement particularly with respect to population figures.

These population figures in particular require urgent examination and reconciliation. Whilst there may be a logical explanation for the differences, this should be proved on both sides.

Water Resources and Water Abstraction

The CAMS outcome directed by the Environment Agency has concluded that all of the five Water Resource Management Units (WRMUs) covering Herefordshire are at the fully licensed or 'No Water Available' status. This means that any increases in demand for water e.g. population growth or agricultural consumption will have to be met through a combination of:

- Decreased demand
- Increased efficiency of use
- Licence revocations (unused or terminated licenses)
- Licence trading schemes
- Seasonally or Flow Constrained Licences

Nevertheless, under current scenarios i.e. at 'No Water Available' status (excluding future Habitats RoC reductions and/or deteriorating climate change effects beyond those envisaged under UKCP09, see below), Herefordshire Council will have a significant role to play in promoting reduced water demands by the baseline population, and in promoting water neutrality (i.e. increased demand by RSS growth offset by increased efficiencies) for new housing.

Impacts of climate change are a key critical issue, and DCWW has itself confirmed that climate change reductions in water availability may become a predominant factor in Headroom calculation for some zones. DCWW has assessed the impact of climate change with regard to changes in supply and demand for water in line with industry standards and the EA Water Resource Planning

guidelines. This is reflected in the increasing Target Headroom shown for most WRZs across the planning period.

In essence, UKCP09 and the EA River Flows 2050 study predictions suggest that summer rainfall may reduce by upto 40% in the West Midlands-East Wales area. River flows in September may be up to 30 – 50% lower in September for example. This assessment is for natural river flows, whereas the River Wye is a regulated river, supported by releases from the Elan valley system. The effects of climate change on regulation will still need to be assessed.

The Environment Agency position with regard to climate change impacts on future Abstraction Licences is unclear at present. It is conceivable that by 2050, if river flows have systematically declined by 30 – 50% for some months, the Environment Agency may conceivably be stipulating 'across the board' reductions in abstraction quantities of similar proportions by means of 'Hands Off' conditions.

The potential impact of these reductions should be assessed as soon as possible.

Increased water efficiencies, reduced demand and aims of 'water neutrality' should be priority areas for investigation in terms of the impact of new housing by Herefordshire Council.

Water Supply, Demand and Consumption

The Government long-term target for England is to reduce per capita consumption to not more than 130 l/p/day. This should be a minimum target of new households, and there will probably be a significant requirement for retrospective metering and water efficiency initiatives for the larger proportion of currently unmeasured households in Herefordshire, which as of 2006-07 constituted 60% of all households. Areas supplied by DCWW however fall under the jurisdiction of Welsh Assembly Government (WAG), and DCWW points out that WAG has not set a target for water consumption generally. Furthermore, WAG and DCWW do not support compulsory or accelerated metering.

Overall within Herefordshire, the Unmeasured household consumption is 16% above national average, and the Measured household consumption is slightly below national average. Taken together the Herefordshire consumption is 6% above national average, but there would appear to be significant scope to reduce existing consumption in certain areas. Unmeasured households in Whitbourne and Ross-on-Wye Water Resource Zones are forecast to use 197 and 178 l/p/day respectively, significantly higher than the current national average of 148 l/p/day, and very substantially more than the Government target of 130 l/p/day by 2030.

Via the consultation response, DCWW has pointed out that DCWW policies on water efficiency at zonal level are driven by need i.e. where the supply demand balance necessitates and where demand reduction is the least cost economic solution in that zone.

Generally, taking into account the RSS housing forecasts, and climate change impacts on demand (but not supply), DCWW shows that for a Dry Year Annual Average scenario all of its Water Resource Zones (WRZs) have a supply-demand surplus across the planning period.

Distribution Input, the simplest overall measure of water used is largely static for all zones across the planning period with the exception of Ross on Wye and Llyswen. However, this is achieved by DCWW assuming that currently unmeasured households (the majority) will be moved over to Measured Households, at a rate of 2 – 3% year on year. This is a fairly ambitious metering programme, and Herefordshire Council should satisfy itself that this is a) achievable in principle b) being achieved in practice. DCWW has confirmed that meter uptake values within the draft WRMP are based upon actual current trends of uptake over a 10 year period, and within that period it has encountered uptake at higher levels (up to 3.2% annually. The uptake rate is reviewed annually.

This strategy not only presupposes that metering will significantly increase, but that metered households will automatically reduce their consumption accordingly (probable, but not certain). Currently, DCWW shows no significant reduction in per capita consumption relative within each sector (Unmeasured and Measured) compared to current rates.

In the Water Resources Strategy for Wales, with respect to demand management the Environment Agency is of the view that water metering and sliding scales of charges can play an important role in increasing efficiency, providing affordability concerns are addressed. The EA is also of the view that as levels of metering increase, average water use per person will reduce. This is because metered households tend to use 10-15% less water.

However, WAG and Welsh Water do not support compulsory metering, and contrary to the above assertion, DCWW is of the view that it has no evidence to support reductions in consumption as a result of metering.

As DCWW has confirmed on a number of occasions, it cannot commit funding to future infrastructure improvements until such funding is approved by OFWAT through the AMP Review process. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment plan, developers may be required to fund the essential improvements.

DCWW would emphasise that water services infrastructure requirements need to be assessed on an individual basis. It cannot provide this assessment until it is informed where the specific development will be allocated.

It has given assurances to Herefordshire Council that there are no high level constraints at Water Treatment Works level. Should the proposed growth for Herefordshire city materialise, then its initial indications are that the trunk water mains serving the city from both north and south would need to be upsized to ensure security of supplies.

Licensed agricultural water use accounts for some 61% of all licenses in Herefordshire. As a County with a substantial agricultural base, this water use is vital to the local economy. Efficient use of this water is paramount. Herefordshire is probably typical of the national demand for water for irrigation likely to increase in all areas over the next 10 years, which could be 25 per cent higher by 2020. The recent trend of increasing demand for potato irrigation is expected to continue over the next 10 years, although the rapid rise in demand is likely to start to slow down by 2020. Water for irrigating vegetables will become an increasingly important use of water in the next 10 years.

Abstractors have to demonstrate to the Environment Agency that their water needs are necessary and efficient. In the case of Herefordshire, in view of the very large proportion that agricultural water represents, this is doubly necessary. On the risk based approach, Herefordshire Council should be satisfied that the 37 largest abstractors of water in the County are all engaging in efficient practices. Future business expansion plans would be of interest.

It is interesting to observe that whilst water companies have to provide highly detailed and rigorous water resource management plans, collectively the largest users of water in the County do not.

There is a recommended role here for the Unitary Authority to take a long-term overview, since agriculture resources and employment are as much a key issue for the planning authority as residential employment and housing?

In terms of demand, DCWW are confident that climate change impacts will not markedly influence the supply-demand balance i.e. consumption rates etc. are accounted for in the adjusted Target Headroom within its current water resources planning period to 2034/35.

River flows are predicted to reduce by 40 – 50% in summer months by around 2050 under the UKCP09 High Emissions scenario. In this scenario, it is difficult to see that the Environment

Agency would do anything other than stipulate increased HoF conditions or cut back to all licence holders in future years, to maintain ecological River flow objectives.

Hence, for summer months abstraction quotas might reduce by similar amounts to the proportionate reduction of Daily Mean Flow for example. Such reductions would basically constitute a reduction in Deployable Output, and this eventuality should be assessed if only on a 'what if' basis.

Herefordshire Council can assess for itself the implications on its housing strategy by use of the Sensitivity Model developed for this study.

For agriculture, the potential impact of climate change on increased demand is expected to be high. Irrigation requirements could increase dramatically, and could move northwards and westwards in the UK as a result of climate change. By the 2020s, central England **and** eastern margins of Wales could experience conditions similar to those currently typical of the south and east of England.

The Environment Agency believes that the changing pattern of future dry years (increases in short droughts but little change in long duration droughts) may require significant adaptations in water resources policy and practice, both for public water supply and agriculture.

Herefordshire Council is urged to explore seriously the options for water neutrality across the County. Water neutrality could potentially be achieved by a combination of:

- modest reductions in overall per capita consumption
- retro-fitting of water efficient appliances
- variable or block tariffs
- increased metering of households
- implementation of widespread CSH Code 3 to 5 new homes
- reduced demand for agricultural water by improved efficiencies

DCWW has stated that it is very concerned by the proposal for a water neutrality study and is unclear on the driver for this. Currently it has indicated within the Draft WRMP that there is adequate water available to meet development to the proposed level within the RSS. A number of the proposals listed above are not within the power of Herefordshire Council to deliver and in direct conflict of Welsh Water, and more importantly WAG policy. WAG does not support a policy of compulsory metering. DCWW is reviewing the use of variable tariffs but only to support affordability issues, again in line with WAG policy.

Sewerage Infrastructure

Although sewerage infrastructure could prove to be a principal constraint for new RSS housing in some areas, we are unable to report on any detailed information or data for this part of the water services infrastructure. DCWW has provided a summary statement pertaining to individual sites with regard to potential infrastructure constraints. We have been unable to obtain similar relevant information from Severn Trent Water who is the sewerage undertaker around the Ledbury area.

DCWW has stated that hydraulic capacity information relates to confidential information which it does not issue within the public domain. It has agreed with Herefordshire Council directly that it would assess the impacts to its assets once meaningful information had been received relating to specific growth options within the council area. This type of information involves running complex models with very detailed information. It would not allow this assessment to be carried out by external consultants and it would need to be reimbursed for the cost of such specific tasks outside of its planned Regulatory improvements.

Capital Investment Programme submissions are made in 5 yearly cycles to OFWAT, and only after approved funding are improvements undertaken. LDPs help DCWW to understand the level of growth to guide investment. However, DCWW will only invest for confirmed allocations, as this is the only basis for approval of funding by the regulator. Plans are prioritised to meet specific objectives, and due to the disparity in timeliness, if a development needs to proceed in advance of DCWW's planned improvement, these essential services need to be acquired through planning obligations.

Determination of existing hydraulic capacities and potential flooding (hydraulic performance) is data intensive, generally requiring the preparation of Drainage Area Plans. Outputs from the DAPs were not made available to the consultant, so the Outline Water Cycle Study is unable to identify any issues or constraints with regard to the impact of emerging spatial strategies on sewerage capacity.

The Outline Water Cycle Study is unable to identify any issues or constraints with regard to the impact of emerging spatial strategies on hydraulic or water quality CSO performance due to lack of data.

Wastewater Treatment and Pollution Control

The study has identified 51 STWs discharging to the Wye system, and 51 discharge to the Teme system. In the case of the Teme, the significant majority are very small works , for which we have been unable to obtain data.

The largest STWs in the Wye are the Rotherwas and Eign STWs at Hereford which together account for approximately 65% of total treatment capacity by population equivalent. The largest Works in the Teme system is at Ledbury, which accounts for 54% of the total treatment capacity in terms of population equivalent.

The current operational capacity of these works in relation to the incoming effluent load cannot be established as DCWW declined to share this information on the grounds of confidentiality. It has however provided a list of STWs with an indication of what headroom is available to accommodate new housing.

The time-span and the costs associated with upgrading or replacing these STWs where this may be necessary as a result of the growth strategy remains uninvestigated and is a priority for more detailed study. It will require a much greater level of co-operation between DCWW and Herefordshire Council than has been evident to date.

In summary, 34 of the 51 STWs identified under the ownership of DCWW have operational constraints, and are at the limit of their capacity. This includes all of the main market town STWs with the exception of Ross on Wye, which is reported to have some 1600 household headroom capacity (4000 p.e.). The Ledbury STW under Severn Trent Water has capacity for some 2500 houses, although some refurbishment work would be needed to the terminal pumping station.

Following recent AMP4 upgrading due for completion March 2010, Rotherwas and Eign STWs will have headroom capacity for some 3800 homes. This is a significant shortfall on the predicted balance of 5369 required in Hereford by 2026.

It is strongly recommended that some form of 'time-line' matrix is produced for every STW by Herefordshire Council, showing, against various housing trajectories, when operational limits will be reached, the possible deficit capacity, and the associated upgrading costs needed to bring the capacity into surplus. This will require close engagement with DCWW. With regard to the Habitats Review of Consents outcomes regarding water quality, 16 sites have been identified in Herefordshire (Wye only) where no adverse impact could not be established.

With the exception of Herefordshire Pool, these all relate to DCWW STWs. The actions proposed generally require modifications to the Consents. Eign and Rotherwas will have their Discharge Consents tightened, which will reduce the headroom available for new housing.

The remainder of the adverse impacts are all within the Lugg catchment, and comprise the Leominster, Bromyard, Kington, Bodenham and Moreton-on-Lugg STWs with regard to tightened constraints. All of these STWs will therefore have reduced headroom to accommodate new housing. The outcomes for DCWW with regard to STW operational capacity at these locations is not clear and requires clarification.

There are significant pollution pressures from phosphates in the Lugg and Leadon catchments, generally ascribed 50:50 between sewage loadings and farming practice.

The River Lugg and River Arrow are currently designated as 'Poor' ecological status, and it has been established that there will be significant housing pressure particularly around Leominster that is likely to exacerbate this problem. The River Wye from the Lugg confluence (part of the SAC) is designated as a eutrophic sensitive waterbody, and hence mitigation measures will be required in conjunction with improved farming practice to provide mitigation measures.

Similarly, the River Leadon is a eutrophic sensitive waterbody, and is currently classed as 'Poor' ecological status. It also is likely to receive a significant increase in housing pressure that without mitigation will exacerbate the situation.

The Humber Brook s.e. of Leominster, and the Frome upstream of Bromyard are the worst rivers in Herefordshire in terms of overall ecological status, and will require specific mitigation measures if new housing is required in these sub-catchments.

Catchment Scale Flood Risk Management

A comprehensive SFRA for Herefordshire was completed in April 2008, with a final 3rd Edition issued on DVD in April 2009. This was a large and complex study, designed to be read and used as a stand-alone document with a supporting Geographical Information System (GIS) evidence base. It should be regarded as a sister document to this Water Cycle Study.

Consequently, this Water Cycle Study document does not repeat the issues and outputs of the SFRA, although cross-references are made where appropriate and necessary, particularly with regard to Surface Water Management Plans where there is a high degree of inter-linkage between surface water drainage and flood risk.

Risk driven plans and strategies such as SFRAs and CFMPs should target policy and resources at the highest risk areas. It is requirement of these plans that the Environment Agency and LPA should engage and agree which areas within the catchment are the highest at risk and what polices should be adopted to control this risk.

Within the SFRA framework, the highest risk areas that are identified for urgent active policy consideration are based on the following objective measures:

- The five highest ranking catchments in terms of fluvial flood risk i.e. existing flood-risk defined by property counts within the 1% AEP floodplain
- The five highest ranking catchments in terms of generalised flood hazard as defined by the Catchment Flood Hazard Index of the SFRA study
- The five highest ranking catchments in terms of number of reported flood incidents.
- Specific settlements where there has been repeated severe flooding and where strategic options may be necessary in the future.

The Herefordshire SFRA has addressed climate change by provision of two objective tools:

- Specially commissioned output of the EA Generalised Flood Model increasing river flows by 20%, to provide a GIS based 1% AEP flood outline + climate change effects (HSFRA Climate Change Outline)

- Establishment of the Catchment Flood Hazard Index. This Index indicates the probable level of sensitivity of the overall catchment to future climate change. The derivation of the Index itself could be modified in future if more reliable and deterministic data become available.

Both of these assist in applying the managed adaptive approach as recommended by DEFRA.

Integrated Drainage and Surface Water Management

The Government's view is that the key to the consistent and successful implementation of SUDS for all development sites is inclusion of a sustainable drainage policy within regional and local development documents. This should be implemented with the collaboration of the Environment Agency and the sewerage undertaker (Welsh Water). In areas of intense development or locally complex drainage issues, it may be necessary to formulate a Surface Water Management Plan that has multi-agency engagement and support.

In view of the intense housing pressures forthcoming in and around Leominster and Hereford, and the extensive historical flood risk in these areas also, we are of the view that Surface Water Management Plans are urgently required for:

- Hereford (north-west)
- Hereford (south-east)
- Leominster

A working group comprised of representatives from Herefordshire Council, DCWW and EA should be established to from the Terms of Reference, data needs, and outcomes.

Legislative impacts on roles and responsibilities of forthcoming Floods and Water Management Bill should be reviewed jointly by Herefordshire Council and DCWW.

With regard to sustainable drainage systems (SUDS) there is potential for significant overlap of roles, with possibly conflicting outcomes. A Policy Statement may be required, and precise roles and responsibilities clarified in the LDF. A Memorandum of Understanding may be required between DCWW and Herefordshire Council to achieve co-ordinated and consistent policies.

1. THE REGULATORY FRAMEWORK

1.1 Water Cycle Studies

1.1.1 Planning for Water

There is a finite capacity within the environment, and it cannot simply provide more and more water arising either through increased consumption rates or overall demand because of increasing housing requirements. Equally, there is a limit to the amount of waste water that can be safely returned to rivers and the sea without having a detrimental impact on the environment. Extreme rainfall can overwhelm surface water drainage and overtop flood defences.

Climate change is bringing fresh challenges as patterns of rainfall are predicted to change, with more intense rainfall events, and possibly much drier summers. Planning for water has to take into account these natural constraints, and factors such as the timing and location imposed by the development itself.

A Water Cycle Strategy provides a plan and programme of Water Services Infrastructure implementation, taking into account the fundamental requirements of the water environment. It is determined through an assessment of infrastructure capacity for:

- water resources and supply
- sewage disposal and treatment
- surface water drainage and flood risk management

It should also consider the impact of efficiency measures and provide an overall estimate of cost for the identified solution(s) and of the identified infrastructure improvements required. This approach to development is now a requirement of Government Regional Spatial Strategies and Sub-regional Strategies.

1.1.2 Sustainable Development

Standards and legislation to protect water and the environment are changing in a way that requires a partnership approach to deliver infrastructure through strategic ways of working. In particular, Planning Policy Statements 1, 3, 12, 23 and 25 all emphasise the importance of environmental sustainability and delivering water infrastructure to achieve it.

Specifically, Growth Areas and Growth Points such as Herefordshire must undertake Water Cycle Studies and Strategic Flood Risk Assessments as part of their Growth Point status (see 1.2).

1.1.3 Overview of the Water Cycle Process

More development means that more water is abstracted from the environment; therefore more water is treated, stored and consumed. More wastewater flows to sewage treatment works, thence discharges back to the environment with potentially increased pollutant loads. There is also a greater risk of flooding from reduced permeable areas and increased surface water runoff.

Increased water demand increases the need for additional Water Services Infrastructure (WSI). In this context WSI may be defined as:

- licensed systems for abstraction from reservoirs, rivers and aquifers;
- new storage provision (e.g. reservoirs) and long distance transfers of water between catchments
- raw water abstraction and treatment
- major transfer pumping stations and pipelines to local areas of demand
- local water supply distribution infrastructure
- additional infrastructure to control surface water runoff in urban areas
- local drainage and storage infrastructure
- wastewater network and treatment
- the receiving watercourses

This use of water is part of a continuous cycle; consequently the needs of the water environment (its environmental capacity) and the provision of each of the elements of WSI (as defined previously) should be considered together.

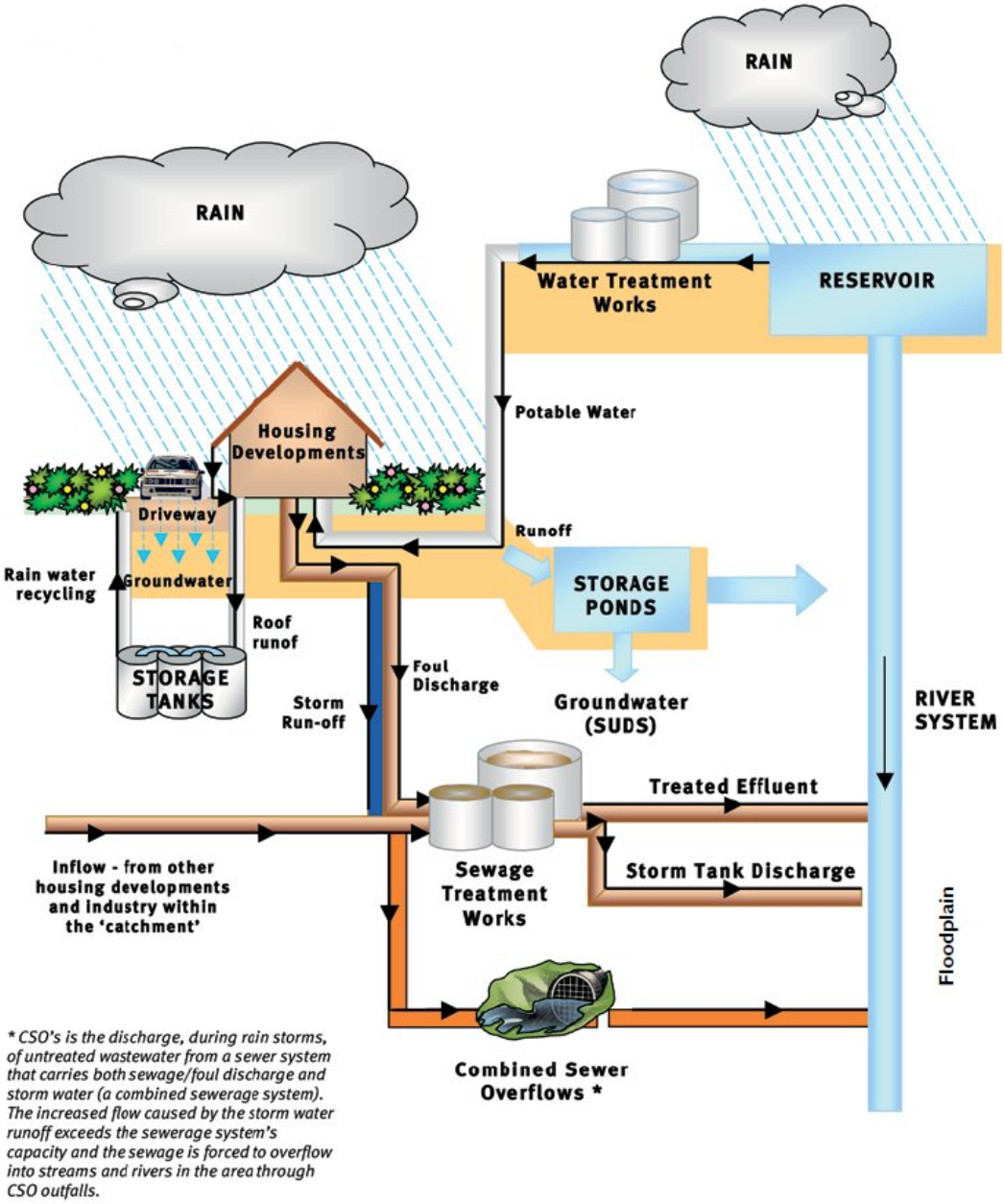
This process is commonly referred to as the 'Urban Water Cycle' (see **Figure 1-1**). Within the Water Cycle there are opportunities to consider reduced consumption, recycling and re-use of water. These can be implemented through a Water Cycle Strategy, which is recognised as best practice and allows the principles of sustainable development to be fully exploited.

A Water Cycle Strategy should consider all the WSI elements - how they interact, the impact of the scale and rate of development and how water should be properly managed. It should ensure that new developments do not compromise existing ones and that water quality and the environment are protected and enhanced.

It is important also to recognise the demands and pressures that water used by agriculture places on the water cycle. Agriculture commonly abstracts very large quantities of surface and or groundwater, and unlike potable water, is usually regarded as fully consumptive i.e. most of what it abstracts is not returned to the waterbody. This represents a direct loss of available water out of the water cycle.

Excessive use of inorganic fertilisers (nitrogen and phosphorus rich) creates high levels of diffuse pollution into waterbodies. Hence, a consideration of agricultural water efficiency is a key part of any Water Cycle Strategy.

Figure 1-1 – Overview of Urban Water Cycle Processes



Source: Water Services Infrastructure Guide – WSIG, Milton Keynes & East Midlands

1.1.4 Key Deliverables of a Water Cycle Study

Development planners need to liaise with the Environment Agency and appropriate water and wastewater providers at the earliest opportunity so that all parties understand and take account of each other's processes, practices and issues in order to promote the efficient and sustainable delivery of infrastructure.

Water Cycle Studies should inform Local Development Frameworks (LDFs) and the Core Strategy by highlighting major issues, including, where possible, immediate funding and longer-term maintenance costs. Further, they should:

- Confirm the scale and timing of infrastructure needed at an early stage of planning
- Propose a strategic and tactical solution to infrastructure provision that will reduce disturbance to existing communities
- Inform developers of the required water services infrastructure and likely programme of works
- Provide supporting information for water companies to justify investment plans with OFWAT.
- Ensure that higher environmental standards required by the Water Framework Directive are met
- Provide general guidance on measures that developers should provide to reduce their impact on the water cycle and where possible make improvements.

This Outline Water Cycle Study document, following published guidance from the Environment Agency [1] covers an initial appraisal of water resource availability, water supply and treatment, through to wastewater capacity and the ecological impacts of increased discharges to the environment, with respect to Herefordshire and its immediate environs.

1.2 West Midlands Growth Point Status

Announced in December 2005, the Growth Points initiative is designed to provide support to local communities who wish to pursue large scale and sustainable growth, including new housing, through a partnership with Government.

Herefordshire was one of 45 locations in the country to be granted New Growth Point status by the Department for Communities and Local Government (DCLG) in 2006. New Growth Points will deliver a substantial number of new homes to help first time buyers onto the property ladder and enable towns and cities to grow their economies by creating new jobs and encouraging business development.

Growth Point status is not a statutory designation but a relationship (defined by explicit conditions and based on detailed factual assessment) between central government and local partners that is built on four principles:

- early delivery of housing as part of the growth plans
- supporting local partners to achieve sustainable growth
- working with local partners to ensure that infrastructure and service provision keep pace with growth
- ensuring effective delivery

The Government is committed to ensuring that housing growth is accompanied by the necessary infrastructure needed to deliver sustainable development at

the local level. Delivering the necessary infrastructure is critical to delivering housing, not only for future residents, but to address the concerns of existing communities.

Herefordshire Council currently aims to build approximately 8,500 homes by 2016. New transport infrastructure will be provided in association with the new housing development and the Edgar Street Grid area of Hereford will be regenerated. Housing proposals have also been put forward for the county's market towns, enabling them to meet their needs and aid rural regeneration.

The Regional Spatial Strategy 'Spatial Options, January 2008) requires Herefordshire Council to provide in the order of 16,600 dwellings between 2006 – 2026 (Option 1). Of these, some 8,300 will be in and around Hereford. It should be understood that the process of public examination and approval by the Secretary of State could still result in the figure being amended (either up or down). Options 2 and 3 identified an increase in growth rates requiring 20,500 houses to be developed within the County up until 2026.

Central issues that must be considered by Herefordshire Council in its housing projections include the potential impacts on water resources, water demand and supply, wastewater treatment, and flood risk.

Flood risk strategy has been covered in an associated document, the Strategic Flood Risk Assessment (SFRA) for Herefordshire, published in April 2008 [2].

1.3 Local Development Framework

Herefordshire Council is in the process of developing its new Local Development Framework (LDF), derived from the Herefordshire Unitary Development Plan (UDP). Adoption of the Local Development Framework is expected in the autumn of 2008. LDF policies and proposals have been developed to be consistent with those of the West Midlands Regional Spatial Strategy, RSS11. Throughout, there is a strong emphasis on the delivery of sustainable development.

Water management issues within the County have been identified by the Council as a significant issue potentially affecting future housing development and employment opportunity. It is a requirement of Growth Point status that Local Planning Authorities (LPAs) should undertake Water Cycle Studies to inform sound planning policies at all levels of planning, including Regional Spatial Strategies and Local Development Documents.

This document is part of the essential 'evidence base' that will be used to generate policy and strategy for Local Development Frameworks (LDFs) and Local Development Documents (LDDs).

The LDF defines where and how development occurs and therefore largely where and how much water is required and needs to be disposed of. It is therefore imperative that a discussion of issues takes place between all key

stakeholders throughout the LDF's preparation and agreement as to the location, scale and type of growth.

The LDF should be subject to an iterative Sustainability Appraisal incorporating a Strategic Environmental Assessment (SEA) which should address impacts on the water environment, water resources and water quality.

1.4 Future Water – The Government Water Strategy

In 2008 the Government launched its water strategy for England, setting out its vision for the water sector by 2030 [3]. It is a vision of a sector that values and protects its water resources; that delivers water to customers through fair, affordable and cost-reflective charges; where flood risk is addressed with markedly greater understanding and use of good surface water management and where the water industry has cut its greenhouse gas emissions.

The vision shows a sector that is resilient to climate change, with its likelihood of more frequent droughts as well as floods, and to population growth, with forward planning fully in tune with these adaptation challenges.

In short, **the vision is for sustainable delivery of secure water supplies and an improved and protected water environment**.

Recurring themes of the strategy are the need for us all to value water and not inadvertently waste it. Wasting water means wasting a resource on which we are dependent and which is limited in its seasonal and regional availability. It also means wasting the energy required to supply, treat and distribute the water to where it is used, and to remove and treat wastewater.

Central to the long term forward planning for water supply are the statutory 25-year water resources management plans (WRMPs) that water companies are required to produce and which help inform the 5-yearly reviews of water price limits carried out by OFWAT, the economic regulator for the water industry. In these plans, water companies must examine their supply options strategically and innovatively and take into account the best available information about changes in climate, population and water demand. Herefordshire is served by Welsh Water, and it's draft WRMP was published in March 2008 [4].

It is essential to secure a sustainable water supply and demand balance. Long-term, water demand cannot exceed water supply, without creating water supply shortages or damaging the environment. This means limiting and even reducing our water consumption, while not ruling out new supply infrastructure. It means reducing the environmental impacts of abstracting, distributing and treating the water we drink, and the impacts of collecting and treating our wastewater before returning it to the natural environment.

Planning authorities will need to work particularly closely with the water companies and the Environment Agency on the timing and numbers of new households in those areas likely to see the greatest growth [1]. Where significant

numbers of new houses are expected, such as in Herefordshire, the infrastructure needed to support these new homes, including water supply, water disposal and flood protection measures must be very carefully assessed within the context of the Government's housing and water strategies.

1.5 Water Resources Strategy for Wales

The Water Resources Strategy for Wales was published by the Environment Agency in June 2009 [5]. This is relevant to this study as water resources for Herefordshire are principally derived from Wales. With regard to water resources management in Wales, the Environment Agency has the specific following objectives:

- The twin track approach of resource development with demand management is adopted in all sectors of water use
- The average amount of water used per person in the home is reduced
- The Environment Agency targets and adapts its approach to reflect the location and timing of pressures on water resources
- Leakage from mains and supply pipes is reduced
- New and existing homes and buildings are more water efficient
- Water resources are allocated efficiently and are shared within regions where there are areas of surplus

With regard to water use and water efficiency, the Agency has stated the following objectives:

- Water pricing for the abstraction and use of water acts as an incentive for the sustainable use of water resources
- Abstractors and users make informed choices to use water more efficiently
- Innovative tariffs are adopted by water companies to maximise savings and minimise issues of affordability
- The needs of wildlife, fisheries, navigation and recreation, as well as the environment and abstractors, are fully taken into account when allocating water resources.
- Innovative technology is developed to improve water efficiency by all water users

1.6 The Water Framework Directive

1.6.1 Process and Objectives

Directive 2000/60/EC [6] of the European Parliament establishes a framework for community action in the field of water policy (known as The Water Framework

Directive or WFD). The approach emphasises the strong need for integrated approaches to the protection, improvement and sustainable use of water resources.

The Water Framework Directive applies to all surface freshwater bodies (including lakes, streams and rivers), groundwater, groundwater dependant ecosystems, estuaries and coastal waters extending one mile from low-water. It came into force in December 2000, and transposed into UK law in December 2003.

Its overall objective is consistent, sustainable water management across Europe in order to:

- Reduce pollution, prevent deterioration and improve the condition of aquatic ecosystems including wetlands
- Promote sustainable use of water
- Help reduce the effects of floods and droughts

The primary mechanism for implementing the WFD is by means of River Basin Management Plans (RBMPs). There are 11 major river basin 'districts' defined within England and Wales, and as the 'competent authority' for implementation of the WFD objectives in England and Wales, the Environment Agency is responsible for submitting proposals to the Secretary of State for:

- Environmental objectives for each body of water within a River Basin
- The Programme of Measures defined to deliver these objectives
- A River Basin Management Plan for each River Basin District

The WFD introduces six-year cycles of planning, intended to be consultative with major regional stakeholders, and iterative in its process.

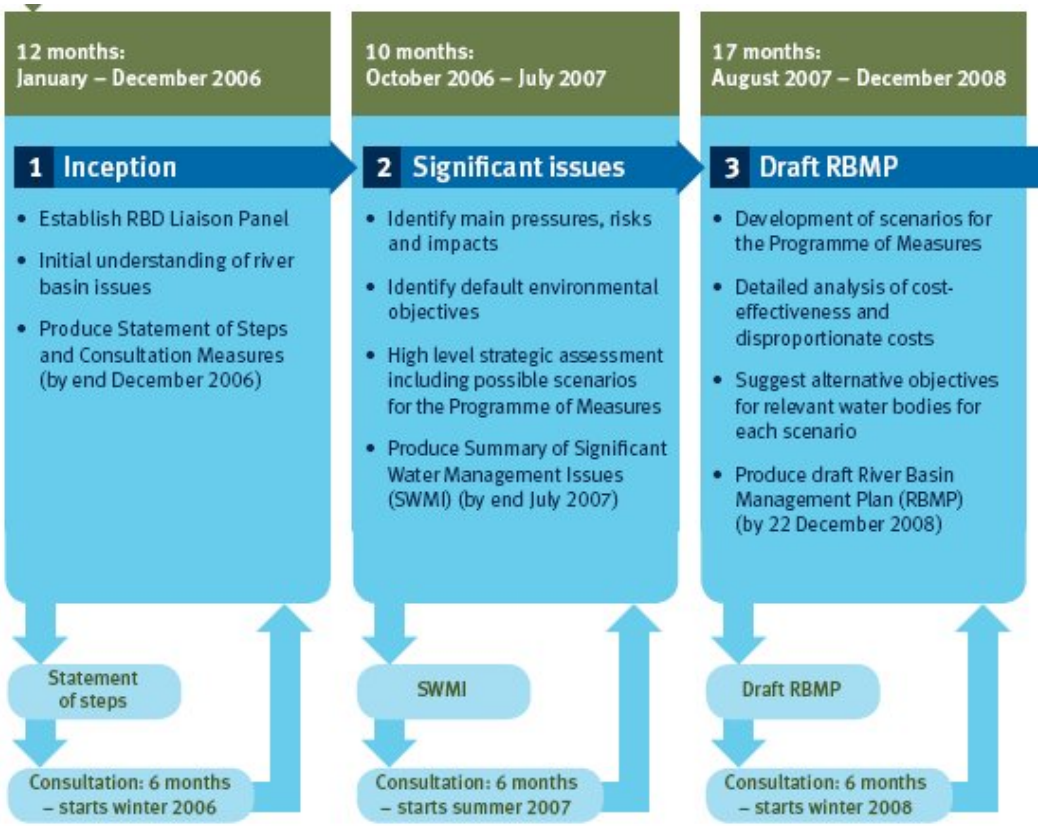
The importance of the WFD to the role of Herefordshire Council is that River Basin environmental objectives are the predominant driving force of the Environment Agency with regard to sustainable water management in the River Wye and River Teme. Herefordshire forms a significant proportion of the River Wye catchment area, which is itself a significant part of the Severn Trent River Basin District, and a smaller proportion of the River Teme catchment.

Hence, through the well defined consultation process, Herefordshire has the opportunity to influence the content and implementation of the River Basin Management Plan through its own local policies and plans, most notably the Water Cycle Strategy, the Strategic Flood Risk Assessment, and its Local Development Framework generally.

1.6.2 The Severn Trent River Basin Management Plan

In common with all RBDs, the River Basin Management Plan process is regulated by a strict time-table of consultations. A RBD Liaison Panel representing major regional stakeholders was formed in 2006 to overview the consultation process. Figure 1-2 summarises the milestone stages to 2008.

Figure 1-2 – Overview timescales of RBMP Process to December 2008

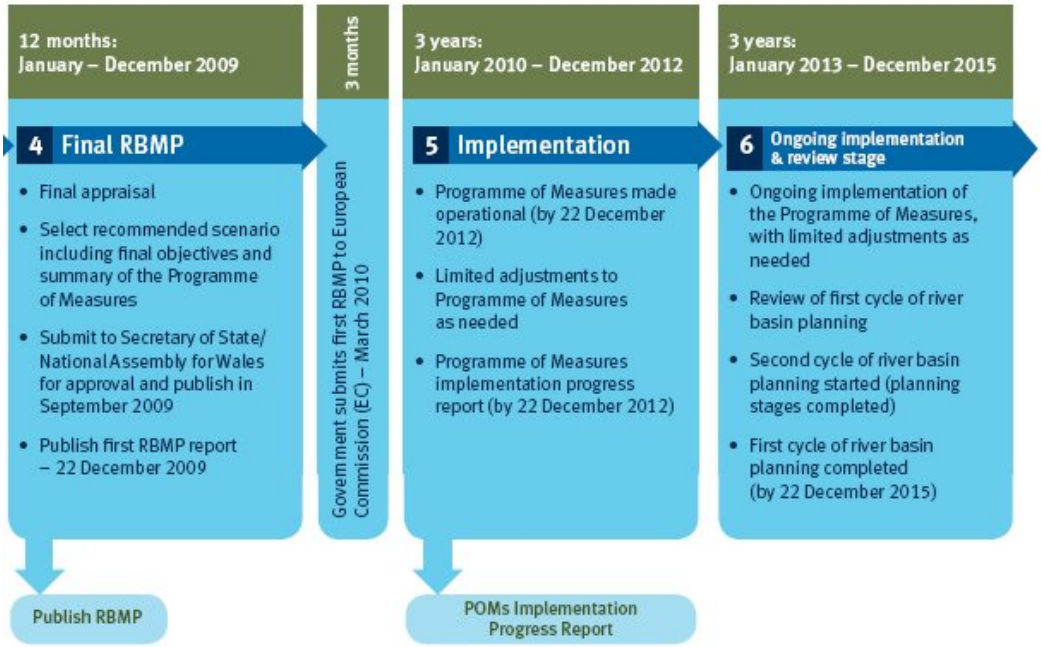


Source: A Framework for River Basin Planning – A Summary (Environment Agency February 2006)

The Draft RBMP was published in December 2008, issued as a consultation document, the consultation period terminating on 22 June 2009 [7]. From January – August 2009 a final appraisal stage will lead to an approval by the Secretary of State in September 2009 and implementation of the plan for a six year period between 22 December 2009 – 22 December 2015.

Figure 1-3 summarises the milestone stages to 2015.

Figure 1-3 - Overview timescales of RBMP Process to December 2015



Source: A Framework for River Basin Planning – A Summary (Environment Agency, February 2006)

1.7 Habitats Directive (SACs)

1.7.1 Introduction

SACs are areas which have been given special protection under the European Union's Habitats Directive. **Council Directive 92/43/EEC** on the Conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) established a framework for Community action to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species at a **favourable conservation status,** introducing robust protection for those habitats and species of European importance.

Conservation status will be taken as "favourable" when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis

European law provides a very high level of protection to two types of designated sites due to their special environment. These are:

- Special Areas of Conservation (SACs), which contribute to biodiversity within which habitats and species are maintained and restored
- Special Protection Areas (SPAs), which provides protection to birds, and their nests, eggs and habitats

In the UK the Directive has been transposed into national laws by means of the Conservation (Natural Habitats, & c.) Regulations 1994 ('the Habitats Regulations'). The 189 habitats listed in Annex I of the Directive and the 788 species listed in Annex II, are to be protected by means of a network of sites.

Each Member State is required to prepare and propose a national list of sites for evaluation in order to form a European network of Sites of Community Importance (SCIs). Once adopted, these are designated by Member States as Special Areas of Conservation (SACs), and along with Special Protection Areas (SPAs) classified under the EC Birds Directive, form a network of protected areas known as **Natura 2000**.

The Habitats Directive introduced for the first time for protected areas, the precautionary principle; that is that projects can only be permitted having ascertained **no adverse effect on the integrity of the site**. Projects may still be permitted if there are no alternatives, and there are imperative reasons of overriding public interest (Article 6).

The current UK status and distribution of EC Habitats Directive interest features are readily available through the Joint Nature Conservation Committee (JNCC) website.

1.7.2 Review of Consents

In order to meet obligations to avoid deterioration to Natura 2000 sites, competent authorities (including the Environment Agency and Local Planning Authorities) are required to review those consents, permissions or authorisations which may affect the integrity of these sites.

As a competent and relevant authority, the Environment Agency has a statutory duty, under the Habitats Regulations, to ensure that the integrity of the Wye riverine SAC ecosystem is maintained or restored through sustainable water resources management and appropriate water quality measures. As a result, the Environment Agency has to assess the effects of existing abstraction licences (Habitats Directive RoC process) and any new applications to make sure that they do not impact on internationally important nature conservation sites (Regulation 48).

The aim of this process is to ascertain that existing permissions are having “no adverse effect” on the integrity of the designated species and habitats, either alone or in combination with other permissions. Where a conclusion of “no adverse effect” cannot be drawn, changes to licensed permissions must be

made at the final stage of the process in order to enable a conclusion of "no adverse effect" on the integrity of the SAC to be made.

This Review of Consents process directly impinges upon the abstraction licences and discharge consents held by Dŵr Cymru-Welsh Water (DCWW), and consequently is a significant issue with regard to future public water supply to future housing, as well as the impact of such housing on the operation of Sewage Treatment Works (STWs).

The Environment Agency has throughout 2008-2009 undertaken a systematic review of all Water Abstraction Licences and Discharge Consents throughout the UK to determine if existing licences should be affirmed, modified or revoked to protect designated conservation sites.

This is a four-stage process requiring that all relevant permissions likely to have a significant effect on a European site are identified and action plans proposed by March 2010:

Stage 1 – Identification of Sites
• excluded if no linkage between a licence and a conservation site established

Stage 2 - Screening
• significance of the hydrological effect of the licensed abstraction or discharge
• likelihood of ecological effects on the protected habitats and species, subject to the Precautionary Principle

Stage 3 - Appropriate Assessment
• more detailed review of effects using best available information
• proof needed that licence will not affect the integrity of the site

Stage 4 - Options Appraisal and Implementation
• review 'site model', options and the case for sustainability reduction

For some regions, including the River Wye, this RoC process is at Stage 4, although the precise extent and impact of licence modifications has still to be finalised. More specific information is provided under Section 2 [8].

1.7.3 Restoring Sustainable Abstraction Programme

The Restoring Sustainable Abstraction (RSA) Programme was set up by the Environment Agency in 1999 to identify and catalogue those ecological sites which may be at risk from over-abstraction. The RSA programme is a way of prioritising and progressively examining and resolving these concerns. As part of this programme, the Agency has been investigating sites that are affected by the EC Habitats Directive, Sites of Specific Scientific Interest in addition to local sites.

Hence, "sustainability reductions' as they are commonly referred to may be derived specifically from the Habitats Directive RoC process, but are also part of the wider RSA programme.

1.8 Catchment Abstraction Management Strategy (CAMS)

The development of Catchment Abstraction Management Strategies (CAMS) by the Environment Agency was a result of the Government publication **Taking Water Responsibly**. The principal aim of CAMS is to provide a systematic framework for resource availability assessment and produce a licensing strategy which aids the sustainable management of water resources on a catchment scale. The Water Framework Directive imposes duties on regulators and operators to have regard for efficient and sustainable water use, and CAMS thus contribute to wider WFD objectives.

1.8.1 Licence Determination and CAMS

Any operator or individual wanting to abstract more than 20 m³/day from a 'source of supply' (river, stream, lake or borehole) must have an abstraction licence from the Environment Agency. In the licence determination, the Environment Agency principally assesses:

- whether the quantities applied for and the purpose of the abstraction are reasonable
- that there is sufficient water available from the resource to support it
- that the potential impacts on the environment and other water users are acceptable

The final River Wye CAMS document was published after consultation in March 2008 [9]. It sets out how the Environment Agency will manage water abstraction until 2014. It outlines where water is available, and also, if relevant, where it is necessary to reduce current rates of abstraction.

Welsh Water, as the predominant supplier of potable drinking water to Herefordshire is subject to the same regulation and constraints identified by the CAMS process as any other operator. Hence the CAMS strategy is central to an understanding of how public water supply to increased housing demands might be affected in future. Relevant issues are examined in more detail in **4.3** below.

1.8.2 RAM Framework and River Flow Objectives

The Resource Assessment and Management Framework (the RAM Framework) has been developed by the Environment Agency to provide a consistent technical approach to water resource assessment and management within the Catchment Abstraction Management Strategy (CAMS) process.

Whilst this approach is technically complex (see Wye CAMS, Chapter 2), its outputs are highly relevant to the licensing strategy because the RAM framework guides and informs the processes of abstraction licensing, resource recovery, strategic catchment water resource planning, and the management of other factors influencing water resource availability.

Fundamentally, **resource availability** is expressed as a statement of the surplus or deficit of resources compared with pre-defined flow or groundwater level protection objectives, derived according to ecological sensitivity to abstraction and other flow needs.

River Flow Objectives (RFOs) are established to reflect sensitivity to flow of different hydro-ecological habitats needs in order to protect both low flows and flow variability. In setting RFOs and establishing Hands-Off Flows (HOFs) for surface water licensing, the acceptability of low flow impacts due to groundwater abstraction must also be explicitly considered.

In setting ecological River Flow Objectives (eRFOs), the aim is to define how much water should be reserved for the environment in order to protect the ecology of the river reach. Identified CAMS Rivers are then assessed in terms of their ecological sensitivity to abstraction impacts through an Environmental Weighting (EW) system. The Environmental Weighting (EW) system uses information on four 'ecological' indicators:

- Fish
- macro-invertebrates
- macrophytes
- physical characteristics of the river reach

It is based principally on the sensitivity of the ecological indicators to changes in river flow. Flow is considered as a simple proxy for a number of related parameters which may have a key influence on habitat (e.g. water depth, flow velocity, wetted perimeter etc.).

Each of these four components is scored on a scale of 1 to 5 for all of the highlighted CAMS rivers. A score of 5 indicates the greatest ecological sensitivity to abstraction impacts and a score of 1 indicates least sensitivity to abstraction.

The individual scores are then combined on maps based on a single, integrated delineation of river reaches. The five EW bands of ecological sensitivity to abstraction related flow reduction are:

- VH (Very High) Abstraction Sensitivity: EW score = 5 (in-stream ecology most sensitive to artificial reductions in river flow)
- H (High) Abstraction Sensitivity: EW score = 4
- M (Moderate) Abstraction Sensitivity: EW score = 3
- L (Low) Abstraction Sensitivity: EW score = 2
- VL (Very Low) Abstraction Sensitivity: EW score = 1 (in-stream ecology least sensitive to artificial reductions in river flow).

Finally, the EW Band is used to set the ecological River Flow Objectives (eRFO) by referencing an RFO Table that defines the volume of water available for licensing whilst ensuring that sufficient water is retained to support the ecology of the river reach.

These river flow objectives are then compared with a **licensed scenario flow** which assumes that all licences are being fully utilised i.e. the fully licensed quantity is being abstracted and returned to the river (for non-consumptive abstractions). This comparison reveals a surplus, balance or a deficit. The size of the surplus/deficit corresponds to resource availability status for the unit.

The surface water resource availability classification (see **Figure 1-4**) gives an indication of whether new licences will be available from the river or whether some recovery of resources is required. A classification of 'over-licensed' or 'over-abstracted' generally indicates that no new licences will be granted.

However, this applies only at times of low flow. In a natural river there are significant variations in flow throughout the year. During periods when flows are higher, there may be some water available for abstraction. The classification is therefore a classification of resource availability at low flow

1.8.3 Resource Availability Status

The licensing of abstractions depends fundamentally on what water resources are available within a catchment and where abstraction for consumptive purposes can be allowed without detriment to either downstream users or the riverine environment. The process by which this is assessed is technically complex, but is summarised in the River Wye CAMS report.

To provide this information the Environment Agency uses a nationally standard classification system. This gives a "**resource availability status**" and indicates:

- the relative balance between the environmental requirements for water and how much is licensed for abstraction
- whether water is available for further abstraction
- areas where abstraction needs to be reduced.

There are four categories of resource availability status, as shown in Figure 1-4.

Figure 1-4 – Environment Agency Standard Resource Availability Classification

Indicative resource availability status	Licence availability
Water available	Water is likely to be available at all flows including low flows. Restrictions may apply.
No water available	No water is available for further licensing at low flows. Water may be available at higher flows with appropriate restrictions.
Over licensed	Current actual abstraction is such that no water is available at low flows. If existing licences were used to their full allocation they could cause unacceptable environmental damage at low flows. Water may be available at high flows, with appropriate restrictions.
Over abstracted	Existing abstraction is unsustainable and could be causing environmental damage at low flows. Water may still be available at high flows, with appropriate restrictions.

It is important to understand that the resource availability status is relative to the baseline condition of the ecological River Flow Objective (RFO). In simple terms, the river flow objective (Ml/d) is an ecological threshold determined by the minimum river flow needed to sustain aquatic ecology (habitats and/or species).

Very often the absolute RFO minimum is the flow that is equalled or exceeded 95% of the time, but there is a corresponding RFO value for each and every part of the flow duration curve. Hence at the flow equalled or exceeded 50% of the time, there will also be a corresponding RFO level (Ml/day).

For example, if the total quantity of water permitted to all licensed abstractions within a particular Water Resource Management Unit (WRMU) was abstracted during any flow condition that would reduce the river flow below the RFO level, then the WRMU is said to be 'over-licensed'. However, at higher flows (e.g. winter and spring) there may still be the opportunity to abstract water providing the total of all abstractions at that particular flow would not cross the RFO threshold.

1.8.4 Hands off Flows (HoF)

Abstraction licences are sometimes managed in order to ensure that flow variability is maintained by the use of 'Hands off Flow' (HoF) conditions. These are conditions on licences that require abstraction to stop (or reduce) when the flow in the river falls below a specified level.

Therefore, when river flows are above the hands-off flow, abstraction can take place but when flows are below this level, no abstraction (or reduced abstraction only) can occur. Low flows will occur more frequently during the summer months.

In order to maximise abstraction while maintaining the variability of flow (required for many aquatic species) a tiered system of hands-off flows is applied. Licences are generally granted with the lowest HoF possible on a first-come-first-served basis. As more licences are granted, the HoF must be increased to maintain sustainable flows in the river.

Water availability specific to Herefordshire is examined in more detail in 2.4

1.9 Urban Waste Water Treatment Directive

1.9.1 Introduction

Directive 91/271/EEC [10] of the European Parliament establishes a framework for community action to protect the environment from the adverse effects of sewage discharges, transposed into The Urban Waste Water Treatment (England and Wales) Regulations 1994. It sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges, as amended by Directive 98/15/EC.

In general terms, the UWWTD requires Member States to construct sewerage networks and sewage treatment works for urban areas of greater than 2000 population equivalent (p.e.), where the unit "p.e." or 'Population Equivalent' (a key measure for the comparison of different kinds of wastewater) is defined as:

- 1 population equivalent (BOD_5 p.e.) is the organic biodegradable load having a 5-day biochemical oxygen demand (BOD_5) of 60g O2/day. The minimum level of treatment is usually to the Secondary level (biological treatment).

The Directive lays down uniform emission standards, or percentage reductions in pollutant concentrations, for discharges from Sewage Treatment Works (STWs) to receiving waters, which are either:

- Normal (no special constraints)
- Sensitive (subject to eutrophication pressures OR used for drinking water abstraction)

The key parameters defined in the Urban Waste Water Directive are BOD_5, Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS). For urban agglomerations of less then 2000 p.e., the level of treatment should be 'appropriate' to maintain as far as possible the **ecological status** of the waterbody. Table 1-5 summarises the effluent standards.

1.9.2 Sensitive Areas and Levels of Treatment

Water bodies can be identified as **Sensitive Areas** on three grounds:

a) Where they are found to be eutrophic or where they may become eutrophic in the near future if protective action is not taken.

b) Where they exceed or could exceed a specified concentration of nitrate - to protect water supply sources and/or the environment.

c) Where discharges affecting them are subject to more than secondary treatment to comply with the standards of other Directives.

Where required, more stringent treatment than secondary (tertiary) treatment is applied to sewage to protect Sensitive Areas.

Primary treatment requires that the BOD_5 load of the wastewater is reduced by at least 20% before discharge to the waterbody. Total Suspended Solids (TSS) should be reduced by at least 50% before discharge to the waterbody.

Secondary treatment requires that various more stringent levels of treatment are applied. The additional treatment involves reducing levels of nitrogen and/or phosphorus in discharges.

Tertiary treatment is not explicitly defined in its method, but it generally assumes specialist processes to remove phosphates and/or nitrates, and the

treatment level must achieve the Emission Limit Values set out in Figure 1-6. Tertiary treatment is typically required where Bathing Water and Shellfish Water sensitive areas have been identified.

Eutrophication means the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned.

Minimum standards of treatment according to the three most basic determinands for urban agglomerations in excess of 2000 p.e. are summarised in Figure 1-5.

Figure 1-5 - Standards for Wastewater Secondary Treatment (Normal Waterbodies)

Criteria	Units	BOD_5 mg/l	COD mg/l	TSS mg/l
Agglomeration > 2000 p.e.	mg/litre	**25**	**125**	**35**
Agglomeration > 2000 p.e.	*% reduced*	*70-90*	*75*	*90*
Agglomeration > 2000 p.e. + > 1500 mASL	mg/litre	**25**	**125**	**60**
Agglomeration > 2000 p.e. + > 1500 mASL	*% reduced*	*40*	*75*	*70*
Agglomeration > 10,000 p.e.	mg/litre	**25**	**125**	**35**
Agglomeration > 10,000 p.e.	*% reduced*	*70-90*	*75*	*90*
Agglomeration > 10,000 p.e. + > 1500 mASL	mg/litre	**25**	**125**	**35**
Agglomeration > 10,000 p.e. + > 1500 mASL	*% reduced*	*40*	*75*	*90*

Figure 1-6 - Standards for Wastewater Tertiary Treatment (Sensitive Waterbodies)

Criteria As for Table 8-1 PLUS	Units	Total P mg/l	Total N mg/l
Agglomeration > 10,000 p.e.	mg/litre	**2**	**15**
Agglomeration > 10,000 p.e.	*% reduced*	*80*	*70-80*
Agglomeration > 100,000 p.e.	mg/litre	**1**	**10**
Agglomeration > 100,000 p.e.	*% reduced*	*80*	*70-80*

(% reduced means in relation to the inflow concentration BEFORE treatment).
(Total N includes ammoniacal nitrogen, nitrite-nitrogen and nitrate-nitrogen).

Under the Directive the UK is required to review environmental waters at four-yearly intervals to determine whether they are sensitive to the effects of sewage discharges. This information is available via the DEFRA website in the form of published Maps and Tables.

They set out the statutory requirements for identifying such water bodies, indicate why each of the water bodies are identified as Sensitive Areas, UK obligations under the legislation, and what this means, in terms of improvement of treatment at sewage works to protect these areas from the adverse effects of sewage discharges.

Sensitive Waters specific to Herefordshire are examined in more detail in **2.5**.

1.10 The Water Act 2003

In June 1998 the Government issued a consultation paper **The Review of the Water Abstraction Licensing System in England and Wales**, proposing a number of administrative and legislative changes to the water abstraction licensing system.

The legislative changes, recommended by Taking Water Responsibly were included in the Water Act 2003. The Act strengthens the Environment Agency's powers for the sustainable management of water resources. Key changes included:

- Time limits for all new abstraction licences
- Facility to revoke abstraction licences causing serious environmental damage without compensation
- Greater flexibility to raise or lower licensing thresholds
- Small and environmentally insignificant abstractions deregulated
- Licensing extended to abstractors of significant quantities presently outside the licensing system (e.g. trickle irrigation)
- Water company drought plans and water resource management plans (previously produced voluntarily) to become a statutory requirement.

It was also decided that there should be a separate consultation concerning the application of economic instruments as a measure of abstraction control. The consultation paper **Economic Instruments in Relation to Water Abstraction** was issued in April 2000. The analysis of the responses to the consultation was published in **Tuning Water Taking**. The consultation addressed two main areas, water abstraction charges and abstraction licence trading.

Water Rights Trading is the transfer of licensable water rights from one party to another, for benefit. Under current legislation some water rights trading is possible, and the Water Act 2003 contains provisions that will remove barriers to trading. The Environment Agency has recently consulted on its suggested approach to trading and will implement revised guidance in conjunction with the implementation of the relevant provisions of the Water Act 2003 [11].

1.11 Draft Flood and Water Management Bill 2009

1.11.1 Government Future Vision for Surface Water

The Government's future vision for surface water [3] is to develop:

- More adaptable drainage systems delivering reduced flood risk, improved water quality, and decreasing burdens on the sewer system
- Better management of surface water drainage, allowing for the increased capture and reuse of water; slow absorption through the ground and more above-ground storage and routing of surface water separate from the foul sewer system
- Better public appreciation of the causes and consequences of surface water run-off and the actions we can all take to minimise the risks

"*Those who increase the amount of impervious surface area, and therefore the speed and volume of run-off, do not face the full consequences of their actions. This does not always encourage responsible management of surface water. The system of charging for surface water drainage should be more transparent and reward organisations that place a smaller load on the surface water drainage system. We will consider whether funding for surface water drainage should be changed to better reflect the polluter pays principle.*" [3]

There should be a clear presumption within the Local Development Framework (LDF) in favour of sites that are able to deliver significant local reductions in runoff. Good surface water management will involve increased use of SUDS and surface water flow routes, through the design and planning of the whole urban fabric, as the capacity of the landscape to store and convey water is much greater than the below-ground system.

1.11.2 Sustainable Drainage and Surface Water Management Plans

The draft Flood and Water Management Bill (consultation until 24 July 2009) will:

- deliver improved security, service and sustainability for people and their communities
- make clear who is responsible for managing all sources of flood risk
- protect essential water supplies by enabling water companies to control more non-essential uses of water during droughts
- modernise the law for managing the safety of reservoirs
- encourage more sustainable forms of drainage in new developments
- make it easier to resolve misconnections to sewers

1.11.3 Managing Flood Risk

The floods in summer 2007 proved that there were significant gaps in the powers held by various bodies in trying to reduce the risk of flooding. This Bill therefore puts in place those changes recommended by the Pitt Review [12] in the aftermath of those floods.

For the first time, the law will cover all forms of flooding and shift the emphasis from building defences to actual risk management. The Bill requires unitary and county councils to work with all relevant parties including the water and sewerage companies to put in place local surface water management plans. As part of this, they will agree which risks are the most pressing and the programme of work that will ultimately improve protection of local communities and businesses.

Hence Surface Water Management Plans (SWMPs) are an integral part of the water cycle, and will force water companies and LPAs to work closely in identifying and resolving surface water flooding issues.

1.11.4 The role of Sustainable Drainage Systems (SUDS)

The draft Bill will end the automatic right to connect to sewers for surface water drainage and require developers to put SUDS in place in new developments wherever practicable. Connection will be conditional on meeting new national standards on SUDS and drainage. The industry will be involved in developing these standards.

New SUDS will be adopted and maintained by local authorities. This will mean that people would pay a reduced surface water drainage charge to the water company.

1.12 The Structure and Use of this Outline Water Cycle Study

1.12.1 Scope and Structure

This Outline Water Cycle Study (OWCS) covers the County of Herefordshire. Water Resource Zones, river basins and catchments however do not necessarily follow administrative boundaries, and the Herefordshire OWCS must take account of the hydrological and environmental influences and impacts that lie outside its authority boundary.

The OWCS follows the guidelines of the Environment Agency (2009), using data where this was provided. This phase should not normally require additional detailed modelling or analysis to support the assessment. Its focus should be on gathering and assessing the data available, identifying the environmental and major infrastructure constraints, and deciding where further detailed assessment is needed.

An Outline Water Cycle Study should:

- identify environmental risks and constraints
- identify if environmental resources can cope with further development
- identify if the development would overload the existing infrastructure
- identify if major new systems are needed to allow development
- establish if there is water cycle capacity for new development without needing to build major new infrastructure
- provide the evidence base for the local planning authority's Core Strategy
- provide an outline water cycle strategy agreed by all partners, where appropriate.

The Herefordshire situation is somewhat complex because the hydrological boundaries of the required study area extend across the Welsh border to the west and the Gloucestershire and Worcestershire borders to the east and north. Two Environment Agency Regions (Wales south-east area and Midlands west area) have regulatory powers within the County boundary, essentially defined by the boundary of the Wye and Teme river basins. See **Evidence Map 1-1**.

After this review Section on the fundamental legislative framework, the OWCS study first presents a major all-encompassing summary of the 'environment baseline' for Herefordshire. It is this baseline against which the proposed Growth point housing forecast and impact must be systematically assessed. Environmental constraints or objectives imposed by the Water Framework, the Urban Waste Water and Habitats Directives are systematically presented.

The next section reviews the current baseline population and housing growth projections for Herefordshire, and sets these needs against the overall baseline environmental objectives for the River Wye and River Teme catchments, as set out in the statutory River Basin Management Plan due for implementation in December 2009. Housing projections should be assessed in the context of their environmental impact, as well as identifying capacity constraints.

Following sections deal logically in sequence with each major phase of the human water cycle. Below each principal phase are summarised some typical issues that may receive more detailed investigation where these are directly relevant to housing projections and where data are available

- **Section 2 – Environment Baseline**
  - Ecological status of waterbodies
  - Severn District River Basin Management Plan
  - Habitats Regulations sites of importance
  - Water resources and availability
  - Urban Wastewater Directive Sensitive areas
  - Catchment scale flood risk
  - Climate change

- **Section 3 - Housing Pressures**
  - Core Strategy Developing Options

- Growth Point Population and Housing Estimates and Balances-

- **Section 4 - Water Resources And Water Abstraction**
  - Availability of raw water
  - Proportional use of water
  - Licensing arrangements
  - Abstraction for households
  - Abstraction for agriculture
  - Sustainability reductions due to Habitats Directive
  - Climate change impacts

- **Section 5 - Water Demand and Consumption**
  - Current household consumption
  - Future household consumption
  - Future Water targets
  - Water efficiency initiatives
  - Demand scenario modelling
  - Code for Sustainable Homes
  - Water Efficient Buildings
  - Agricultural water consumption
  - Climate change impacts on agriculture
  - Water Neutrality-

- **Section 6 – Sewerage Infrastructure**
  - Performance of future systems

- **Section 7 – Wastewater Treatment and Pollution control**
  - General discharges in Herefordshire
  - Sewage Treatment Works appraisal
  - Habitats RoC impact on STWs
  - Diffuse pollution pressures

- **Section 8 – Catchment Scale Flood Risk Management**
  - Identifying key flood risk areas
  - Climate change impact

- **Section 9 – Integrated Surface Water Management**
  - DEFRA guidance and Water Bill 2009
  - Surface Water Management Plans
  - SUDS Best Practice and Implementation

1.12.2 The Supportive Text Evidence Base

This OWCS Technical Report is structured into eight key sections. Each section, whilst contributing to the overall objectives, acts as a stand-alone input to support the evidence base of the Core Strategy and provide data for future Local Development Documents.

Each section of the OWCS Technical Report document addresses a key issue with regard to the water cycle. The existing **data** or **evidence base** is presented and reviewed first (often this has had to be compiled from extensive

collection of raw data), and this is followed by a Summary of Main Issues pertinent to the Chapter. A further tabulated 'action list' of particular issues or constraints that require urgent attention finalises each Chapter.

1.12.3 The Geographic Information System Evidence Base

A substantial part of the work effort of the OWCS has been to develop ongoing databases and GIS layers for use by Herefordshire Council planners and its agents. These databases are 'behind the scenes', but form a principal part of the evidence base. The OWCS Technical Report (this document) essentially describes how and why these data layers have been prepared, and summarises the key environmental issues that arise from their interpretation.

Greatest value is obtained from the GIS evidence base by using it primarily on the appropriate platform (in this case the Council's MapInfo™ GIS software). A number of key GIS data layers have been formally developed and submitted to the Council as part of the evidence base. These will be summarised in the relevant sections.

It is anticipated that wherever appropriate, the relevant GIS layers and/or databases can be released to third parties, in particular the Environment Agency, Consultants and Developers to facilitate further detailed technical studies.

For illustrative purposes only, A3 sized versions of relevant 'Evidence Maps' are provided at the end of each section to aid understanding of the written text. Where appropriate, an identical but larger, smaller scale map is provided at A2 size in the Technical Appendices which provide more clarity and detail of the output, available only to authorised personnel.

For third party privacy and security reasons, site specific details such as address, National Grid Reference, postcode or other identification are generally not labelled on these maps, although such data IS contained within the electronic databases or GIS layers for access by authorised personnel.

2. THE ENVIRONMENT BASELINE

This Section reviews the principal environmental objectives and constraints potentially affecting housing disposition and trajectories for the Wye and Teme catchments, as determined by the regulatory framework.

2.1 Environmental Objectives Overview

There are four fundamental legislative drivers that will influence how ongoing housing pressures are managed within the context of the water cycle.

- The EU Water Framework Directive (WFD)
- The EU Habitats Directive (HD)
- The Environment Agency Wye CAMS Assessment
- The EU Urban Wastewater Treatment Directive (UWWTD)

The environmental and ecological objectives of these Directives have a direct and pre-eminent influence on the Environment Agency's licensing strategy, both with regard to water abstraction and to sewage discharges.

Through the mechanism of UK River Basin Management Plans, fundamentally, the WFD seeks to:

- enhance the status and prevent further deterioration of aquatic ecosystems
- promote the sustainable use of water
- reduce pollution of water, especially by 'priority' and 'priority hazardous' substances
- ensure progressive reduction of groundwater pollution

Through the mechanism of the UK Habitats Regulations, fundamentally, the Habitats Directive seeks to:

- support the Natura 2000 network of protected areas
- require measures to be taken to maintain or restore natural habitats and wild species at a favourable conservation status
- ensure that the integrity of riverine SAC ecosystems is maintained or restored through sustainable water resources management
- ensure that permissions (abstraction licences, discharge consents and waste management licences) do not have an adverse effect on the integrity of the designated SAC species.

The principal aim of CAMS is to provide a systematic framework for resource availability assessment and produce a licensing strategy which aids the sustainable management of water resources on a catchment scale. There is increasing pressure from the Environment Agency to impose time-limited

licenses, or licenses with varying conditions in response to abstraction or climate change pressures.

Through the mechanism of the Urban Waste Water Treatment Regulations 1994, the Waste Water Treatment Directive seeks to protect receiving waters with enhanced levels of secondary treatment from STWS, and to further protect sensitive waters that are susceptible to either eutrophication or nitrification.

Future licensing strategies (which will directly influence water delivery and disposal infrastructure, and hence indirectly the availability and phasing of housing) will reflect the long-term environmental and ecological objectives of these Directives.

2.2 Ecological Status of Waterbodies

The WFD introduces a 6 yearly cycle of river basin planning. An RBMP for each river basin district must be produced in 2009, 2015, 2021 etc. Principally the plans must list the environmental objectives for that district, justify how and where alternative objectives have been used, and summarise the programme of measures which will be taken to achieve the objectives.

These objectives are essentially set out within the River Basin Management Plans (RBMPs) published for the 11 River Basin Districts in the UK. These RBMPs will first come into force in December 2009.

The relevance of the Severn River Basin District (SRBD) River Basin Management Plan (RBMP) is that the Environment Agency will set high level objectives for environmental improvements (specifically ecological and/or chemical status for all waterbodies) that are likely to directly affect the water cycle process through amended consents for water abstraction and sewage discharge. The specific objectives as set out in the draft RBMP are explained further in 2.2.4 and 2.2.5

2.2.1 Ecological Status – Surface Water

The Water Framework Directive requires classification of all surface water body types in terms of **ecological status** and **chemical status** as shown in Figure 2-1. Ecological status is made up of:

- biological quality elements (aquatic fauna and flora)
- physico-chemical quality elements (e.g. dissolved oxygen, nutrients, pollutants etc)
- hydro-morphological quality elements (e.g. flow conditions, condition of river bed etc.)

Hydro-morphological quality elements are not required to meet pre-determined standards (except for high status water bodies) but must not prevent other quality elements from achieving their environmental objectives.

Chemical status is either 'good' or 'failing to achieve good'. 'Good' means that none of the substances covered by the Priority Substances Directive exceeds the standard set for it. Standards for priority substances are set out in Part II of the Schedule to the draft Directions at Annex B.

Surface waters have five status classes defined in terms of how much the ecology deviates from natural conditions, see **Table 2-1**. These are High, Good, Moderate, Poor and Bad. High or Reference status means that the water body is unaffected or virtually unaffected by human activity. Good status water body shows some signs of damage, such as slight alterations in the balance of aquatic species (biological quality elements) that would be expected in a water body unaffected by human activity.

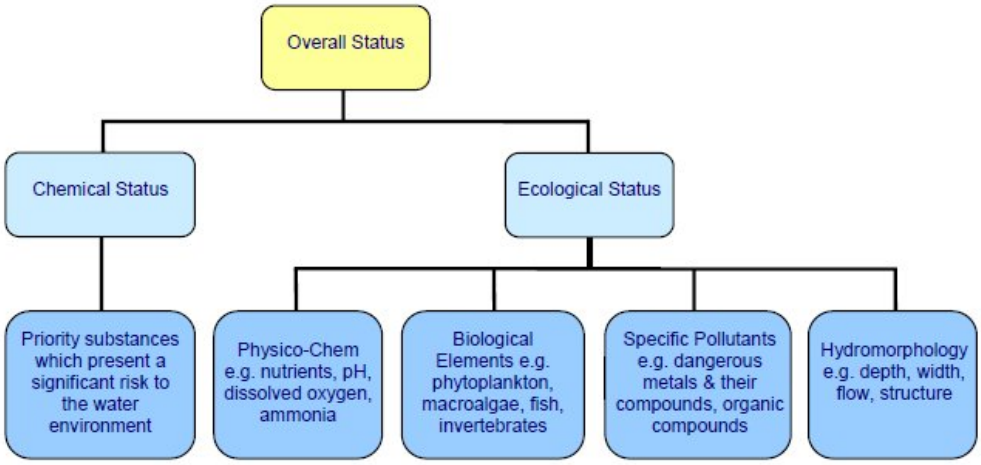
Table 2-1 – General Conditions used to define WFD Classes of Ecological Status

Ecological Status	Definition
High	The values of the biological quality elements reflect those normally associated with undisturbed conditions. There are virtually no anthropogenic alterations to the values of the physico-chemical and hydromorphological conditions compared to undisturbed conditions.
Good	The values of the biological elements show some low level of distortion compared to High status, but deviate only slightly from those of undisturbed conditions
Moderate	There is moderate distortion of the biological elements compared to undisturbed conditions, and these conditions are significantly more disturbed than those for Good Status
Poor	There are major alterations to the biological elements, and the biological communities differ substantially compared to undisturbed conditions
Bad	There are severe alterations to the biological elements, and a significant proportion of the communities normally found under undisturbed conditions are absent

Source: Water Framework Directive, Annex V, Table 1.2

For a water body to achieve good ecological status, the biological quality elements must show only slight signs of disturbance caused by human activity. Among other things, this requires the chemical, physicochemical and hydromorphological quality of the water body to achieve the standards and conditions necessary to support the biological quality elements at good status.

Figure 2-1 – Components of Ecological Status under WFD



Source: Severn District draft RBMP Consultation December 2008

To determine the ecological status of a water body, the Environment Agency will establish through monitoring or modelling the values for the relevant biological and physico-chemical quality elements and compare them with the corresponding values for these quality elements set out in Parts II, III and V of the Schedule to the Direction on Surface Water Typology and Environmental Standards. The quality element most severely affected by human activity determines the overall ecological status. This is referred to as the 'one out – all out principle'.

The colour scheme is standardised, hence under the stipulations of the Common Implementation Strategy (CIS) Guidance Document No. 9 (GIS Elements of the WFD), the above colour scheme should be used when presenting mapped values of waterbody ecological status. This is the convention issued in the RBMPs and also in this waterbody study.

2.2.2 Chemical Status

The chemical status of waterbodies has a specific meaning under the Water Framework Directive. It should not be confused with general physico-chemical conditions which are a different element in the classification of ecological status. An understanding of chemical status introduces a large additional amount of complexity into water pollution definitions, which will only be summarised here.

"Good surface water chemical status" means the chemical status required to meet the environmental objectives for surface water established in Article 4(1)(a), that is the chemical status achieved by a body of water in which concentrations of pollutants do not exceed **environmental quality standards** established in Annex IX and under Article 16(7), and other Community legislation setting environmental quality standards". [WFD Article 2, 24].

Therefore "chemical status' mainly refers to specific hazardous chemicals or pollutants, NOT general physico-chemical indicators. A similar definition applies to groundwater.

2.2.3 Chemical Status - Groundwater

Groundwater bodies are classified in terms of chemical status and quantitative status. There are only two status classes for groundwater status – good and poor. Overall groundwater status is determined by the lower of the groundwater chemical status and quantitative status classifications. Criteria that must be met for a body to be classed as good quantitative status and good chemical status are set out in the WFD and further elaborated in the EU Groundwater Directive.

2.2.4 Specific Pressures Identified within Severn RBD

The water bodies in the Severn River Basin District are subject to a range of pressures, summarised below. For further detailed description of these pressures refer to Annex G 'Pressures and Risks to our Waters' of the Severn RBMP [6].

- Over-abstraction is a significant issue as most of the Severn RBD has no water available for further abstraction licensing at low flows.
- The largest use of water is for public water supply coming from surface water reservoirs, rivers and from groundwater. In terms of volume, the water industry accounts for half of the total water abstracted.
- Diffuse pollution by sediments, pesticides, and the effects of urban and transport pollution have caused widespread problems across the Severn RBD
- Sediments are primarily as a result of soil erosion caused by land based activities, such as, forestry, construction, and particularly agriculture. Pesticides are also a significant diffuse pollution issue. The principal sources of pesticides include sheep dip application, application of pesticides to crops, and anti-fouling paint on boats.
- Point source pollution is also a significant concern, particularly phosphorus (rivers and standing water) and nitrates (surface and groundwater)
- High phosphorus concentrations are the main cause of eutrophication in fresh waters. The key sources of this pressure are agriculture, discharges from sewage treatment works, dosing for drinking water and other domestic effluents.

  (The National SIMCAT models used for the latest rivers phosphorus assessment estimate that 75% of the phosphorus load in the Severn RBD is derived from point sources and 25% is derived mainly from

diffuse sources)

- Nitrate pollution can impact on both surface and groundwater and comes principally from agriculture (61%) and sewage treatment works discharges (32%) (RBD total). Pressures from agricultural nitrate tend to be higher in the eastern part of the basin, owing to the higher density of arable farming compared to western areas.

- Alien species' or 'invasive non-native species' are plants and animals that have been introduced and pose a potential threat to native wildlife.

  (Water bodies that have a significant presence of alien species will not meet 'high ecological status' under the Water Framework Directive).

2.2.5 Specific Objectives of the Severn RBMP

The Wye catchment is rich in wildlife and habitats and this is recognised in the designation of the Wye and several tributaries as a riverine Special Area of Conservation (SAC). The Wye and many of its tributaries are designated as SSSIs. The area offers many opportunities for water based recreation and the Wye and Lugg are unusual in that there is a public right of navigation. The River Wye is a well-established and nationally significant salmon & brown trout rod fishery and also a locally important coarse fish fishery.

Resources of the River Wye are vital in providing water for the Midlands, Gloucestershire and South Wales. Abstractions from the upper Wye predominantly support the Midlands, whilst abstractions from the lower Wye support Herefordshire and South Wales. The economy is moderately dependent on businesses requiring water abstraction, primarily agricultural where trickle and spray irrigation is frequently used.

Proposed actions to tackle the issues in the catchment include:

- providing advice to farmers under both the England Catchment Sensitive Farming Delivery Initiative and the Environment Agency Wales Catchment Initiative
- improvements to sewage treatment work discharges to reduce levels of ammonia and phosphorus
- actions to reduce the exploitation of salmon
- habitat improvements to benefit fish
- actions to control invasive non-native (alien) weeds

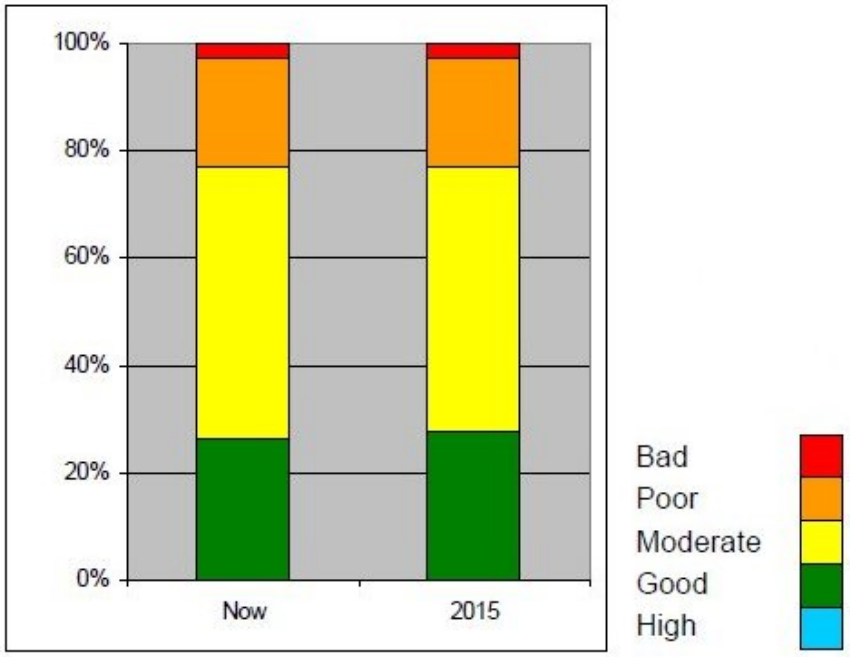
Currently 368 km (26 per cent) of river length assessed in the Wye catchment are achieving good ecological status or potential. The elements most commonly preventing good status in all water bodies by 2015 are fish, phosphorus and diatoms.

149 km (10 per cent) of river has yet to be assessed. Of the eight lake water bodies in the catchment, two are at good ecological status or potential, three are at moderate and one at poor. Two lakes are yet to be assessed.

The Environment Agency is proposing that by 2015 there would be 388 km (28 per cent) of river length at good ecological status or potential. The actions proposed will reduce phosphorus in over 145 km and ammonia in 13 km of rivers and improve dissolved oxygen levels in almost 4.5 km of rivers in the catchment. These objectives are summarised in **Figure 2-2**.

The objectives of reducing phosphorous, ammonia and increasing dissolved oxygen levels are highly relevant issues with regard to water cycle infrastructure within Herefordshire and the associated water treatment and sewage treatment works.

Figure 2-2 – Planned Progress for Ecological Status – Severn RBMP



Source: Severn District draft RBMP Consultation December 2008

2.2.6 Ecological Status of Herefordshire Surface Waterbodies

With draft data provided by the Environment Agency, this study has mapped the current ecological status of every surface waterbody within Herefordshire. Such an overview provides a powerful insight into the general ecological condition of waterbodies within the County. Information is presented as **Evidence Map 2-1 – Waterbody Ecological Status.**

The principal GIS layers for this map include:

- **HWCS EA Ecostatus 2010**

- **HWCS EA Ecostatus 2010 Teme**

These layers contain a significant amount of specific data in relation to ecological components and risks to the waterbody.

Summarising the broad scale issues of **Evidence Map 2-1**, the River Wye is determined as being in Moderate Ecological Status throughout the upper Wye (Wales) and the lower Wye (England) reaches. The River Lugg below Leominster and the River Frome below Bromyard are similarly in Moderate Ecological Status. The River Teme between Leintwardine and Whitbourne is also in Moderate Ecological Status.

Relatively few reaches of waterbodies are determined as in Good Status. Generally these are restricted to small lengths of river in the remote headwaters, such as the River Teme above Knighton, the River Lugg above Presteigne, and the River Arrow above Kington. The upper reaches of the Monnow, Dulas Brook and Escley Brook are notable for all being in Good Ecological Status.

Of direct relevance to water cycle infrastructure pressures (i.e. waterbodies at greatest probable risk of deterioration), those waterbodies that are falling into either Bad or Poor status have been summarised in **Table 2-2** below. Table 2-2 further summarises the specific risks that may compromise the ecological status in future i.e. pressures on the waterbody.

These waterbodies have also been presented in map form as **Evidence Map 2-2 – Waterbodies in Poor or Bad Status**, which illustrates the location of each failing waterbody.

Summarising Table 2-2 and Evidence Map 2-2, there are ten waterbodies within Herefordshire in the Wye catchment at Poor Ecological Status. These generally exhibit Good to High conditions for specific parameters such as Dissolved Oxygen (DO), Phosphate (P) and Ammonia. Generally the final Ecological Status appears to be largely governed by poor biological status of the waterbody.

There are four waterbodies in the Wye catchment that are classed as Bad. Clearly these waterbodies have significant issues to be addressed. These are Norton Brook, Humber Brook, River Frome (above Bromyard), and the Monnow (mid reaches). Again, specific components of the ecological status are largely Good to High, but there appear to be specific problems with the general biological status.

There are four waterbodies that are in Poor Status within the River Teme catchment. Generally the principal failing is on the overall biological status.

The Environment Agency has explained that only a biological element (Invertebrates, Fish, Macrophytes, Diatoms) can drive a waterbody to be of POOR or BAD status. For failing overall Physico-chemical standards, (Annex 8 and Annex 10 chemicals) the lowest classification that can be given is Moderate.

The Environment Agency has emphasised that a Poor or Bad status allocation is not necessarily marginal just because the physico-chemical assessment is Good. For example fish are sensitive to sediment or physical barriers to migration. These classifications are based on actual survey data (not modelled) and come with a statistical indication of confidence.

The Agency has a measure of statistical confidence that a waterbody fails to meet Good Ecological Status (so for example if fish survey data has narrow confidence bands that do not cross into the GOOD status category then it will be very certain not to achieve Good Ecological Status, while if fish survey data has a wide distribution the confidence bands which cross both Moderate and Good class boundaries then the data may be flagged as “uncertain not to achieve Good Ecological Status”.

In essence, where the Agency is certain of a failure it would look to put in place ‘measures’ to improve ecological status, and where it is uncertain it would look to increase certainty typically by collecting more data.

Table 2-2 below summarises the Environment Agency level of confidence attributed to the waterbodies currently classed as being in Poor or Bad ecological status.

Table 2-2 – Waterbodies in Poor Ecological Status

Waterbody Name	Location	Overall Ecological Status	Confidence Level < GES	Overall Biological Status	Overall Physico Chem	Overall Hydro-morphology	DO Status	pH Status	Phosphate Status	Ammonia Status
Garren Brook	Source to confluence with Gamber Brook	Poor	*High*	Poor Phytobenthos	Good	Not High	High	High	Good	High
River Arrow	Source to Kington	Poor	*High*	Poor Fish	High	Not High	High	High	High	High
River Honddu	Source to confluence with Monnow	Poor	*Medium*	Fish Invertebrates	Good	Not High	High	High	Good	High
Hay Dulas Brook	Source to confluence with River Wye	Poor	*Medium*	Poor Fish	High	Not High	High	High	High	High
River Wye	From confluence with Walford Brook to Severn	Poor	*Medium*	Poor Phytobenthos	High	Not High	High	High	High	High
Cheaton Brook	Source to confluence with River Lugg	Poor	*High*	Poor Phytob/Fish	Good	Not High	High	High	Good	High
Lime Brook	Source to confluence with River Lugg	Poor	*Medium*	Poor Fish	Good	Not High	High	High	Good	High
Letton Lake Brook	Source to confluence with River Wye	Poor	*High*	Poor Invertebrates	Moderate	Not High	Poor	High	Moderate	High
River Lugg	From Presteigne to confluence with Arrow	Poor	*High*	Poor Phytobenthos	Good	Not High	High	High	Good	High
River Arrow	Kington to confluence with River Lugg	Poor	*High*	Poor Phytobenthos	Good	Not High	High	High	Good	High
River Redlake	Source to confluence with River Clun	Poor		Poor	Moderate	Not High	High	High	Good	High
River Leadon	Source to confluence with Preston Brook	Poor		Poor	Moderate	Not High	Moderate	High	Moderate	High
Preston Brook	Source to confluence with Kempley Brook	Poor		Poor	Moderate	Not High	Bad	High	Poor	Good
Glynch Brook	Source to confluence with River Leadon	Poor		Poor	Moderate	Not High	Good	High	Poor	High

Table 2-3 - Waterbodies in Bad Ecological Status

Waterbody Name	Location	Overall Ecological Status	Confidence Level < GES	Overall Biological Status	Overall Physico Chem	Overall Hydro-morphology	DO Status	pH Status	Phosphate Status	Ammonia Status
Norton Brook	Source to confluence with River Lugg	Bad	*Medium*	Bad Fish	Good	Not High	High	High	Good	High
Humber Brook	Source to confluence with Holly Brook	Bad	*Medium*	Bad Fish	Good	Not High	High	High	Good	High
River Frome	Source to Bromyard	Bad	*Medium*	Bad Fish	Good	Not High	High	High	Good	High
River Monnow	From confluence with Escley Brook to confluence with Honddu	Bad	*Medium*	Bad Fish	Good	Not High	High	High	Good	High

2.3 Habitats Sites of Community Importance

2.3.1 River Wye SSSI

Natural England (NE) and the Countryside Council for Wales (CCW) have responsibility for identifying and protecting Sites of Special Scientific Interest (SSSIs) in England and Wales respectively. The River Wye is a designated SSSI. Under the Government's Public Service Agreement (PSA), the target is to have 95% of every SSSI in favourable or recovering condition by 2010.

Together the River Wye (Lower Wye and Upper Wye SSSIs) and several of its tributaries represent a large, linear ecosystem which acts as an important wildlife corridor, an essential migration route, and a key breeding area for many nationally and internationally important species. The Wye is of special interest for its associated plant and animal communities. Its character spans a range of types from an upland base-poor stream to an estuarine, silty lowland river.

The river's overall diversity is a product of its underlying geology, soil type, adjacent land use and near natural fluvio-geomorphological regime. The River Wye forms one of the longest, near natural rivers in England and Wales.

The River Wye (Lower Wye) is a rare example of a near natural, large western eutrophic river which, unlike many rivers of a similar type, has not been subject to significant modification from human activities. The river is of special interest for three main aquatic plant community types -

- rivers on sandstone, mudstone and hard limestone
- clay rivers
- lowland rivers with minimal gradient
- certain flowering plants and bryophytes.

The river shows a clear downstream succession in plant communities reflecting variations in geology, flow rate and land use. In particular the river exhibits a natural increase in dissolved minerals as it flows over the underlying geology of Old Red Sandstone and Carboniferous Limestone. Localised differences in water chemistry are also created where major tributaries, such as the River Lugg, enter the main channel.

Currently, according to Natural England, the 'rivers and streams' components of the River Wye SSSI are at a state of:

- 17% 'meeting PSA target'
- 83% 'Area unfavourable no change'

This designation is due to the following adverse conditions:

- Excessive fertiliser use
- Invasive freshwater species

- Siltation
- Diffuse pollution from agric
- Diffuse pollution from urban run-off

2.3.2 Habitats Regulations Classified Sites

The Habitats Directive and the Habitats Regulations require measures to be taken to maintain or restore natural habitats and wild species at a **favourable conservation status**. The Wye SAC is currently classified as being in 'unfavourable' conservation status due to the condition of atlantic salmon, allis and twaite shad and white-clawed crayfish species. The 'unfavourable' status is due to a number of factors.

The pre-eminent Habitats Directive site within Herefordshire is the River Wye SAC (the entirety of the River Wye, EU Code UK001262)).

Historically, the Wye is the most famous and productive river in Wales for Atlantic salmon, with high-quality spawning grounds and juvenile habitat in both the main channel and tributaries; water quality in the system is generally favourable. It is also one of the most diverse river systems in the UK, with a transition from hard geology, high gradients, rapid flow fluctuations and low nutrient-content in its upper reaches, to a more nutrient-rich river with lower gradient, more stable flow and softer geology in the lowlands.

The effect of river engineering work on migration and spawning has been limited, although there is a localised influence from the Elan Valley reservoirs, through inundation of spawning and nursery habitat and fluctuations in flow and water levels in the upper Wye.

The most important tributaries for spawning are included in the SAC, in particular the River Lugg. The Wye salmon population is particularly notable for the very high proportion (around 75%) of multi sea winter (MSW) fish, a stock component which has declined sharply in recent years throughout the UK. This pattern has also occurred in the Wye, with a consequent marked decline in the population since the 1980s. However, the Wye salmon population is still of considerable importance in UK terms.

In its entirety the River Wye SAC extends from the headwaters in Wales (and into most upper Wye tributaries) to the tidal limit at Monmouth.

The River Wye SAC within Herefordshire extends from Hay on Wye to Monmouth (SAC 002A), and on the River Lugg from just above the confluence with the Humber Brook to the confluence to the River Lugg downstream of Hereford (SAC002B).

See **Evidence Map 2-3 – Herefordshire SACs and SSSIs**

Table 2-4 – Qualifying Habitats and Species – River Wye SAC

Annex 1 Habitats	Code	Distribution
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	3260	
Annex II Species (Anadromous fish)		
Atlantic salmon	1106	
Sea Lamprey	1095	
River Lamprey	1099	
Allis Shad	1102	
Twaite Shad	1103	
Annex II Species (Non-migratory & invertebrates)		
White clawed crayfish	1092	
Brook Lamprey	1096	
Bullhead	1163	
Annex II Species (Mammals of riverine habitats)		
Otter	1355	

2.3.3 River Wye Special Area of Conservation RoC Process

A draft Stage 4 Site Action Plan was published by the Environment Agency in April 2009 [8]. Specifically the purpose of the final (Stage 4) Options Appraisal is

"*to ensure that Agency permissions which could not be shown to have no adverse impact on site integrity in Stage 3 do not cause or could not potentially cause or contribute to adverse effects on site integrity….*

The outcome of the Stage 4 Options Appraisal is a decision as to whether a conclusion of no adverse effect on integrity can be reached through modifications, restrictions or revocations, and if so what these modifications need to be".

In summary, the Agency identified 30 Consents relating to water quality and 37 Consents relating to water resources where 'no adverse effect' could not be shown. These 67 Consents are of direct relevance to the water cycle, and are examined in more detail in this and following sections.

Figure 2-3 – Summary of EA ROC Stage 3 Appropriate Assessment

Function	No adverse effect on site integrity can be shown	No adverse effect on site integrity cannot be shown
Water Quality	252	30
Water Resources	101	37
Waste	14	0
PIR	14	0
Air Quality	-	*Long Distance AQ
Groundwater	663	0

2.3.4 Finalised 'Adverse Effect' Sites – Water Quality

From the following GIS data layers prepared for the study:

- **HWCS Discharges Wye** (all discharge consents both within Wye catchment and in Herefordshire)

A SQL type query has identified that 16 of the 30 listed sites are within Herefordshire. This information is presented in **Evidence Map 2-4 – Habitats Directive Finalised Adverse Sites** which also shows the sites affecting water resources. Of these, 14 sites are related to Sewage Treatment Works (STW) performance.

The appropriate GIS layer (which can be interrogated for several attributes including operator name, daily amount etc.) is:

- **HWCS RoC Stage 4 Sites**

Note that the River Teme area has yet to be appraised by the study in terms of RoC adverse impact sites (awaiting data). In September 2009, the EA confirmed that it is only at a draft Stage 3 assessment for the Teme RoC. This assessment will not therefore be available before completion of the Water Cycle study process.

2.3.5 Finalised 'Adverse Effect' Sites – Water Resources

From the following GIS data layers prepared for the study:

- **HWCS Abstractions Wye SWA** (all constrained and unconstrained surface water abstractions both in Wye catchment and in Herefordshire)
- **HWCS Abstractions Wye GWU** (all unconstrained groundwater abstractions both in Wye catchment and in Herefordshire)

A SQL type query has identified that 32 of the 37 listed sites are within Herefordshire. This information is presented in **Evidence Map 2-4 – Habitats Directive Finalised Adverse Sites** which also distinguishes between surface water and groundwater abstractions.

The appropriate GIS layer (which can be interrogated for several attributes including operator name, daily amount etc.) is:

- **HWCS RoC Stage 4 Sites**

Note that the River Teme area has yet to be appraised by the study (awaiting data). The Environment Agency has confirmed (meeting 11/9/09) however that in terms of impacts on licensed quantities for water resources, the Teme is very unlikely to have any reductions imposed on existing abstraction licences.

The principal abstraction licence relating to Herefordshire in this instance is the DCWW water abstraction from the Teme east of Bromyard, supplying the Whitbourne WRZ.

2.3.6 Environmental Outcomes of Stage 4 Action Plan

Environment Agency Stage 4 guidance states that a series of environmental outcomes (EO) are required for each site to enable a conclusion of no adverse effect on site integrity to be reached.

For water quality objectives, these reflect a combination of various targets defined by the Water Framework Directive (to achieve Good Ecological Status) and the EC Freshwater Fish Directive, and are summarised as follows:

Table 2-5 - Target Environmental Outcomes – Water Quality

EO to Achieve 'No Adverse Effect'	DO mg/l	DO %	BOD mg/l	Total Ammonia mg/l	Unionised Ammonia NH_3 mg/l	pH	TSS mg/l
General River Ecosystem		80%	2.5	0.25	0.021	6-9	
EC Directive 78/659/EEC	> 9		< 5.0	< 0.78	< 0.025	6-9	< 25

For water resources objectives, the target Environmental Outcomes are presented in Table 2-6.

Table 2-6 – Target Environmental Outcomes – Water Resources

EO to Achieve 'No Adverse Effect'	Objectives
Environmental Outcome 1 (EO1)	Ensure that there is and will be adequate flow throughout the SAC and its estuary to maintain/restore the integrity of features within the European site.
Environmental Outcome 2 (EO2)	Ensure that the River Wye has a hydrological regime reflecting the properties of natural flow variability necessary to maintain/restore the integrity of the European site.
Environmental Outcome 3 (EO3)	Ensure that the frequency and magnitude of spate flows in the SAC and the estuary are adequate to maintain/restore the integrity of the European site
Environmental Outcome 4 (EO4)	Ensure that the risk of entrainment of SAC species is minimised to maintain/restore the integrity of the European site.

It should be made clear that as of September 2009, the RoC Site Action Plan is still under review by the Environment Agency. Changes to specific consents may yet be forthcoming, and these should be monitored, although these cannot be anticipated in this document.

2.4 Water Resources and Availability

Through the RAM framework and the Catchment Abstraction Management Strategy (CAMS) described under 1.8, the Environment Agency determines the licensing strategy for the various WRMUs identified [9]. Where this is sufficient surplus resource over and above the River Flow Objective for a given flow, then water is said to be 'available at all flows, including low flows'. Restrictions (i.e. Hands Off conditions) may still apply.

Conversely, if the RAM process shows that at or below flow durations of 95% that the RFO is compromised by the total of all licensed abstractions, then the WRMU is at 'No Water Available' status. Depending on the proportion of time that the RFO is in deficit, other more restrictive licensing strategies may come into force, as shown in Table 2-5.

The Environment Agency uses standard threshold values to determine the WRMU status, see Table 2-7.

Table 2-7 – Environment Agency AP Thresholds for Resource Status

MIN % TIME, SCENARIO > ECO. RFO	ABS & DIS SCENARIO	AP RESOURCE STATUS AT LOW FLOWS
> 95%	LICENSED	WATER AVAILABLE
70 – 95 %	LICENSED	NO WATER AVAILABLE
< 70%	LICENSED	OVER LICENSED
<70%	RECENT ACTUAL	OVER ABSTRACTED

2.4.1 Water Resource Management Units in Herefordshire

The Environment Agency further sub-divides the principal catchment boundaries into more detailed Water Resource Management Units (WRMUs) or Groundwater Management Units (GWMus). Generally these are still based on topographic boundaries (watersheds) or groundwater divides (aquifers) but allow a greater degree of precision about water resource availability in specific areas.

The relevance of WRMUs is that the water resources, the available water and the ensuing licensing strategy will be applied uniformly across that WRMU.

Herefordshire is covered by 5 surface water WRMUs as shown in Evidence Map 2-5. Four of these fall within the River Wye CAMS area, and one within the River Teme CAMS area. The River Teme constitutes a single WRMU.

Although 11 Groundwater Management Units (GWMUs) are delineated in this CAMS area there is no separate groundwater licensing policy for the Wye. Groundwater in the Wye CAMS is likely to be in connection with surface watercourses across the catchment, therefore the resource availability status for the WRMUs represent the integrated availability status for both ground and surface water.

2.4.2 Determination of Resource Status – River Wye

Based on the above criteria, **Evidence Map 2-5** shows that three of the four WRMUs within Herefordshire are at 'No Water Available' status, namely WRMU 8 (Upper Wye), WRMU 10 (Lugg), and WRMU 1 (Lower Wye). WRMU 17 is technically at 'Water Available' status. However, the status of this WRMU is over-ridden in the CAMS because of the significant potential water availability deficit in WRMU 1 downstream.

The eventual determination of the resource status for each unit will be dependent on the outcome of the Review of Consents (RoC) process.

2.4.3 Determination of Resource Status – River Teme

12 of the 15 Assessment Points in the Teme catchment are assessed as having 'Water Available'. The resource status changes to 'No Water Available' for the Clun, the Corve and the Laughern Brook.

However the Severn Corridor CAMS (published June 2003), which determined the Environment Agency overall strategy for the River Severn established that water below the confluence with the River Worfe, (upstream of the River Teme confluence with the River Severn) may only be available at higher flows (without 'hands-off' Flow restrictions).

As a result the resource status of the whole of the River Teme catchment has been overridden to 'No Water Available' due to the downstream requirements on the River Severn, shown in **Evidence Map 2-5** as 'WRMU TL'.

In some parts of the catchment there can be significant water movement between water in the river channel and the adjoining gravel deposits. This is a natural process which, under very low flow conditions, leads to some short sections of the river channel running dry before the water re-emerges from the gravel deposits. One example of this natural phenomenon happens at Leintwardine.

This means that there is a need to override the status of the contributing catchments. There is a further requirement on the Agency to protect the designated and non-designated conservation sites.

The Environment Agency has confirmed that the Teme CAMS 2nd Cycle has just commenced and is due for completion in April 2010.

2.5 Urban Wastewater Sensitive Areas

Where Sensitive Areas are identified under criteria (a) and/or (b) of 1.9.2 additional treatment is required where they are affected by discharges from sewage works serving communities with populations greater than 10,000.

The additional treatment involves reducing levels of nitrogen and/or phosphorus in discharges to standards set in the Urban Waste Water Treatment Directive within seven years of identification of these Sensitive Areas.

2.5.1 Identified Eutrophic Waters in Herefordshire

DEFRA maintains a register of identified Sensitive Waters. Table 2-8 summarises the eutrophic waters. There are no Nitrate Sensitive waters identified within Herefordshire.

Table 2-8 – Identified Eutrophic Sensitive Waters in Herefordshire

DEFRA ID	Name	Start NGR	END NGR	Date of Notification
38	River Teme	SO 51600 73000	SO 85000 52100	30.07.1998
43	River Leadon	SO 69900 37300	SO 82100 19600	30.07.1998
11	River Wye	SO 51700 38500	ST 54400 91400	18.05.1994

Evidence Map 2-6 illustrates the extent of the eutrophic sensitive waterbodies within Herefordshire. There are seven identified Tertiary standard STWs relevant to these rivers, specifically:

- Hereford (Eign) STW and Hereford (Rotherwas) STW (population 55,400) which discharge to the River Wye in Hereford
- Leominster STW (population 11,100) which discharges to the River Lugg at Leominster
- Cadburys Plc WwTW which discharges effluent to the River Lugg south of Leominster
- Ross Lower Cleeve STW (population 10,100) which discharges to the River Wye below Ross-on-Wye
- Ludlow STW (population 10,500) which discharges to the River Teme just north of the Herefordshire border
- Ledbury STW (population 9,900) which discharges to the River Leadon within Herefordshire.

Population estimates are based on mid 2007 estimates (ONS LSOAs). All of these effluent discharges are subject to phosphate removal to comply with the UWWTD. Evidently there will be a particular need for these STWs to maintain high standards of effluent discharge as per Figure 1-6.

The appropriate GIS layer is:

- **HWCS Eutrophic Sensitive Waters**

Other STWs discharging to these rivers that do not necessarily have to comply with UWWTD standards, but which nevertheless may require increasingly tight Consents imposed by the Environment Agency by reason of increased effluent loadings to any STWs discharging to a nutrient sensitive area are discussed in more detail in **7 - WASTEWATER TREATMENT AND POLLUTION CONTROL**.

2.6 Catchment Scale Flood Risk

A comprehensive SFRA for Herefordshire was completed in April 2008, with a final 3rd Edition issued on DVD in April 2009 [2]. This was a large and complex study, designed to be read and used as a stand-alone document with a supporting Geographical Information System (GIS) evidence base. It should be regarded as a sister document to this Water Cycle Study.

The primary aim of a Strategic Flood Risk Assessment is to determine whether planning policies or development land allocations will increase the risk of flooding, both within the development and the surrounding area, and to identify and promote measures that will minimise flood-risk and/or enhance flood resilience at all levels, particularly with regard to future development and existing critical infrastructure.

Local development documents (LDDs) provide a key planning tool for ensuring that flood risk is factored into the allocation of land types in accordance with regional policy but also taking account of local issues and concerns.

The Core Strategy LDD should include clear, strategic and robust policies for the management of flood risk, taking climate change into account. LDDs should demonstrate that the land allocations meet the Sequential Test as set out in Annex D: Planning Policy Guidance 25 – Development and Flood Risk.

The Strategic Flood Risk Assessment amongst many other detailed technical outputs, prepared a major database of historical flooding reports, compiled primarily from Local Authority and Environment Agency sources. Whilst some 50% of the recorded flooding incidents are related to major fluvial flooding, importantly, the remaining 50% are related to surface water flooding due to and drainage and/or inadequate sewerage capacity.

For reference, the GIS layers derived in the SFRA **HSFRA Flood Reports 072811a**, **HSFRA All Catchments** and **HSFRA Main Flood Spots** have been imported into the WCS GIS system as:

- **HWCS Flood Reports**
- **HWCS All Catchments**
- **HWCS Main Flood Spots**

These data have been produced as **Evidence Map 2-7 – Significant Historical Flood Reports**

Fluvial flood risk issues are analysed in more detail in **8 - CATCHMENT SCALE FLOOD RISK MANAGEMENT**. Local surface water management issues are analysed in more detail in **9 - INTEGRATED DRAINAGE AND SURFACE WATER MANAGEMENT.**

2.7 Climate Change

2.7.1 UK Climate Impacts Programme – UKCIP

The pre-eminent source of climate change information for the UK is derived from the United Kingdom Climate Impacts Programme who prepares data, forecasts and maps of scenario climate changes.

The Scenarios Gateway of the UK Climate Change Impacts Programme (www.ukcip.org.uk) [13] provides access to maps, datasets and guidance relevant to UKCIP climate change scenarios. The UKCIP climate change scenarios are funded by the Department for Environment, Food and Rural Affairs (DEFRA) and modelled by the Hadley Centre for Climate Prediction and Research (part of the Met Office), and are a key component of UK national and regional climate impacts assessment.

The guidance pages are a good starting point for general information about climate change scenarios and their use in impacts assessment. They describe how climate change scenarios can be used in decision-making and provide details of the uncertainties involved in climate modelling. They also contain frequently asked questions, definitions of commonly-used terms and links to other relevant data and resources.

2.7.2 UKCIP02

Until 2009, climate change scenarios were derived from the UKCIP02 programme. They were released in April 2002, accompanied by analysis by the Tyndall Centre. The UKCIP02 scenarios have been used extensively in climate change impacts research, providing a common starting point for assessing climate change vulnerability, impacts and adaptation in the UK.

The relevant technical report is:

- Climate Change Scenarios for the UK – The UKCIP02 Scientific Report

The UKCIP02 scenarios are based on four different IPCC SRES emissions scenarios:

- Low Emissions
- Medium-Low Emissions
- Medium-High Emissions
- High Emissions

For each scenario, the predicted change in future climate for the United Kingdom is calculated for three future time-slices:

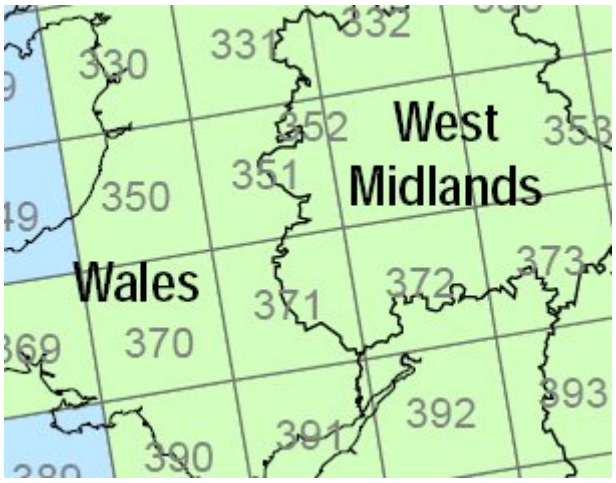
- 2011 to 2040 (called the 2020s)
- 2041 to 2070 (called the 2050s)
- 2071 to 2100 (called the 2080s)

Within each time-slice, changes are presented for several time-scales:

- Changes in annual averages
- Changes in seasonal averages
- Changes in monthly averages
- Changes in the frequency of some extreme events

Changes to the UK climate are reported across a grid with 50 km² cell size, see **Figure 2-4**. At this scale, changes in climatic variables are presented either as differences or percentage changes relative to the modelled present day baseline climate (1961 to 1990). Some climate variables (including precipitation) are further downscaled to a grid with 5 km cell size using simple interpolation. At this scale, absolute values of projected future UK climate are reported.

Figure 2-4 – UKCIP02 Modelled Grid Locations



2.7.3 UKCP09

The next package of climate change scenarios for the UK have the full title of **UK Climate Projections** and are known as UKCP09 or the Projections for short [14]. These supersede the delayed outputs from UKCIP08, and were published on the 18 June 2009.

The first of the UKCP09 Reports is available as:

- **UK Climate Projections – The Climate of the UK and Recent Trends**

UKCP09 uses significantly enhanced probabilistic modelling and will provide more accurate climate projections for:

- all 25 x 25 km UK land grid squares
- some aggregated regions, including administrative areas and river basin areas
- a similar range of climate variables as UKCIP02
- three future scenarios of greenhouse gas emissions (labelled as Low, Medium and High)
- the period 2010-2099, using seven overlapping 30-year time-slices that move forwards in decade steps (i.e. 2010–2039, 2020–2049, etc. until 2070–2099)
- as projected climate change (i.e. change relative to the 1961-1990 baseline period) and as projected future climate (i.e. absolute future climate values)

2.7.4 Climate Change in West Midlands

Table 2-9 confirms the general observation for the UK that spring and summer precipitation is declining and autumn and winter precipitation is increasing. In the West Midlands, summer precipitation has declined by some 5% since 1961, counter-balanced by a 30% increase in autumn precipitation.

Since Herefordshire water sources for potable water are derived primarily from 'run of river' sources, reduction in summer flows are a highly relevant issue with regard to water availability and declining quantities available for river flow objectives.

Table 2-9 – Regional Changes in Annual Precipitation 1961 - 2006

Area	Spring	Summer	Autumn	Winter	Annual
South West England	4.0	-8.8	28.6	15.9	9.7
South East England	-6.5	-13.1	20.6	23.3	5.4
London	-7.0	-16.7	19.4	22.7	2.5
Wales	8.4	-5.6	22.3	27.0	13.6
East of England	-1.7	4.9	21.6	17.7	9.3
West Midlands	-1.4	-5.2	29.8	10.9	7.6
East Midlands	-4.6	2.6	28.7	11.0	8.1
Northern Ireland	9.5	2.5	-0.7	12.5	5.2
Yorkshire and Humberside	-0.3	-1.1	10.2	24.3	7.1
North West England	6.3	-13.2	5.6	43.0	8.8
North East England	4.6	-6.9	12.4	29.6	8.7
West Scotland	23.2	4.3	11.0	58.6	23.2
East Scotland	14.3	-3.6	28.0	35.9	18.7
North Scotland	22.6	-5.0	11.1	65.8	23.0

Source: UKCP09 - UK Climate Projections – The Climate of the UK and Recent Trends

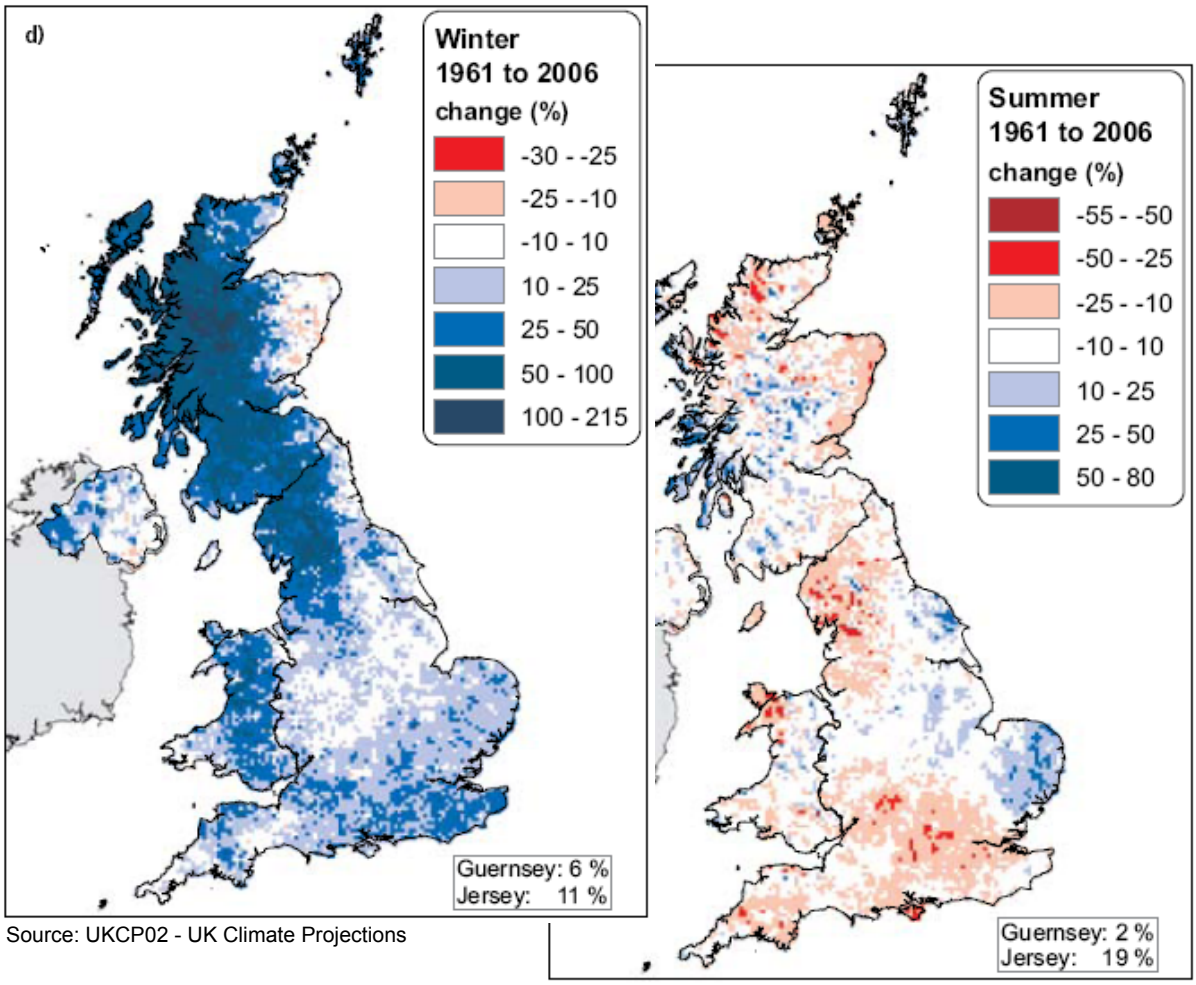
Initial UKCP09 outputs indicate that future climate moves towards drier summers and wetter winters than at present. As would be expected, the change is more noticeable in the High Emissions scenario than in the Low Emissions scenario. Seasonal shifts indicate larger warming in summer than in winter. These shifts in the seasonality of UK climate point towards a more Mediterranean-like seasonal climate regime – in effect a larger differentiation between the summer (warm and dry) and winter (mild and wet) seasons.

UKCP09 now provides more detailed maps at the administrative and/or river basin scale, for time slices 2020, 2050 and 2080, for three emissions scenarios (low, medium and high) for variables of:

- Annual Average Daily Temperature
- Summer Precipitation
- Winter Precipitation

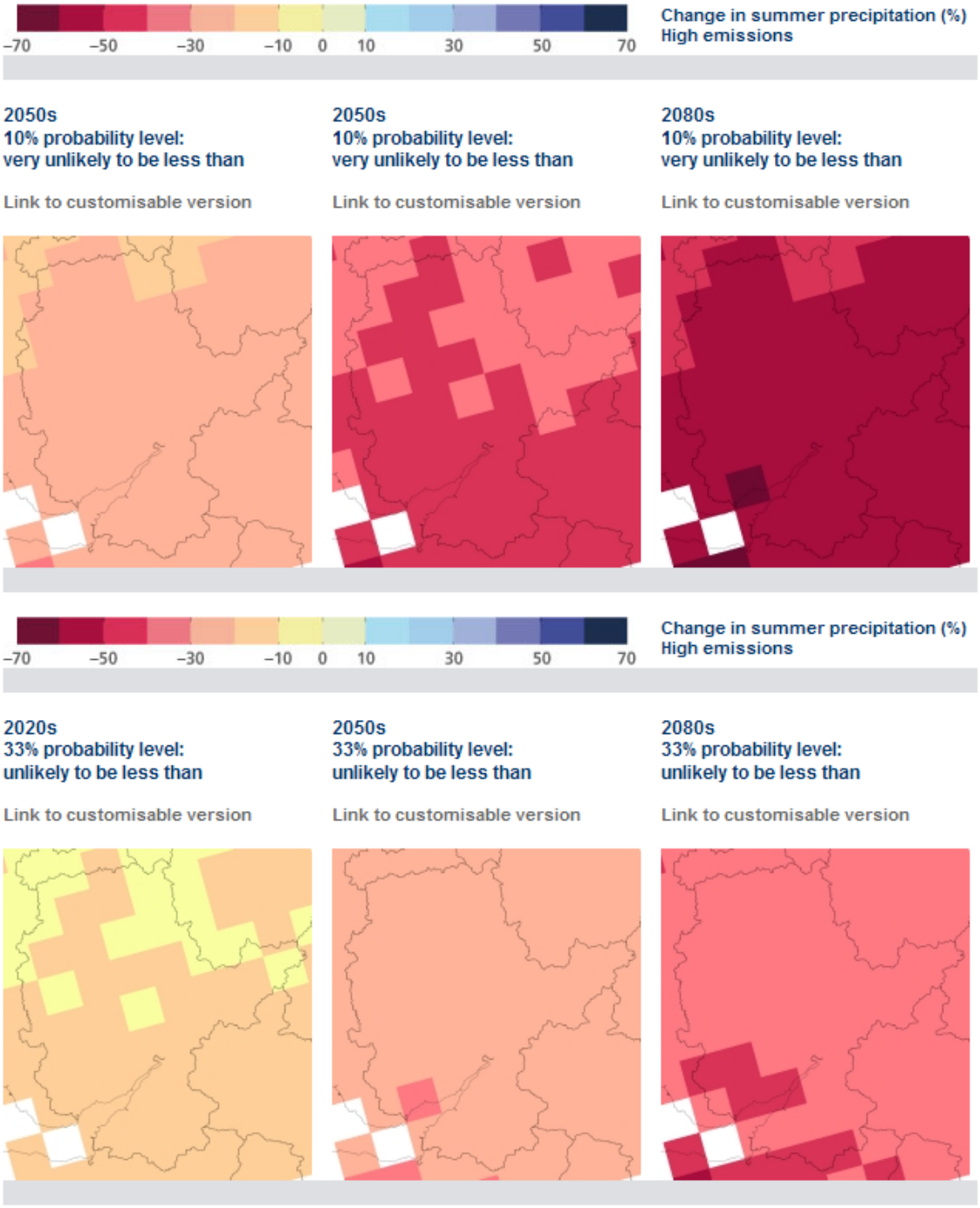
The UKCP09 probabilistic projections for the Severn River Basin for the Summer Precipitation, High Emissions scenario are shown as **Figure 2-6**. Note that there is an error on the published UKCP09 graphic. The first graphic should say 2020, not 2050.

Figure 2-5 – % change in winter and summer precipitation 1961 - 2006



Source: UKCP02 - UK Climate Projections

Figure 2-6 – UKCP09 Summer Precipitation, High Emissions



Source: UKCP09 – Regional forecast – Severn River Basin

Figure 2-6 illustrates that with 90% certainty, by 2050, summer precipitation would not be greater than a -40% reduction in comparison to current levels, but reductions of upto -40% are therefore feasible. Under the 67% certainty probability, reductions may be closer to -20%.

Clearly this magnitude of reduction has very profound implications for:

- Water availability for potable water abstraction
- Increased consumption by population and agriculture

2.7.5 Climate Change and River Flows in the 2050s

The Environment Agency has recently completed a Science Report:

- **Climate change and river flows in the 2050s** [15]

This study, completed by CEH Wallingford and the Environment Agency in 2009 is the first to use catchment-level models to look at river flows across the whole of England and Wales. Its finding that total annual river flow could drop by as much as 10–15 per cent by the 2050s is a result of lower summer and autumn river flows and higher winter river flows.

The work has been carried out using the Continuous Estimation of River Flows (CERF) model. This is a regionalised rainfall-runoff model developed by the Environment Agency and the Centre for Ecology and Hydrology (CEH). The model uses time series data of precipitation and potential evaporation demand to model time series of daily river flows.

The maps showing the change in mean monthly river flow suggest that nowhere in England and Wales is likely to escape the effects of reduced river flow. Wales and the north and west of England are predicted to see significant reductions in river flow throughout the summer months (June, July and August).

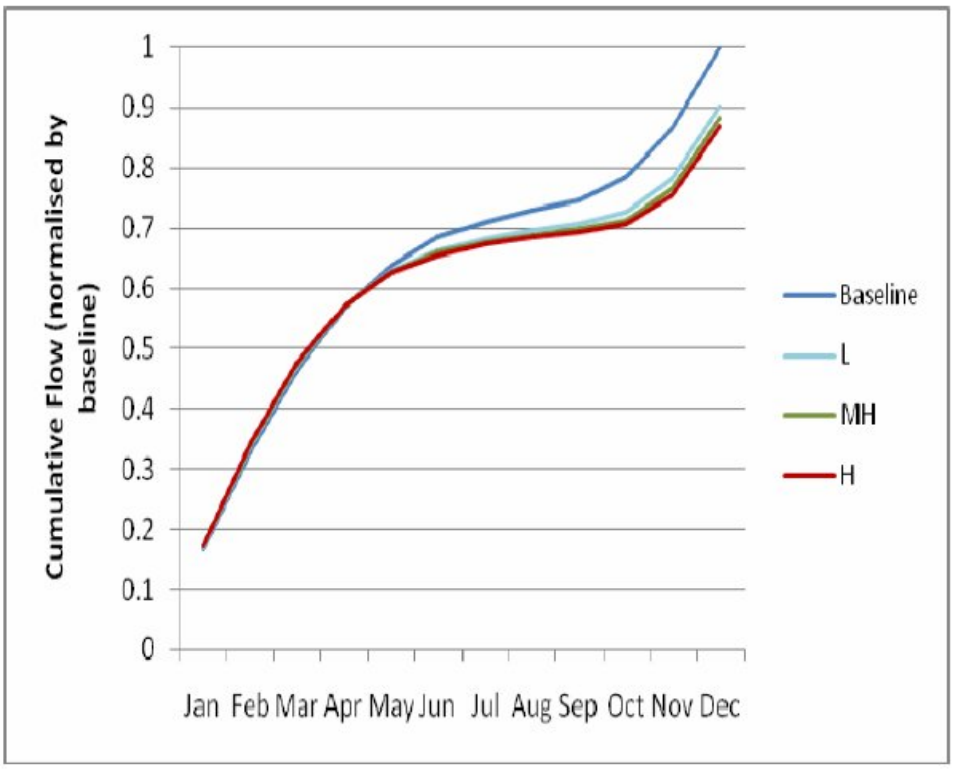
The study suggests that the number of months where river flow increases will be less than the number of months where river flow decreases. When combined with increased temperatures – and hence increased evaporation – this pattern is likely to affect the total annual river flow.

The study produced these flow curves for seven major catchments across England and Wales – the Bedford Ouse, the Dee, the Medway, the Mersey, the Severn, the Thames and the Yorkshire Ouse. All of them show a potential reduction in total annual river flow by the 2050s of between 10 and 15 per cent when compared to current values.

Using the Severn River Basin as an example, **Figure 2-7** shows cumulative monthly river flow throughout the calendar year as a proportion of baseline total river flow.

The dark blue line is the long-term average cumulative river flow for the current climate. The other three lines are the cumulative river flow predicted for the 2050s under the three UKCIP02 scenarios as a proportion of the baseline values. The scenario lines all clearly fall below the baseline by late spring/early summer and by the end of the year are considerably lower than the dark blue line. For example, under the High Emissions scenario, river flow is some 8% lower in October than at present.

Figure 2-7 – Cumulative Monthly River Flow – Severn River Basin



2.7.6 Climate change and River Wye in 2050s

The Environment Agency was asked to provide more specific data relating to the River Wye catchment but declined, indicating that the generalised method used for the study should not necessarily be extrapolated down to sub-basin level.

Scrutiny of Figure 2-8 however suggest that for the River Wye, winter flows in January may be some 5 – 10% higher than at present, whereas September flows may be some 30 – 50% lower under the High Scenario.

The above illustrations generally relate to the High Emissions scenario as a worst case. DCWW wishes to emphasise that it is unable to plan for this scenario. Under WRMP guidelines it models the effects of and plans for Medium Emissions scenarios. This is significant because whilst it is confident that it can invest to resolve impacts under such a scenario, it cannot give this undertaking for higher emissions scenarios.

It is also important to note that the Agency assessment concerns changes to natural river flows i.e. unregulated systems. These are not necessarily representative therefore of the River Wye which is a heavily regulated river i.e. its flows are modified to a large degree by the reservoirs of the Elan valley. These have the effect of supporting low flows during summer via the

established 'compensation flow' release of 231846 m³/day (2.68 m³/s) when flows at the Redbrook gauging station fall below 1.209 Mm³/day (14 m³/s).

Similarly, autumn flood flows may be attenuated to some degree by storage filling of the reservoirs if they are at less than full supply capacity at the end of the summer.

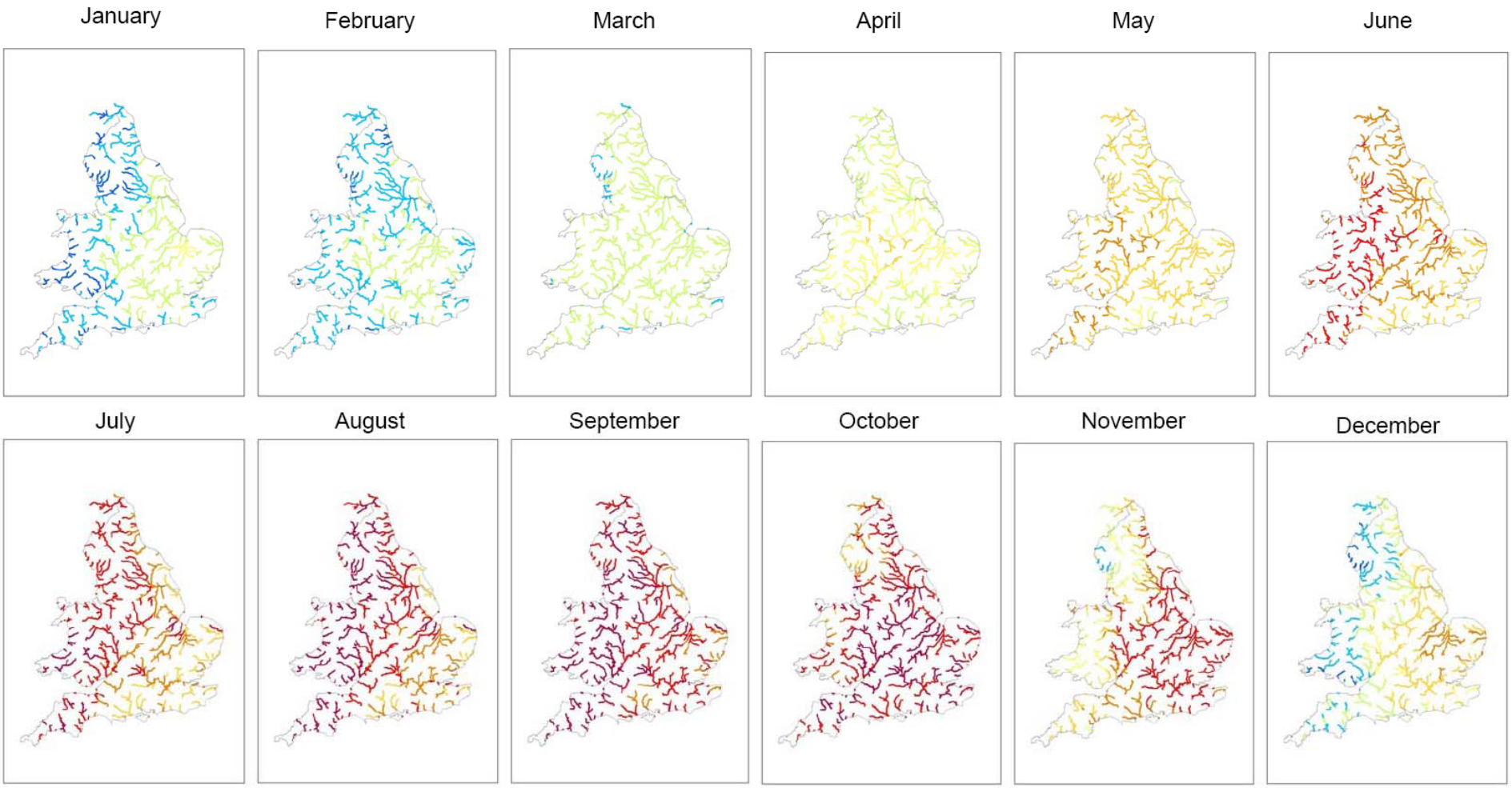
DCWW has emphasised that the extremes highlighted in this report are not necessarily representative at the catchment scale, and should not be taken out of context. The predictions for example show an increase in winter rainfall, which could potentially be stored by the reservoirs for release in dry periods.

DCWW points out that managing climate change will require a change in the management approach to water resources within the catchment. Long-term management will be about increased storage and reinforced infrastructure.

Going forward, climate impact will not have a linear relationship to deployable output, and complex climate change - water resource modelling will be required to interpret the implications of UKCP09 on specific water resource zones.

The Environment Agency has stated that it is not able to explicitly incorporate climate change impacts into the RoC process, as it must make its determination on the basis of current provable evidence. Hence, the precise impact of climate change on the future status of Consents is currently uncertain.

Figure 2-8 – Percentage Change in Mean Monthly Flow (UKCIP02 Medium High Scenario)



Key:
Dark Blue – 10-15% increase: **Light Blue** – 5 -10% increase: Green +/- 5% **Yellow** - 5-10% decrease: **Brown** – 20-30% decrease: **Red** – 30 -50% decrease: **Purple** – 50-80% decrease
Source: EA SC070079/SS1 – Climate Change and River Flows in 2050s. Source: E.A.

2.7.7 Climate Change and Flood risk

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 housing to more sustainable locations at less risk from flooding.

Consideration of climate change issues is incorporated throughout Planning Policy Statement 25 [16] and it is a specific requirement of SFRAs that climate change issues be addressed. This applies equally to windfall sites that may fall outside the strategic assessment at a later date.

Table 2-10 summarises the precautionary changes in flood hazard parameters that may be expected over the next 100 years.

Table 2-10 – Recommended Precautionary Sensitivity Ranges

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

Notes:

1. Refer to *Defra FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts, October 2006*, for details of the derivation of this table.
2. For deriving peak rainfall, for example, between 2025-2055 multiply the rainfall measurement (in mm/hour) by 10 per cent and between 2055-2085 multiply the rainfall measurement by 20 per cent. So, if there is a 10mm/hour event, for the 2025-2055 period this would equate to 11mm/hour; and for the 2055/2085 period, this would equate to 12mm/hour. Other parameters in Table B.2 are treated similarly.

Source: PPS 25 - Development and Flood Risk

2.8 Summary of Main Issues

2.8.1 Ecological Status of Waterbodies

There are 14 identified waterbodies within Herefordshire at Poor Ecological status. A further 4 are at Bad ecological status. These will be subjected to close scrutiny by the Environment Agency in order to achieve a status of 'Good' by 2015.

However, we note that for the majority, the individual components of physico-chemical quality, BOD and Ammonia are generally all at High or Good status. Only a biological element (Invertebrates, Fish, Macrophytes or Diatoms) can drive a waterbody to be classed as Poor or Bad. For failures of the physico-chemical standards (as defined by Annex 8 or Annex 10), the lowest classification that can be given is Moderate.

The Environment Agency has emphasised that even when the physico-chemical standards of the waterbody are acceptable (e.g. Good status), a Poor or Bad final classification can still be allocated since fish are sensitive to sediment concentrations or physical barriers to migration for example.

2.8.2 Habitats Regulations Review of Consents

The Environment Agency Stage 4 RoC process has identified 30 sites in the River Wye catchment where current discharge Consent licenses cannot be shown to have no adverse effect. Of these 16 are within Herefordshire (incorporating Presteigne STW) and are of direct relevance to water services infrastructure. 14 of the sites are related to Sewage Treatment Works (STW) performance, which will require urgent further scrutiny. The River Wye was principally affected by the Eign and Rotherwas STWs, and the River Arrow and the Lugg from Leominster to Hereford are also principally affected.

37 sites are further identified which relate to water resources adverse impacts, and of these 32 are within Herefordshire. The lower Lugg (Leominster to Hereford) and the lower Wye (Hereford to Monmouth) are principally affected, and also the River Wye at Hereford.

The Environment Agency has confirmed (September 2009) that following a Post Project Technical Review some of the Stage 4 assessments are being reviewed. DCWW has also confirmed that it will confirm its deployable output position in a revised WRMP as soon as it is clear on its licence amendments under the sustainability reductions.

2.8.3 Water Resources

There are 5 Environment Agency defined Water Resource Management Units (WRMUs) in Herefordshire (4 in the Wye system, 1 in the Teme). For resource

assessment purposes, the groundwater units are contiguous with the defined surface water units in every case.

The CAMS process has determined that each of the five WRMUs is at 'No Water Available' status. This means that at the fully licensed uptake scenario, the ecological river flow objective would be compromised.

Hence, there are two issues arising:

3) Whilst new licences with seasonal and/or flow constraints may be available in future, the Environment Agency's stated preference is that climate change impacts should preferably be accommodated by increased water use efficiency.
4) New abstraction licenses are unlikely to be granted in any WRMU during low flows. In this instance prospective abstractors will have to engage in Water Licence Trading, or cooperate with established abstractors in the form of collective water user groups, who in combination can demonstrate that overall consumption is not increased between several licenses.

2.8.4 Sensitive Receiving Waters

The River Teme, Leadon and Wye are all designated Sensitive Waters (susceptible to eutrophication) under the Urban Wastewater Treatment Directive. Tertiary standards of treatment therefore apply to all STWs serving populations greater than 10,000 p.e. (population equivalent).

DEFRA maps show only Ledbury and Ludlow STWs as designated tertiary level STWs, but we are advised that Leominster STW (Lugg), Rotherwas and Eign STWs on the River Wye and Ross Lower Cleeve (River Wye) are also designated tertiary STWs.

These STWs will therefore have to operate at a high standard of treatment in order to maintain Total Phosphorus (P) at acceptable levels.

2.8.5 Catchment Flood Risk

Catchment scale flood risk, in three categories of a) General surface water flooding b) Fluvial flooding by floodplains c) Historical flooding reports has been identified in detail in the accompanying report **Herefordshire Strategic Flood Risk Assessment** [2].

This identifies the villages of Dorstone, Peterchurch, Kington and Aston Ingham as higher risk localities with respect to general surface water flooding.

Fluvial flooding from adjacent floodplains is prevalent for properties adjacent to the Wye, Red Brook, Yazor Brook and Withy Brook in Hereford, Pinsley Brook and River Lugg in Leominster, Eardisland on the River Arrow, and the River Lugg at Bodenham, Mordiford and Hampton Bishop.

Historically, Hereford, Lower Bullingham and Hampton Bishop report the greater number of repeatedly flooded properties. S. Leominster, Stoke Prior,

Hope-u-Dinmore, Bodenham, Marden, Sutton St Nicholas, Withington Marsh, Hampton Bishop and Mordiford are also higher risk locations.

2.8.6 Climate change

UKCIP02 climate change projections, superseded by UKCP09, consistently suggest that reductions in summer rainfall of up to -20 to -40% may be likely. The Environment Agency has postulated in its assessment that summer river flows by 2050 will be some -20% less than at present in the Severn River Basin under the High Emissions scenario.

DCWW wishes to emphasise that it is unable to plan for this scenario. Under WRMP guidelines it plans for Medium Emissions scenarios. This is significant because whilst it is confident that it can invest to resolve impacts under such a scenario, it cannot give this undertaking for higher emissions scenarios.

It is also important to note that the Agency assessment concerns changes to natural river flows i.e. unregulated systems. These are not necessarily representative therefore of the River Wye which is a heavily regulated river i.e. its flows are modified to a large degree by the reservoirs of the Elan valley.

2.9 Issues for Action - The Environment Baseline

Table 2-11 – Issues for Action – The Environment Baseline

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions
2a	14 waterbodies at Poor Ecological status. 4 at Bad. These assessments may be borderline however. What is the EA level of confidence? What are the specific objectives?	EA	EA confirmed confidence of Status. Where confidence is less than certain, more data will be collected. Objective is to attain GES
2b	16 Habitats RoC sites identified within Herefordshire adversely affecting water quality. River Lugg from Leominster to Hereford particularly affected.	EA, CCW,NE DCWW Herefordshire	3 water quality licences revoked. 20 modified, 259 confirmed.
2c	32 Habitats RoC sites identified within Herefordshire adversely affecting water resources. Lower Wye below Hereford particularly affected.	EA,CCW,NE DCWW Herefordshire	Various licences reviewed, affecting abstraction on the River Wye and River Lugg especially. EA and DCWW still to confirm final positions.
2d	All WRMUs identified as 'No Water Available' status. Hence further licensing will be restricted. Increased demands must be offset by increased efficiency or Water Rights trading.	DCWW EA Herefordshire	Environment Agency preference is for increased efficiency of use rather than new licences
2e	Wye, Leadon and Teme all identified as eutrophic sensitive rivers. Hence Phosphorous (P) pollution of rivers from point (STW) and diffuse (farming) sources threatens eco-status.	DCWW Herefordshire EA	Seven treatment plants provide phosphate removal under UWWTD. EA implementing programme of measures under Severn RBMP
2f	Numerous identified towns and villages with high risks of fluvial flooding and historical flooding incidents	Herefordshire EA	Identified under SFRA
2g	Climate change reduction in summer rainfall (-20% to -40%) has profound implications for reduced water availability and increased potable and agricultural consumption.	DCWW Herefordshire EA	Medium Emissions scenario catered for in 2008 DCWW supply-demand forecasts to 2033/34
2h	Climate change increase in winter rainfall (20% to 30%) has profound implications for increased catchment saturation, increased general runoff and peak flows.	Herefordshire DCWW EA	Greater emphasis on SUDS, strategic attenuation, and flood resilience measures
2i	Abstraction Licence AN0038701 not in original database supplied to consultants, although it is outside Herefordshire	WWC	Ignored

3. HOUSING PRESSURES

3.1 Regional Spatial Strategy

The Regional Plan (RSS11) already sets the scene for the Herefordshire Core Strategy by indicating how the region should develop over the next 20 years and setting targets for new homes and employment land for the County.

The Regional Spatial Strategy 'Spatial Options, January 2008) requires Herefordshire Council to provide in the order of 16,600 dwellings from 2006 – 2026 (Option 1). Of these, some 8,300 will be in and around Hereford. It should be understood that the process of public examination and approval by the Secretary of State could still result in the figure being amended (either up or down). Options 2 and 3 identified an increase in growth rates requiring 20,500 houses to be developed within the County up until 2026.

A further option proposed by Government Office West Midlands (GOWM, December 2008) is to provide for an additional 1200 dwellings in rural areas (RSS Phase 2 Revision – Government Representation on the Draft).

Herefordshire Council currently aims to build approximately 8,500 homes by 2016. New transport infrastructure will be provided in association with the new housing development and the Edgar Street Grid area of Hereford will be regenerated. Housing proposals have also been put forward for the county's market towns, enabling them to meet their needs and aid rural regeneration.

3.2 Core Strategy – Developing Options

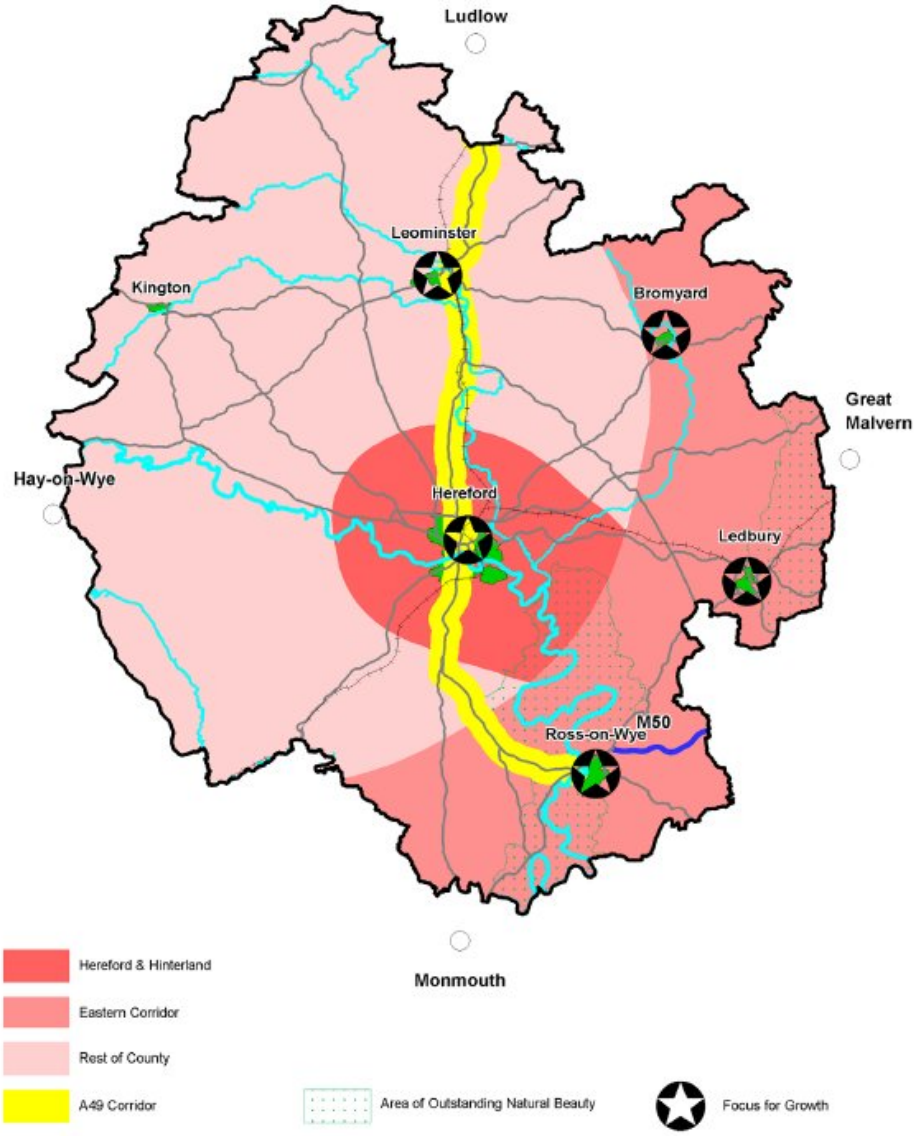
The Developing Options Paper [17] from Herefordshire Council outlines four strategic options. The Options reflect different approaches, emphases' and priorities based on the objectives. The preferred Option could be a combination of one or more of these options or an entirely new approach. However, the Core Strategy must reflect national and regional planning objectives and be tested by a Sustainability Appraisal which will assess its social, economic and environmental performance.

3.2.1 Option A - Focus on Economy

This Option places emphasis on economic objectives and reflects the Economic Development Strategy for Herefordshire. It would focus housing and employment growth to Hereford, Leominster and the market towns and hinterland settlements in the south and east of the County (around Bromyard, Ross-on-Wye and Ledbury) where employment demand is greatest.

Figure 3-1 summarises the Option as set out in Herefordshire Council: Core Strategy – Developing Options Paper, June 2008.

Figure 3-1 – Developing Options: Core Strategy Option A



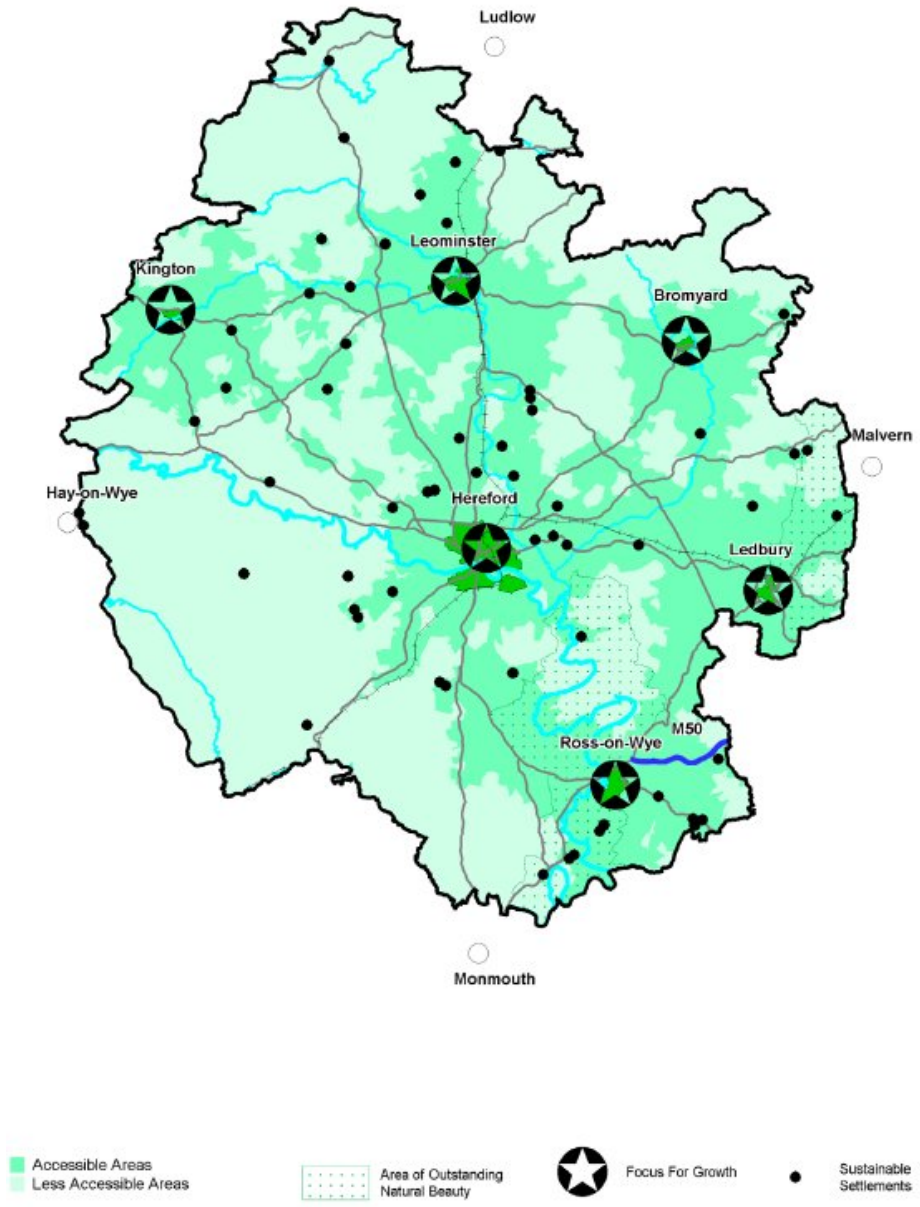
Source: Herefordshire Council - Core Strategy: Developing Options Paper, June 2008

3.2.2 Option B – Focus on Society

Option B places emphasis on social objectives or regeneration. Regeneration is about addressing the impacts of deprivation, which for Herefordshire means tackling income and employment deprivation in parts of Hereford and Leominster as well as tackling deprivation in terms of access to services and facilities (including housing) across the rest of the County, particularly in rural areas.

The focus for growth would be towards Hereford and Leominster but with a dispersal of development to other market towns and sustainable settlements (yet to be determined).

Figure 3-2 - Developing Options: Core Strategy Option B



Source: Herefordshire Council - Core Strategy: Developing Options Paper, June 2008

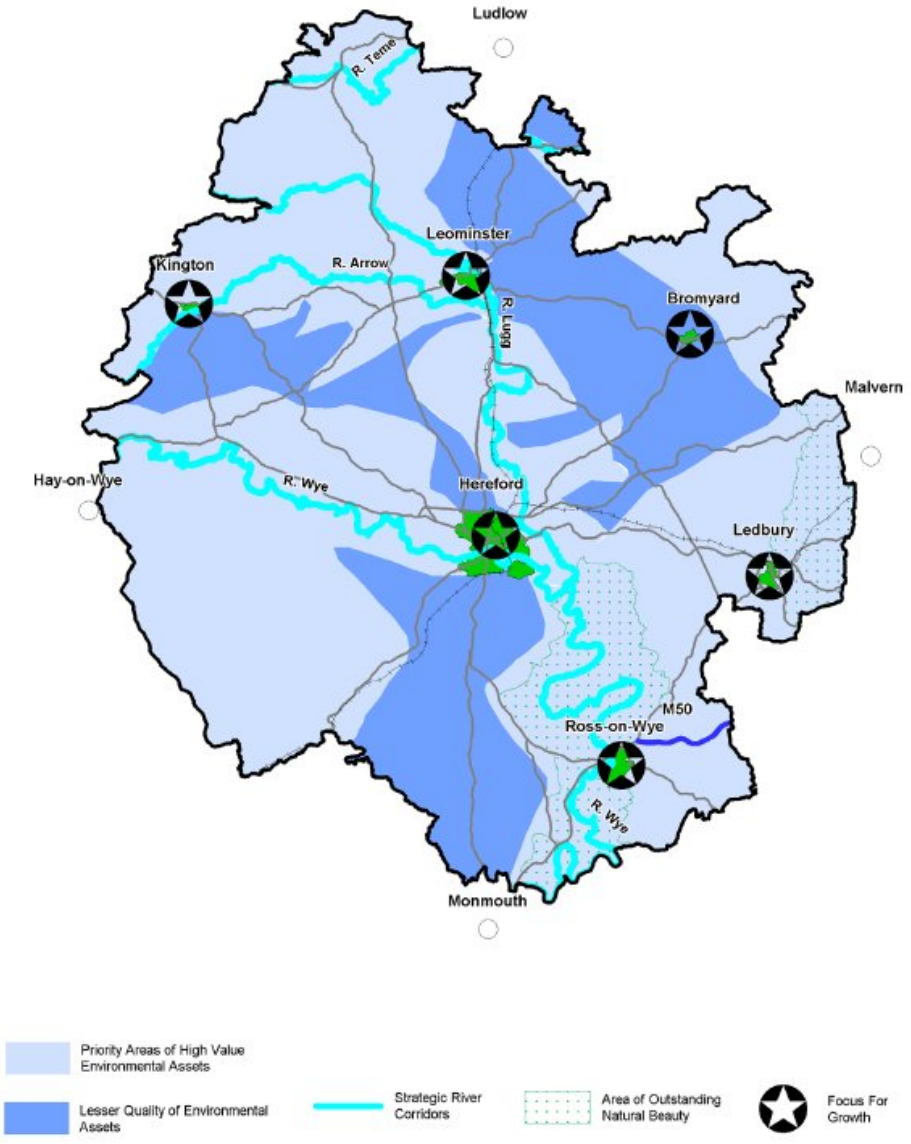
3.2.3 Option C – Focus on Environment

This Option places emphasis on environmental objectives being the driver in accommodating new growth. A key priority of Option C would be to use the opportunities presented through growth to invest in the provision, restoration and enhancement of environmental assets ensuring a robust and adaptable environmental framework across the County and beyond.

The focus of development in this Option would be towards Hereford and the market towns as well as to sustainable settlements (yet to be determined). It is anticipated that growth within these areas could help to deliver either:

- Protection or enhancement of priority areas of high value where environmental assets currently are concentrated e.g. restoration of wetland areas along the floodplains of the western reaches of the River Wye; and/or
- The creation or retention of new, restored or enhanced environmental assets in areas of fewer assets and/or lesser quality, for example a new Country Park or raising air quality levels.

Figure 3-3 - Developing Options: Core Strategy Option C



3.2.4 Option D – Focus on a New or Expanded Settlement

Option D places specific emphasis on housing objectives and promotes the distribution of growth to Hereford, the market towns and a new or expanded settlement in the County. Further work would need to be carried out to identify sustainable locations for such a settlement.

This Option is not in conformity with the existing or emerging regional plan, which generally directs larger scale growth to existing settlements. However, there is continuing uncertainty regarding the regional housing requirement and Option D may become more realistic if the housing targets of the regional plan are raised significantly above those that are currently proposed.

3.3 Growth Point Population and Housing

3.3.1 Herefordshire Potential Development Sites Database

Herefordshire Council has prepared throughout 2007 a major database of potential development sites. The availability of this database also in GIS format greatly enhances the ability to interrogate individual sites with respect to environmental impacts.

This database incorporates the following principal sources:

- Housing land allocated under the policies **H2** (Housing Land, Hereford and Market Towns) and **H5** (Housing Land, Main Villages) of the Herefordshire Unitary Development Plan (UDP,March 2007)

- Employment land allocations **E1** (Rotherwas), **E2** (Moreton on Lugg) and **E3** (Other Land) of the Herefordshire Unitary Development Plan (March 2007)

- **HLAA Sites** (Herefordshire Housing Land Availability Assessment [3]) was commissioned in 2007 to identify all potential housing development sites. Many of these sites may be considered inappropriate for development
- **Officer Sites** includes sites identified by Herefordshire planning officers as part of the HLAA study, with no official status and with the process of assessment continuing.
- **Housing Capacity Study**

- **UDP Representation Sites** includes sites submitted as objection sites to the UDP. These were considered inappropriate for the UDP but are now being reassessed for the Local Development Framework.

Evidence Map 3-1 summarises all of these potential development sites, which can be interrogated in more detail by reference to the appropriate GIS layer:

- **HWCS Development Sites 081127**

This GIS database is a direct copy of the SFRA database **HSFRA Development Sites 081127**. As expected, there are significant housing pressures around Hereford city, and significant concentrations of possible sites around the Market Towns, notably Ledbury and Leominster.

3.3.2 Herefordshire Council Baseline Housing Figures

Accurate determination of the baseline household and non-household property figures is a critical starting point for the proper forecasting of:

- water consumption demands
- wastewater loadings to Sewage Treatment Works

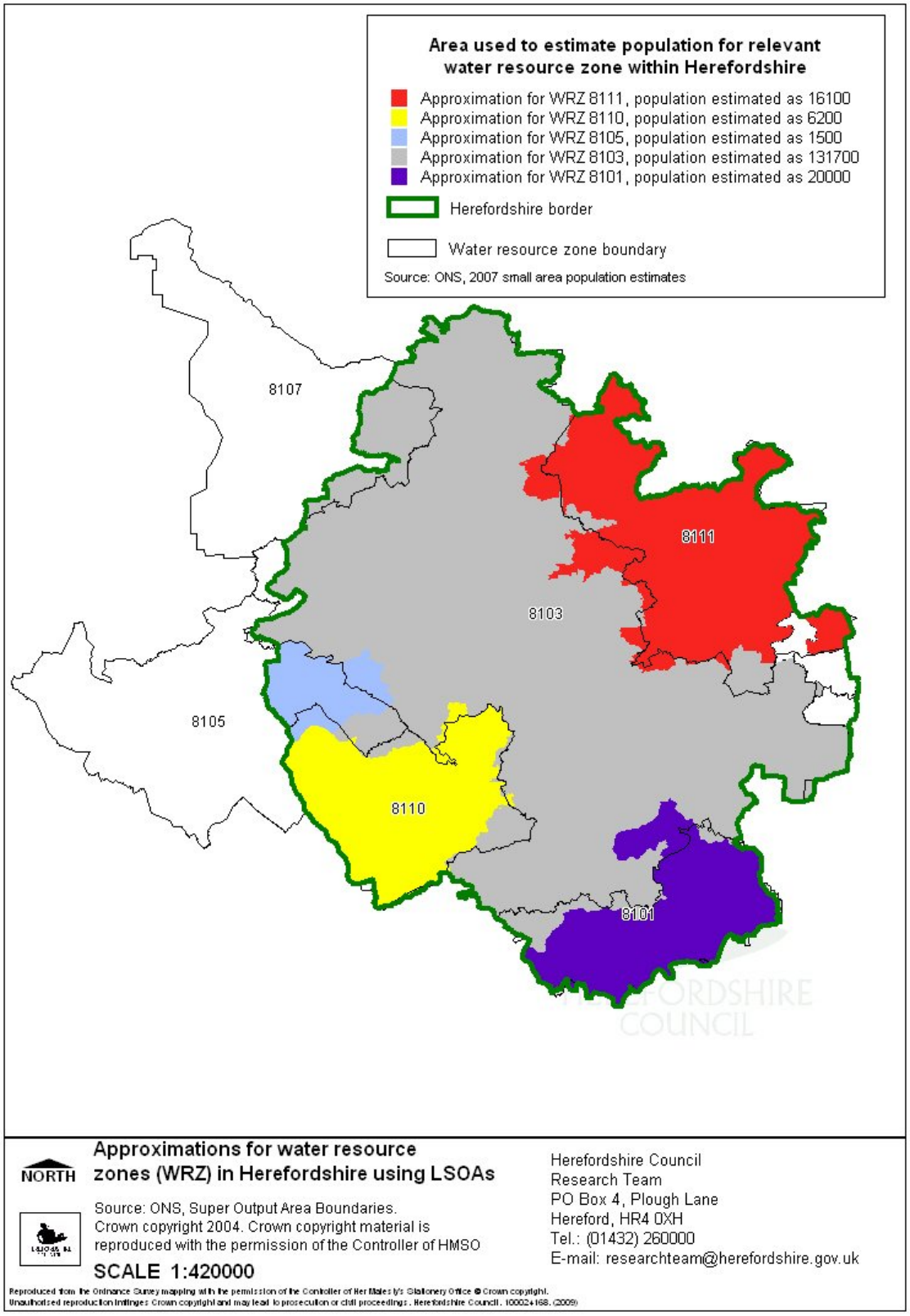
Approximations have been made by Herefordshire Council in respect of the proportion of the area of Herefordshire that falls within each WRZ so that comparable estimates can be made of housing and population within each WRZ falling within Herefordshire.

Figure 3-4 is based on ONS 2007 Small Area Population estimates. These do not match exactly the WRZ boundaries, so the colour scheme above shows the Small Area approximation corresponding to the relevant WRZ. As far as possible this process has sought to match the total equivalent areas of each WRZ, and it is thought that the population estimates should be within +/- 3%.

Herefordshire Council (Research Section) created approximations for water resource zones by considering any lower super output area (these are areas defined by the ONS for the national census) where the majority of the lower super output area (LSOA) was within a water resource zone, to be part of that water resource zone. (Each LSOA has a population of approximately 1500 people).

There were no LSOAs in Herefordshire which were mostly within water resource zone 8107, hence this population (estimated as 675 persons) has been included in the Zone 8103 (Hereford CU) figure. The estimated populations are for the part of the water resource zone within Herefordshire.

Figure 3-4 – Herefordshire Council Population Estimates by WRZ



For example, the Herefordshire Council approximation of Hereford CU Zone 8103 (black line boundary, grey shading) shows some extensions into Zones 8107 (Pilleth) and Zone 8111 (Whitbourne). However, these are offset by similarly sized encroachments of Zone 8111 into Zone 8103.

The residential household and population figures thus derived are assumed to be a reasonably accurate comparison of DCWW scenario year 2006/07 (ending March 2007).

For a complete up to date picture however, the completed and committed developments as approved by Herefordshire Council for the period 2006 – 2008 should be added to the baseline figures so that an updated baseline figure for the start of 2009 can be agreed and used by all parties.

With regard to property counts, Herefordshire Council used the current Local Land and Property Gazetteer (LLPG), using live postally addressable records. We note that according to LLPG, the total residential records count for Herefordshire amounts to 82508. Of these it is estimated that a total of 81200 records fall within one of the DCWW water resource zones. The balance of 82508 – 81200 (1308) is not attributed to any DCWW WRZ.

Non-residential records from LLPG amounts to 8,000 addresses, hence total property count for the entire County of 90,508.

The ONS Sub-national Population Projections (SNPP) estimate the Unitary Authority population to be 177,800 at end of 2006, with the housing stock in 2007 estimated as 78,940 (CLG Housing Strategy Statistical Appendix 2007). These are 1.3% and -4.0% respectively different from the Herefordshire Council assessed figures in **Table 3-1**.

We therefore assume that the methodology and outputs from the Herefordshire Council assessment are basically sound.

3.3.3 Reconciliation with DCWW Housing Figures

It has been impossible to reconcile the household and population estimates by DCWW and Herefordshire Council due to the different sources, formats used and the different baseline years assumed.

In its draft WRMP DCWW is obliged to start its analysis from the base year of 2006/07 (the so called scenario year). It has made estimates of measured and unmeasured households (residential properties), and measured and unmeasured non-households (businesses, schools, hospitals etc) starting from 06/07. These data are easily interpreted from the Water Resource Planning (WRP) Tables presented as part of the dWRMP. However, further complications are:

- DCWW must necessarily present it data by Water Resource Zone, not by County boundary, and some WRZs extend beyond substantially beyond the County boundary, in particular Zones 8107 and 8105.
- Property count is a proxy for the more critical measure of actual population, since water consumption is dependant primarily on

population, not households. Depending on the date and source of the Office of National Statistics (ONS) data-set used, variations in population estimates may be obtained by different bodies.

To clarify this issue as much as possible, we have summarised the DCWW housing and population forecasts (Water Resource Zone) and attempted to compare these to housing and population estimates carried out by Herefordshire Council based on data year ending 2006. These figures should be directly comparable therefore to the forecast data used by DCWW in its WRP Tables for the forecast year ending 06/07(i.e. March 07).

For Zones 8101 (Ross), 8103 (Hereford), 8110 (Vowchurch) and 8111(Whitbourne) however, which essentially define the boundary of Herefordshire, there should be close agreement between DCWW and Herefordshire Council figures on a) residential housing stock b) population.

Examination of **Table 3-1 h**owever shows some alarming discrepancies.

- Allowing for marginal errors in the Herefordshire Council LSOA approximations of the DCWW WRZs, there is still an 18% difference in residential record count for Zone 8103 (Hereford CU). The population count is also adrift by some 10%, a substantial value in absolute terms.

  For example, these differences exceed the quantity that is being assessed as part of the Regional Spatial Strategy, and hence cannot be ignored.

- Zone 8110 (Vowchurch) has a close approximation of population figures but the residential record count is substantially different (hence occupancy rate would be distorted).

- There are very substantial discrepancies for Zone 8111 (Whitbourne), with a 35% difference in housing estimate and a 16% difference in population.
- We note that the total population of Herefordshire as estimated by Herefordshire Council exceeds that of the entirety of all WRZs as assumed by DCWW. Clearly one or both estimates are in error.

In view of the critical nature of correct housing and population data for use in water resource planning and wastewater treatment loadings, it is considered essential that these conflicting outputs are examined jointly and a verifiable and agreed data set produced.

DCWW has been contacted on this issue, and has advised that:

- The DCWW figures do not include any properties that are not connected to DCWW water mains (private supplies etc) (of which there may be several thousand)
- Blocks of flats are counted as single customers (one connection)

- Residential properties which are also farms are classified as non-households, not households (hence large impact in rural zones)

Acknowledging these sources of difference for properties, we would still expect the total population figures to be in close agreement. Hence some close scrutiny of BOTH sources and methods are required.

3.3.4 Population Density by Parish

The GIS data files can be used to examine population figures and densities in relation to the emerging spatial strategy (see 3.4). Using GIS layers in combination:

- **HWCS Parish Population**
- **HWCS Spatial Strategies**

It is possible to produce thematic maps such as **Evidence Map 3-2** which show illustrative combinations of forecast housing pressure by density overlying current population density by Parish (2001 Census data).

3.4 Emerging Spatial Strategy

Based on the housing capacity studies, Herefordshire Council Strategic Planning has developed an early view of emerging sites, which will be subject to change and which will be further informed by strategic studies such as the Water Cycle studies.

Table 3-2 summarises the current initial view of housing dispositions across the County. It is a Regional Spatial Strategy (RSS) requirement that 8,300 houses are provided within Hereford itself. The balance in the remaining Market Towns and Rural Areas will reflect the Core Strategy.

Accounting for 5062 houses already constructed, committed or allocated in the UDP in the period 2006 - 2008, this leaves a balance of 11538 houses to be found in Strategic and non-Strategic sites from 2009 onwards.

Evidence Map 3-2 summarises a current emerging strategy for the County, essentially mapping the data of Table 3-2. Estimates are also included for rural areas, totalling 2340 units, which is somewhat in excess of the target required under Table 3-2. (Data supplied to DCWW 8 May 2009).

The base map reflects population density by Parish (as of 2001). The highest density Parish is Hereford city (dark red). Leominster follows, with Ledbury and Ross-on-Wye in the next category (5,000 – 10,000 population). Increasing shades of green denote decreasing population values.

In essence, this emerging spatial strategy illustrates that the bulk of future housing will be in areas with already significant quantities of population. Hence relative pressure on environmental resources in these specific areas is likely to be significant.

3.5 Summary of Main Issues

3.5.1 Emerging Spatial Strategy

The Regional Spatial Strategy 'Spatial Options, January 2008) requires Herefordshire Council to provide in the order of 16,600 dwellings from 2006 – 2026 (Option 1). Of these, some 8,300 will be in and around Hereford.
A further option proposed by Government Office West Midlands (GOWM, December 2008) is to provide for an additional 1200 dwellings in rural areas (RSS Phase 2 Revision – Government Representation on the Draft).

Accounting for 5062 houses already constructed, committed or allocated in the UDP in the period 2006 - 2008, this leaves a balance of 11538 houses to be found in Strategic and non-Strategic sites from 2009 onwards.

3.5.2 Population and Housing Figures

We currently believe there is a large unexplained discrepancy between the household and population figures provided by DCWW and those estimated by Herefordshire Council.

Based on data at end of 2006, DCWW estimate a total population in the 6 relevant Water Resource Zones of some 175,000. However, Herefordshire sourced data (ONS and LLPG) estimates that there is a population of 175,500 in Herefordshire alone.

WRZ household and population figures are also not in agreement particularly for all of the WRZs falling entirely within Herefordshire where one would expect close agreement particularly with respect to population figures.

Comparison of households is more difficult, because a single registered water connection in the DCWW database may serve many residential addresses in blocks of flats for example.

These population figures in particular require urgent examination and reconciliation. Whilst there may be a logical explanation for the differences, this should be proved on both sides.

Table 3-1– Household and Population Baseline Estimates – DCWW and Herefordshire

Water Resource Zone	DCWW Households End 2006	DCWW Non-hshlds End 2006	DCWW Total Population		HC Residential End 2006 [1]	HC Non-hshlds End 2006	HC Total Population [2]	Population % difference
WRZ 8101 - Ross-on-Wye	7,950	1,110	19,650		9,592	Not assessed	20,000	+1.8%
WRZ 8103 – Hereford CU	50,630	5,450	118,960		60,011	Not assessed	131,700	+10.7%
WRZ 8105 – Llyswen	3,410	660	9,216		816	Not assessed	1,500	N/A
WRZ 8107 – Pilleth	3230	520	7,522		308	Not assessed	Added in 8103	N/A
WRZ 8110 – Vowchurch	2,215	473	5,963		3,251	Not assessed	6,200	+3.9%
WRZ 8111 – Whitbourne	5,350	1,130	13,845		7,222	Not assessed	16,100	+16.2%
Unallocated					1,308	Not assessed	Not assessed	
Totals	**72,785**	**9343**	**175,156**		**82,508**	**8,000**	**175,500**	

Notes:

1) Orange sector is DCWW data for complete Water Resource Zones. Green sector is Herefordshire Council data for Herefordshire ONLY.
2) Zones 8105 and 8107 fall predominantly outside Herefordshire, hence cannot be compared directly.
3) Zones 8101, 8103, 8110 and 8111 fall entirely within Herefordshire and can be compared directly.
4) Although Total Population is similar from both sources, this is misleading. DCWW data is population for ALL WRZs. For Herefordshire it is for the Unitary Authority area ONLY.

Table 3-2 – Balance and Distribution of Housing Requirement on Strategic Sites

Locality	RSS Requirements 2006 – 2026 (a)	Constructed 1996 - 2009	Commitments (b)	Balance Required		Estimate New homes non-strategic	Required New homes Strategic Sites
Hereford	8300	887	1170	*6243*		1000	5243
Bromyard	500	48	163	*289*		100	189
Kington	200	54	104	*42*		38	4
Ledbury	800	28	13	*759*		20	739
Leominster	2400	126	597	*1677*		220	1457
Ross-on-Wye	900	197	304	*399*		50	349
Rural Areas	3500	840	844	*1816*		1000	816
Rural Areas 2	1200 ??						
Totals	**16600**	**1640**	**3422**	**11538**		**2428**	**9110**

Version 20 September 2009

General Note: These figures are initial assessments only, intended as a 'first pass' to examine 'what if' scenarios within technical studies such as the WCS and Strategic Flood Risk Assessment

Detailed Notes: (a) For Hereford this is an RSS Preferred Option requirement. For other Towns it is a Core Strategy option
(b) Commitments includes under construction, planning permissions or UDP allocations
(c) Rural Areas 2 reflects possibility of additional 1200 rural dwellings posed by GOWM, as yet unconfirmed.

3.6 Issues for Action - Housing Pressures

Table 3-3 – Issues for Action – Housing Pressures

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions
3a	DCWW estimated total population for all WRZs of study area in the dWRMP is less than the HC estimated population for Herefordshire alone. Requires agreed figures.	DCWW Herefordshire	DCWW and Herefordshire agreed to resolve population figures with latest ONS data.
3b	DCWW estimated population for Hereford CU WRZ is 119,000 compared to HC estimate of 132,000. Requires agreed figures.	DCWW Herefordshire	As above
3c	DCWW estimated population for Hereford CU WRZ is 13,800 compared to HC estimate of 16,100. Requires agreed figures	DCWW Herefordshire	As above
3d	Parish populations from HC date from 2001. Update to 2007/8 would be useful for many purposes.	Herefordshire	As above
3e	HC rural housing balance of Table 3-2 approximately 1969. Letter of 8/5/09 to DCWW identifies 2340 units under RSS Preferred Option.	Herefordshire	Herefordshire Council to check
3f	Significant housing pressures identified in developed areas of Hereford, Leominster and Ledbury. Infrastructure in these areas needs careful assessment. Agreed priorities for action needed.	Herefordshire Environment Agency DCWW	Unresolved. DCWW confirms it requires definitive housing figures, with detailed studies to be funded by developers.
3g	Herefordshire Council concludes that at end of 2008 a balance of 11538 houses has to be constructed by 2026. Does this coincide with DCWW modelling assumptions?	Herefordshire DCWW	See 3a
3h	Forecast emerging spatial strategise (as GIS layer) can be compared to numerous environmental and infrastructure constraints layers for evidence appraisal	Herefordshire	GIS data supplied to Herefordshire Council
3j	Consumption figures for new housing under CSH may be significantly different from existing rates. Natural England has suggested modelling such rates within revised supply-demands	Herefordshire DCWW	Herefordshire could test with Scenarios Model DCWW sees no need as there is no driver for alternative scenarios.

4. WATER RESOURCES AND WATER ABSTRACTION

This Chapter summarises the relevant information sources, technical assessments, infrastructure capacities and potential impacts of increased housing relevant to raw water resources and initial abstraction in so far as they affect Herefordshire.

4.1 Water Availability in Herefordshire

4.1.1 Water Resources in the Wye Catchment

The River Wye catchment is a major source of water not only for Herefordshire but for much of Birmingham, the East Midlands, Leicestershire, Derbyshire and Staffordshire. Severn Trent Water is the principal abstractor of this resource, receiving up to 345 Ml/day from the Elan Valley reservoirs.

The Environment Agency for Wales has undertaken a review of the inflow record for the Elan Valley Reservoirs under the requirements on the Habitats Directive Review of Consents, and concluded that a revision of the flow dataset was necessary. This has resulted in an increase in water available in the Elan Valley and hence downstream along the River Wye. In simple terms, this has increased the annual average deployable output of the Elan Valley system from 307 Ml/d to 336 Ml/d (Severn Trent WRMP).

Severn Trent and Welsh Water (DCWW) both abstract significant quantities of water from the lower Wye around Monmouth. The Severn Trent abstractions primarily supply its Forest and Stroud Water Resource Zone (WRZ) with an export to DCWW in its Ross-on-Wye WRZ, and the DCWW abstractions are primarily used to supply the major conurbations of Cardiff and Newport in its South East Wales Conjunctive Use (SEWCUS) WRZ. The River Wye is a regulated river, and there are complex conditions attached to these lower Wye abstraction licences depending on the quantity of flow in the river as determined at the Redbrook Flow Gauging Station.

Because of the extent to which the Elan Valley Reservoirs and the Wye system are used for public water supply, a compensation flow forms part of the licence conditions. The Environment Agency with DCWW agreed the current rate of compensation release in 1989. The release is triggered once flows in the River Wye as measured at its flow gauging station at Redbrook fall below 1,209,000 m^3/day (14 m^3/s). This results in a maximum release of 231,846 m^3/day (2.68 m^3/s) which also assists flows in the Wye.

All new licences the Environment Agency issues include Hands Off Flow (HOF) restrictions, which are mainly linked to the primary HOF of 1,363,800 m^3/day (15.78 m^3/s) as measured at Redbook Gauging Station.

Whilst these abstractions and their licence implications lie entirely outside Herefordshire and hence the scope of this Water Cycle Study, the Environment Agency has identified through the Habitats RoC process that these lower Wye abstractions have Alone and in-combination impacts causing failure of Habitats Directive Ecological River Flow (HD ERF) in the lower Wye.

Hence, changes in abstraction patterns or quantities upstream (in Herefordshire) potentially have an impact on the lower Wye sites also and are therefore of relevance.

CCW has pointed out that changes may be required to the compensation flow agreement in future in order to maintain flows in the context of the Wye's status as an SAC.

4.1.2 CAMS Assessment Points

Each major catchment that has a Catchment Abstraction Management Strategy (CAMS) is subdivided into Water Resource Management Units (WRMUs). Within each WRMU, water resource availability is further assessed and reported at a number of specific Assessment Points (APs) on the network of CAMS rivers. Each Assessment Point may be associated with a groundwater management unit (GWMU) if there is an aquifer with resources which are significant at the catchment scale.

Water resource assessment at each river AP considers the flows from the entire surface and groundwater catchments upstream of the AP and the influences of all upstream abstractions and discharges on these flows.

There are some 33 APs in the River Wye catchment. 18 of these lie within Herefordshire. The WRMUs and the Assessment Points are illustrated in **Evidence Map 4-1**.

Within each WRMU, generally there are a number of **critical Assessment Points**. These may be defined as where, when comparing several Assessment Points, the 'licensed scenario' (i.e. maximum abstraction potential) first crosses the ecological River Flow Objective at or before the 95% 'ile flow.

Figure 4-1 illustrates the concept of the ecological RFO. First the natural or benchmark flow is determined by standard methods. This is the natural flow of the river with all artificial influences (i.e. abstractions and discharges) removed. Essentially it is a representation of the catchment baseline natural flow pattern over a period of a typical (average) year, based on a long period of record.

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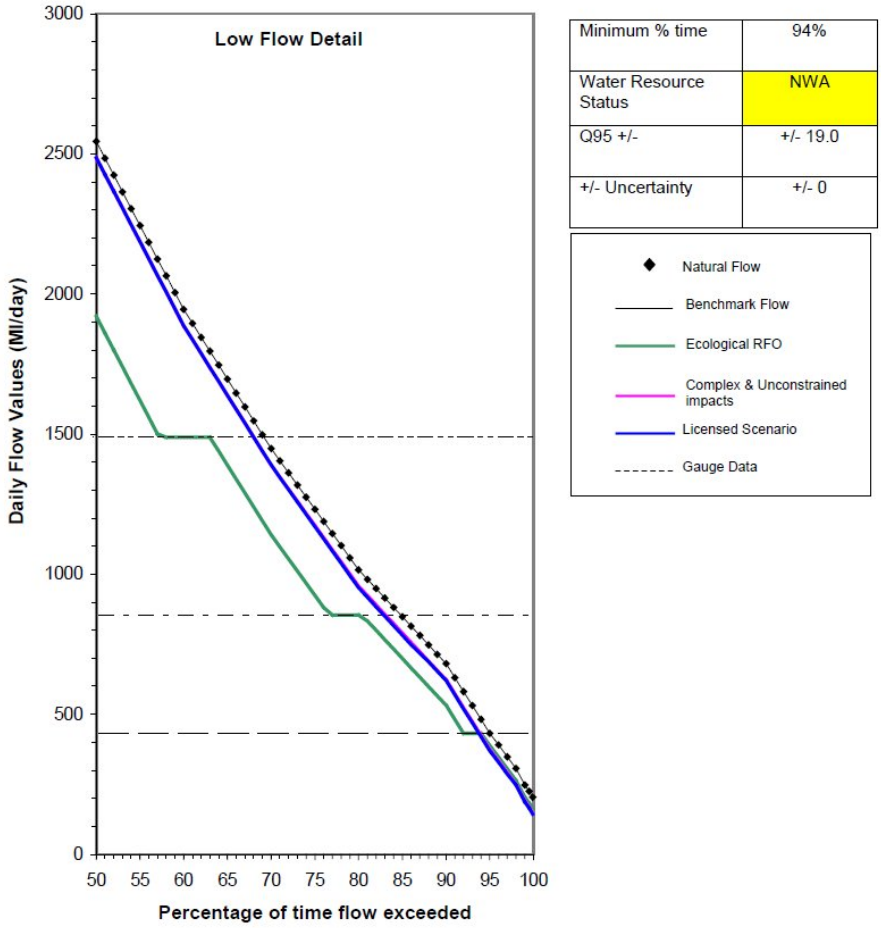
Figure 4-1 – Definition of River Flow Objective with Flow Duration Curve



Source: River Wye CAMS – Chapter 2.

Conventionally in water resources this is expressed as the **Flow Duration Curve (FDC)** for a particular river or point on a river. Hence, for the FDC shown in Figure 4-1, a river flow of 1945 Ml/day is equalled or exceeded 50% of the time. Obviously, for 50% of the time, this same flow is also NOT exceeded. More significantly for critical low flows, Figure 4-1 shows the flow that is equalled or exceeded 95% of the time, in this case 437 Ml/day.

Next the 'licensed abstraction scenario' (which is the actual flow in the river which would result if all abstractions were operating according to the abstraction and discharge scenario assumptions) is superimposed on the same FDC. Essentially the difference between the benchmark flow and RFO lines defines the licensable resource at any given flow.

4.1.3 Water Availability Status within Herefordshire WRMUs

Water availability under the definitions of Figure 1-4 for each WRMU within Herefordshire has been assessed by the Environment Agency for the most critical Assessment Point within the WRMU. This is where the 'licensed

scenario' (i.e. maximum abstraction potential) first crosses the ecological River Flow Objective at or before the 95% 'ile flow.

In other words, if following all abstractions within a particular WRMU there was still sufficient flow in the river equal to or exceeding the 95% 'ile flow, then this catchment would have a status of 'water available'.

Conversely, if the ecological River Flow Objective is crossed by the licensed scenario before the 95% 'ile flow is reached then clearly this WRMU has a potential deficit of water availability. The earlier this threshold is crossed, the greater the potential water deficit.

Table 4-1 – Water Availability Status within Herefordshire WRMUs

WMRU	Critical AP	AP Q50 (Ml/d)	AP Q95 (Ml/d)	EW weight	Min % time LS > RFO	Water Availability Status
WRMU 8	18	2546	432	4	94%	NWA
WRMU 10	11	381	105	4	93%	NWA
WRMU 17	17	4.4	0.5	4	95%	WA
WRMU 1	1	4127	958	4	79%	NWA
WRMU TL						NWA

Interpreting Table 4-1 and cross-referencing to **Evidence Map 4-1**, for example we may assess that WRMU 8 defines the upper Wye WRMU at the Eign Sewage Treatment Works (STW) (Assessment Point 18). The River Wye has a Q95 'low flow' value of 432 Ml/day, and a Median flow of 2546 Ml/day at this location.

This WRMU has a 'high ecological sensitivity to artificial reductions of river flow' (Environmental Weighting class 4). The ecological River Flow Objective is maintained for 94% of the time assuming the licensed scenario, and although this is a very borderline value, the WRMU is just deemed to have 'no water available' for further licensing.

The WRMU worst case is clearly that of WRMU 1 which defines the lower Wye between Eign STW and Redbrook Gauging Station at Monmouth. In this instance the eRFO is maintained for only 79% of the time without being depleted by the licensed scenario.

4.2 Summary Licensing Disposition

To provide insight into what water is taken where and for what purpose, a detailed breakdown of the Environment Agency's issued licenses has been undertaken within the GIS framework.

The key statistics are summarised in **Table 4-2** (Surface Water) and **Table 4-3** (Groundwater). Data are further disaggregated by the Water Resource Management Unit (WRMU) in which they occur, and the purpose of the abstraction. Although the mapped data of **Evidence Map 4-2** and **Evidence Map 4-3** shows all abstractions within the Wye and Teme catchments, **Table 4-2** and **Table 4-3** summarise only those abstractions occurring within Herefordshire.

Obviously the total licensed position is of relevance to the Environment Agency and the wider catchments, but it is useful also to identify just those falling within the LPA area.

There are some interesting and significant interpretations from these Tables.

- Of the total of 278 Ml/d of licensed (not Recent Actual) abstractions, potable water accounts for 23% of the total quantity across 5 WRMUs covering Herefordshire.
- Spray irrigation for agriculture from direct abstraction accounts for 36% of the licensed total.
- Spray irrigation for agriculture from stored abstraction accounts for a further 25% of licensed total quantity
- Industrial process water accounts for a surprisingly negligible amount, although general uses including quarries, golf courses and general farm use make up the balance of 16%.

4.2.1 Surface Water by Sector

Figure 4-2 summarises the disposition of all surface water abstraction licenses within Herefordshire. This should be viewed in conjunction with **Table 4-2**. The total amount of licensed surface water abstraction within Herefordshire is currently 278 Ml/day. Three sectors dominate the licensed position.

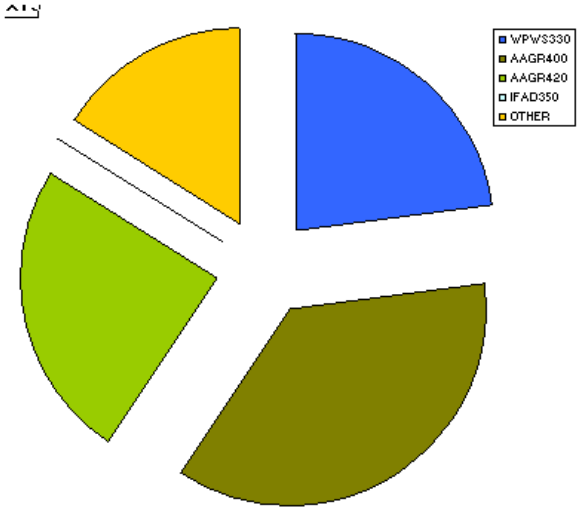
Potable Water Supply (WPWS330) accounts for 23%; Spray Irrigation via direct abstraction (AAGR400) accounts for 36%; Spray Irrigation via storage (AAGR420) accounts for 29%; Industrial Process Water and Others accounts for the remaining 12%.

Hence agriculture, and spray irrigation in particular, accounts for 65% of all the water potentially abstracted within Herefordshire, double of that for potable water.

Interpretation of the matrix of **Table 4-2** allows interesting facts to be derived either by water use sector or by Water Resource Management Unit.

- For example, the biggest single sectoral use of water is stored spray irrigation water in WRMU 10 (Lugg catchment), licensed for 52% of all water abstractions.

Figure 4-2 – Licensed Surface Water Abstractions by Sector



4.2.2 Groundwater by Sector

Figure 4-3 summarises the disposition of the groundwater abstraction licenses by WRMU and by Sector. This should be viewed in conjunction with Table 4-3. The total amount of licensed ground water abstraction within Herefordshire is currently 62 Ml/day. Potable water abstraction accounts for 47% of the total, and is the dominant sector.

The next most significant sectors are equally divided between water for agriculture (20%) and industrial processes (19%). Mineral extraction and other general uses make up the balance of 14%.

Figure 4-3 - Licensed Ground Water Abstractions by Sector

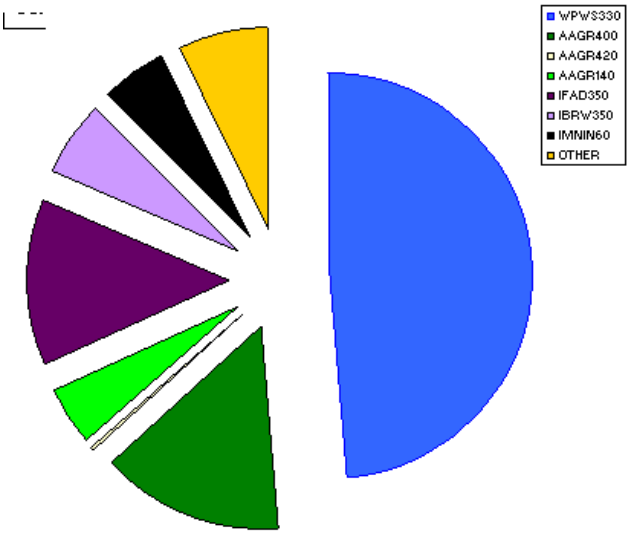


Table 4-2– Licensed Surface Water Abstractions by WRMU and Type

WRMU	All Licenses Ml/day	As % of Q95 Low Flow	Public Water Supply WPWS330	Agriculture Spray Irrigation AAGR400	Agriculture Spray Irrigation AAGR420	Industrial Process Water IFAD350, IFAD160	Other
WRMU 8	71.71(46)	17%	52.0 (1) (72%)	15.2 (29) (21%)	3.46 (5) (4.8%)	0.118 (1) (0.9%)	0.932 (10) (1.3%)
WRMU 10	80.30 (129)	76%	1.14 (1) (1.4%)	27.2 (58) (34%)	41.9 (38) (52%)	0	10.06 (32) (12.6%)
WRMU 17	3.94 (6)	788%	0	3.69 (3) (94%)	0.136 (1)	0	0.114 (2)
WRMU 1	80.36 (145)	8%	2.01 (2) (2.5%)	38.2 (69) (46%)	23.12 (44) (29%)	0.118 (1) (1.5%)	16.91 (29) (21%)
WRMU T	41.77 (55)		9.0 (1) (22%)	16.1 (27) (38%)	N/A	0.109 (1)	16.56 (26) (40%)
Total	**278.1 (381)**		**64.15 (4)** (23%)	**100.39 (186)** (36%)	**68.6 (88)** (25%)	**0.345 (3)** (0%)	**44.56 (99)** (16%)

Purpose Codes:

AAGR140	Agriculture: General farming and Domestic
AAGR400	Agriculture: Spray Irrigation direct
AAGR420	Agriculture: Spray Irrigation via storage
IFAD350	Industrial: Process Water
IFAD160	Food and Drink General
IBRW350	Brewery process water
IMIN60	Mineral Products
WPWS330	Potable Water Supply: Direct

* (first number in brackets refer to number of licenses within Herefordshire, second number refers to % of total within Herefordshire)

Table 4-3 - Licensed Ground Water Abstraction by WRMU and Type

WRMU	All Licenses Ml/day	Public Water Supply WPWS330	Agriculture Spray Irrigation AAGR400	Agriculture Spray Irrigation AAGR420	Agriculture General Use AAGR140	Industrial Process Water IFAD350, IFAD160	Brewery Process IBRW350	Quarrying IMIN60	Other
WRMU 8	3.65 (23)	0	2.00 (5) (55%)	0	0.489 (14) (13.4%)	1.06 (1) (29%)		0	0.10 (3) (2.7%)
WRMU 10	37.47 (94)	26.37 (2) (70%)	3.29 (8) (12.5%)	0.198 (2)	1.64 (60) (4.3%)	0.674 (3) (1.8%)		3.3 (1) (8%)	2.27 (18) (6%)
WRMU 17	12.9 (14)	0	0	0	0.061 (3)	6.78 (1) (53%)	4.14 (2) (32%)		1.92 (8) (14.9)
WRMU 1	8.10 (53)	2.27 (1) (28%)	4.06 (12) (50%)	0	1.23 (31) (15.2%)	0.08 (2) (1%)		0	0.46 (7) (5%)
WRMU T	1.0 (1)	1.0 (1)							
Total	**63.12 (185)**	**29.64 (4)** (47%)	**9.35 (25)** (15%)	**0.198 (2)**	**3.13 (108)** (4.8%)	**8.59 (7)** (13.6%)	**4.14 (2)** (6.4%)	**3.3 (1)** (5.2%)	**4.75 (36)** (7.5%)

Purpose Codes:

AAGR140	Agriculture: General farming and Domestic
AAGR400	Agriculture: Spray Irrigation direct
AAGR420	Agriculture: Spray Irrigation via storage
IFAD350	Industrial: Process Water
IFAD160	Food and Drink General
IBRW350	Brewery process water
IMIN60	Mineral Products
WPWS330	Potable Water Supply: Direct

* (first number in brackets refer to number of licenses, second number refers to % of total for the whole WRMU)

4.3 Public Water Supply

4.3.1 Dwr Cymru Water Resource Zones

Public water supply throughout Herefordshire is principally the responsibility of Dŵr Cymru-Welsh Water (DCWW). Severn Trent Water (STW) supplies a very small part of Herefordshire between Ledbury and West Malvern. This has arisen historically because Herefordshire, whilst in England, falls within the catchment of the River Wye, which has its headwaters and a large percentage of its area falling within Wales. The River Wye and its headwater reservoirs of the Elan Valley supply a significant proportion of the raw water resource to Birmingham, the west Midlands and beyond as well as Herefordshire.

Figure 4-4 – Craig Goch, an Elan Valley Raw Water Source

Source: © B Faulkner 2007

For water resource planning purposes all water companies divide their areas of operation into Water Resource Zones (WRZs) which should not be confused with the Water Resource Management Units (WRMUs) used by the Environment Agency for water availability purposes.

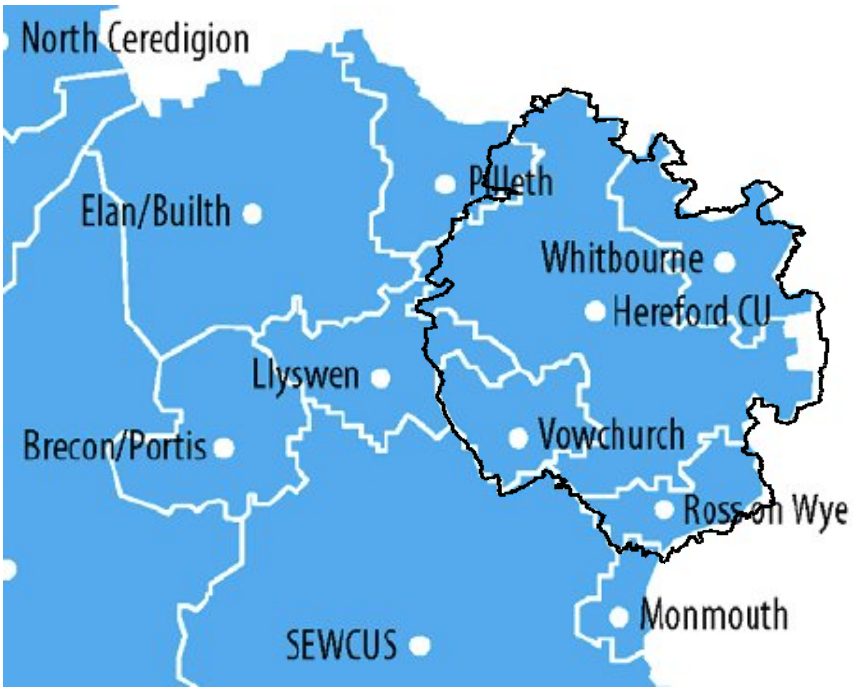
The delineation of a WRZ will arise from many factors, including principally the historic development of infrastructure responding to population pressures. WRZs are not therefore necessarily limited by topographic divides or administrative boundaries.

A Water Resource Zone is the largest possible zone in which all water resources, including external transfers, can be shared and hence the area in

which all customers experience the same level of service or risk of supply failure from a resource shortfall.

A WRZ is therefore the fundamental planning unit to consider when assessing the spatial impact of housing demands on potable water availability.

Figure 4-5 – Water Resource Zones in Herefordshire



Source: Welsh Water Draft Water Resources Management Plan 2008

There are six WRZs covering Herefordshire. Four of these largely fall within and follow the administrative boundary of Herefordshire:

- Herefordshire Conjunctive Use (Zone 8103)
- Whitbourne (Zone 8111)
- Ross on Wye (Zone 8101)
- Vowchurch (Zone 8110)

Of these, Hereford CU Zone 8103 alone comprises some 1253 km² or 58% of the Herefordshire administrative area.

The remaining two WRZs contain relatively small parts of Herefordshire:

- Pilleth (Zone 8107)
- Llyswen (Zone 8105)

4.3.2 DCWW Licensed Abstractions

This section summarises for later reference all of the currently licensed abstractions held by DCWW for Herefordshire water supply. A distinction should be drawn between the licensed quantity and the recent actual abstraction, which may be significantly less.

4.3.3 Dŵr Cymru Water Resources Assessment Requirements

Water undertakers including DCWW in Wales have a statutory duty to prepare and maintain a water resources plan (also known as water resources management plans) under new sections of the Water Industry Act 1991, brought in by the Water Act of 2003. The methodology by which water companies prepare their water resources management plans (WRMPs) are definitively set out by the Environment Agency in the guidance document **Water Resources Planning Guideline 2007** [18].

A water resources plan shows how a water company intends to maintain the balance between supply and demand for water over the next 25 years. The plans are complemented by the water company drought plans, which set out the short-term operational steps that a company will take as a drought progresses.

Companies should set out a baseline forecast of demand for water for 25 years, assuming current demand policies. This should include Government policy and any forthcoming changes in legislation about demand management.

Companies should also consider the impact of climate change on demand, in addition to population growth and the impacts of housing projections. This is particularly relevant in the context of Herefordshire which is a Government designated Growth Point.

The DCWW Draft Water Resources Management Plan (dWRMP) was prepared throughout 2007, and published in March 2008 [4]. However, due to restrictions on its availability imposed by Welsh Assembly Government (WAG), the dWRMP was not made available to the public domain until 15 January 2009.

Simultaneously, DCWW published a Strategic Environmental Assessment (SEA) for consultation to support this Plan. The overall objective of the SEA is to “provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation of plans and programmes with a view to promoting sustainable development” (SEA Directive).

The WRMP covers the 25 year period 2006/07 (the base year) to 3034/35.

4.3.4 Dŵr-Cymru-Welsh Water Level of Service

Levels of service are a contract between companies and their customers. They set out the standard of service that customers can expect to receive from water companies. It is for each water company to decide on a level of service and explain this to customers.

The DCWW WRMP is presented based on the following minimum Level of Service:

- a frequency of not more than 1 in 20 years for a hosepipe ban
- a frequency of not more than 1 in 40 years for a drought permit/order

However, in reviewing future water resource issues, and potential options to resolve deficits, consideration can be given to whether there is potential to vary the Level of Service (LoS) to improve the supply-demand balance.

4.3.5 Supply-Demand Planning Scenarios

For reasons of national consistency and comparison, it is a fundamental requirement of WRMPs that each water company sets out its supply and demand water balances for each of its Water Resource Zones (WRZs) against a pre-defined set of planning scenarios.

Where long-term deficits are identified under a particular scenario, measures need to be identified to offset these deficits. Typically, a water company will provide at least two of the following sets of scenarios in its Water Resources Management Plan.

- Normal Year Annual Average
- Dry Year Annual Average
- Critical Period

For each of the three scenarios, there are three principal sets of data Tables:

- WRP1-BL – Baseline data which shows the supply-demand balance (as of 2006/07) forecast to 2034-35 under current constraints and demand patterns. In any of the three scenarios, this may show a supply-demand deficit in a particular year or years. In this case a solution is required to be demonstrated either for that same scenario (Normal, Dry Year, Critical Period, or all).
- WRP3 – The identified preferred solution to offset any identified deficit (Ml/d) is set out annually under WRP3.
- WRP4-FP – Final Planning solution, which shows the proposed supply-demand balance annually once the identified solution is included to the appropriate deficit scenario.

Table 4-4 summarises the various scenarios and relevant data Tables from the Environment Agency national format.

Table 4-4 – Water Company Standard Water Resource Scenarios

Water Resource Planning Scenarios	Description	Table Ref
Normal Year Annual Average a) Baseline b) Solutions c) Final Planning	Normal weather and demand based from 2006/07 Annual supply-demand 'as is' Quantitative solution for any deficits Revised supply-demand with solutions	WRP9
Dry Year Annual Average a) Baseline b) Solutions c) Final Planning	Representative dry period but with unconstrained demand Annual supply-demand 'as is' Quantitative solution for any deficits Revised supply-demand with solutions	WRP1-BL WRP3 WRP4-FP
Critical Period a) Baseline b) Solutions c) Final Planning	Relevant where sources are limited or where balance is sensitive to demand Annual supply-demand 'as is' Quantitative solution for any deficits Revised supply-demand with solutions	WRP1-BL WRP3 WRP4-FP

In the Guidelines, the Environment Agency stipulated that all WRMPs should have 2006/07 as the base year.

(A complicating factor however was that in this period 2006/2007, many companies had demand saving campaigns and customer restrictions in place, hence the actual data was not representative of a 'normal year'. Adjustments were therefore necessary to normalise the data by making assumptions about the impact of normal or average weather patterns on the 2006/2007 base year data).

For the benefit of the Local Authority strategic planning team, these planning scenarios are defined briefly below.

Normal Year Scenario – Average Annual Demand
This forecast should assume normal or average weather patterns and should be consistent with data in the company's draft and final business plans. As implied, this is the demand for potable water (including leakage) from all sources within a specific WRZ. It assumes an annual demand distributed equally (daily) across the period.

It therefore represents the general total need for water within a typical year, but does not reflect the need for water over much shorter or critical time-scales, which over this time period may be significantly larger than the average daily demand.

Dry Year Scenario – Average Annual Demand
The dry year is defined as a period of low rainfall and unconstrained demand, and should be based on actual historical data. For DCWW the dry year was established as the year exhibiting the highest average demand over the period 2002 – 2007.

The rationale for the Dry Year Average scenario is that there is a strong correlation between a dry year and increased demand for water.

For every Water Resource Zone, a peaking factor of dry year to normal year has been defined based upon the variance that the dry year demonstrates above the average within the period. Essentially, the peaking factor (PF) is the ratio of the maximum flow (or demand) to the average daily flow (or demand) in the water system.

The resulting dry year from this analysis is evidently different for each WRZ, and as such the peaking factors are critical to a correct long-term appraisal of the long-term supply-demand balance.

Critical Period Scenario
For some Water Resource Zones however, the use of an annualised dry year supply-demand balance may still mask short periods of time (days or weeks) when a critical deficit might occur and which therefore has to be planned for.

Hence, companies may need to consider critical period scenarios where:

- a resource zone is supplied only by groundwater or run of river abstractions and limited storage
- resource zone supply-demand balances are judged to be particularly sensitive to peak demands and where resource management rather than operational measures are required.
- there is a substantial short-term increase in demand due to tourism or seasonal industrial or agricultural demand

This is very much the case for the WRZs in Herefordshire, which depend largely either on run of river supplies with limited storage or single source groundwater sources.

The duration of the critical period is company and WRZ specific; DCWW has in its case defined these critical periods as peak weeks. As for the Dry Year Scenario, the demand in this critical period is based on a peaking factor applied to the Annual Average demand figure.

4.3.6 Potable Water Abstraction Key Statistics

A summary of the key attributes of each WRZ, including the disposition of the various abstractions is presented in **Table 4-5**. From Table 4-5 we may infer that the total licensed quantity of abstraction relevant to Herefordshire is in the order of 96.2 Ml/day. Of this the Broomy Hill abstraction accounts for 52 Ml/day or 54% of the total.

Based on 2006-07 data, the indicative average quantity abstracted for use throughout Herefordshire was in the order of 57.8 Ml/day or 60% of the licensed quantity.

The latter figure represents an average consumption however. A typical peaking factor of say 1.2 – 1.4 to account for short period increased demand applied to the average figure yields a potential demand of 68 Ml/day, or 71% of licensed abstraction.

Where known, DCWW has provided an estimate of the treated water maximum capacity of the various key Water Treatment Works (WTWs). Generally this is close to the licensed abstraction value.

In the case of Broomy Hill, the largest single source for Herefordshire, the current estimated maximum treatment capacity is in the order of 58 Ml/day or 11.5% above the current licence maximum limit.

4.3.7 DCWW Climate Change Assumptions

It is a requirement of Water Resource Management Plans (WRMPs) that climate change effects are assessed by the water company. The assumptions for climate change and the impact on the supply demand balance should be clearly stated for each WRZ. Climate change may impact on:

- Available supply (a reduction in Deployable Output)
- Demand Patterns (future uncertainty reflected in increased headroom)
- Both supply and demand simultaneously

Since the assessment of climate change for the last Water Resources Plan submission (UKCIP, 2002) subsequent studies have utilised these climate change models to develop more 'localised', catchment-specific climate change factors (UKWIR, 2007). This provides significantly improved results, particularly for Wales, as it moves DCWW from a position of assessing climate change impact to Wales (2004) to the current position of assessing the impact to individual sources

Figure 4-6 – Comparison of UKCIP02 and UKWIR07 Scenarios

Climate Change Factors													
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wales	UKCIP02	medium	4	3	-1	-4	-10	-17	-22	-26	-22	-12	-2	4
		low	4	3	-1	-4	-9	-15	-20	-24	-20	-11	-2	4
		high	5	4	-1	-4	-11	-18	-24	-28	-24	-13	-2	4
Alwen - Dee	UKWIR07	mid	11	5	5	-6	-13	-8	-11	-22	-9	-1	6	4
		wet	32	21	24	6	2	10	4	-3	15	19	19	18
		dry	-9	-11	-13	-18	-29	-26	-27	-42	-34	-22	-7	-11
Clwyd Coastal		mid	12	5	6	-7	-15	-7	-11	-23	-9	-1	6	4
		wet	33	22	26	6	1	12	5	-2	16	20	20	19
		dry	-8	-12	-14	-19	-31	-26	-28	-44	-35	-22	-8	-11
N Ceredigion		mid	14	5	5	-8	-16	-8	-13	-24	-9	-1	6	4
		wet	35	21	28	4	1	12	6	-2	20	21	18	18
		dry	-6	-12	-18	-20	-33	-28	-31	-47	-39	-23	-6	-11

Source: DCWW dWRMP 2008, Table 9

Figure 4-6 confirms that typically, under the UKWIR07 dry scenario, summer rainfall is expected to reduce by 20 – 40% in some Zones. This is consistent with the latest UKCP09 forecasts.

With regard to supply impacts, DCWW notes that there are a number of zones which are classed as licence constrained, particularly in the Upper Wye and Herefordshire area. In these cases, there has been **an assumption of no climate change impact**, because the Environment Agency has not advised of any such reductions. We take these to include the key sources for Hereford, Bromyard and Ross-on-Wye.

With regard to demand impacts, climate change is considered wholly as part of the uncertainty component within the Target Headroom allowance.

DCWW has pointed out that currently there is no incorporation of climate change (reductions) in the ongoing RoC process. The reductions, such as they are (see below) apply only to the perceived ecological requirements of the affected sites. DCWW considers this to be a significant failing in the Environment Agency review process, but in the interim, has assumed that its existing licence quantities will not be impacted by climate change.

The Environment Agency's confirmed view (meeting 12.09.09) is that whilst climate change impacts are undoubtedly highly relevant to future scenarios, the Habitats Regulations process specifically restricts the Agency to making current-day licence alterations on the basis of established quantifiable evidence.

DCWW has provided a Section on climate change, but it is not explicitly clear what assumptions are made for individual WRZs. The Environment Agency Guidelines suggest that for supply impacts, an explicit reduction in Deployable Output should be made. For demand impacts, the Target Headroom should be increased. Both impacts directly affect the Supply-Demand balance.

There is disagreement by DCWW that climate change should be reflected in reductions in Deployable Output, as this implies a definitive reduction in resource, which if occurring would be reflected in actual reductions in yield.

Whilst we agree that there is considerable uncertainty around climate change predictions (hence probabilistic methods are initially appropriate), IF climate change reductions are realised to the extent anticipated, the reality is that these WILL in effect constitute a definitive reduction in Deployable Output in the long-term. However, these cannot be quantified so far in advance, and we would support DCWW's position that climate change impacts are significantly uncertain, and are therefore more appropriately dealt with initially by increasing the target headroom on the supply-demand balance, at least until reductions in source yield can be established through monitoring.

'What If' type scenarios should therefore be assessed at the earliest opportunity, including Herefordshire Council, who it can be argued, have a leading role to play through the planning process in promoting water efficiencies across the whole County and all sectors.

The Water Resource Zone Supply-Demand models that we have developed for this study allow explicit incorporation of climate change (and RoC) reductions by simply inputting a reduced Deployable Output (and/or increasing the target headroom), and will show how the supply-demand balance could be affected (See Section 5).

Justification for alterations to the models in this way would however require the outputs from much more complex climate change modelling, and guidance would have to be sought from DCWW in particular.

4.3.8 Water Resources Summary – Zone 8101 Ross

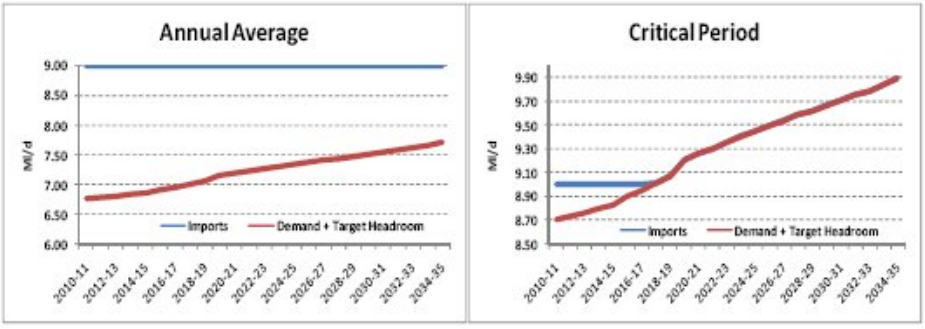
Figure 4-7 summarises the draft water resources position for this zone. Ross on Wye WRZ is dependent on a 9 Ml/d Bulk Water Agreement with Severn Trent Water. Generally, for the Dry Year Annual Average (DYAA) scenario, the zone is in surplus throughout the planning period, hence no final planning solutions are needed.

Figure 4-7 – Water Resources: Zone 8101 Ross on Wye

8101 Ross on Wye

PR04 Status
This zone was in surplus.

Current Status
The Annual Average planning scenario is in surplus throughout the planning period, whilst the Critical Period planning scenario is in surplus until 2017, and then from this point onwards supply is equal to demand. The maximum surplus under the Annual Average scenario is 2.61 Ml/d in 2009/10 and 0.78 Ml/d under the Critical Period scenario in 2009/10.



Final Planning Solution
No schemes required.

Source: DCWW draft WRMP March 2008

4.3.9 Water Resources Summary – Zone 8103 Hereford CU

Figure 4-8 summarises the draft water resources position for this zone. Hereford CU is dependent primarily on run of river sources from the Wye at Broomy Hill, with a WRZ total deployable output of 56.3 Ml/d, of which Broomy Hill provides 52 Ml/d. Generally, for the Dry Year Annual Average (DYAA) scenario, and the Critical Period (CP) scenario, the zone is in surplus throughout the planning period, hence no final planning solutions are needed.

The deceasing Supply-Demand balance is more a reflection of the increasing Target Headroom specified across the period, which has to take into account increasing uncertainty, most particularly for climate change but also demand patterns.

Actual consumption for this Zone actually remains near constant through to 2034-35. This is achieved by DCWW assuming that Unmeasured Households (using 167 l/p/d) will basically decrease at around 3% each year, counter-balanced by an increase in Measured Households using 132 l/p/d. The water saving thus realised offsets all of the new housing arising from the Regional Spatial Strategy.

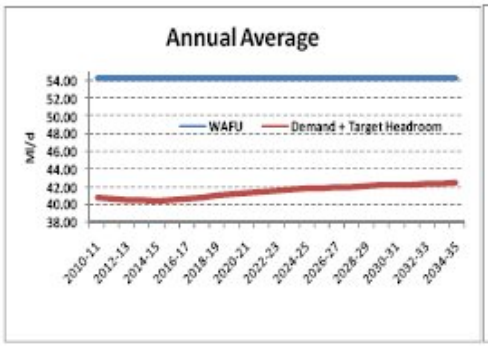
98.4% of WRZ 8103 falls within Herefordshire UA, not 73% as reported by DCWW dWRMP Table 8.

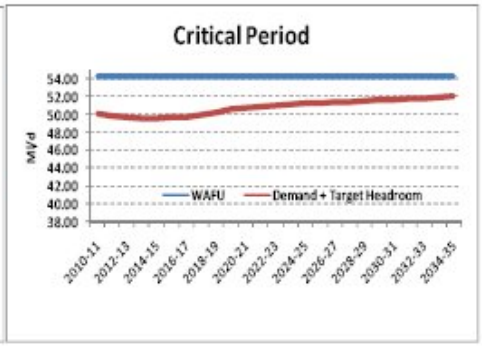
Figure 4-8 - Water Resources: Zone 8103 Hereford CU

8103 Hereford Conjunctive Use System

PR04 Status
This zone was in surplus.

Current Status
Both the Annual Average and Critical Period planning scenarios are in surplus throughout the planning period. The maximum surplus under the Annual Average scenario is 14.02 Ml/d in 2014 and 4.76 Ml/d under the Critical Period scenario in 2013.





Final Planning Solution
No schemes required.

Source: DCWW draft WRMP March 2008

4.3.10 Water Resources Summary – Zone 8105 Llyswen

Figure 4-9 summarises the draft water resources position for this zone. Herefordshire occupies only 17% of the WRZ area, but under the emerging spatial strategy, it is possible that a maximum of 150 new houses may be developed between Hay on Wye and Peterchurch.

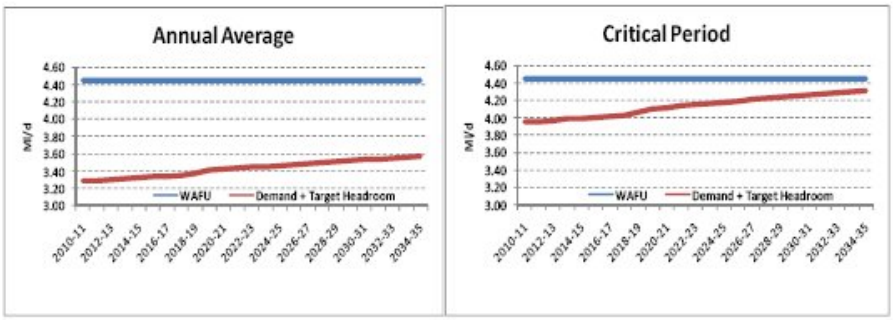
Generally, for the Dry Year Annual Average (DYAA) and CP scenarios, the zone is in surplus throughout the planning period, hence no final planning solutions are needed.

Figure 4-9 - Water Resources: Zone 8107 Llyswen

8105 Llyswen

PR04 Status
This zone was in surplus.

Current Status
Both the Annual Average and Critical Period planning scenarios are in surplus throughout the planning period. The maximum surplus under the Annual Average scenario is 1.23 Ml/d in 2008 and 0.58 Ml/d under the Critical Period scenario in 2008.



Final Planning Solution
No schemes required.

Source: DCWW draft WRMP March 2008

4.3.11 Water Resources Summary – Zone 8107 Pilleth

Figure 4-10 summarises the draft water resources position for this zone. Herefordshire occupies only 16% of Pilleth WRZ. The emerging spatial strategy suggests that the only growth area is likely to be at Presteigne, with some 20 houses.

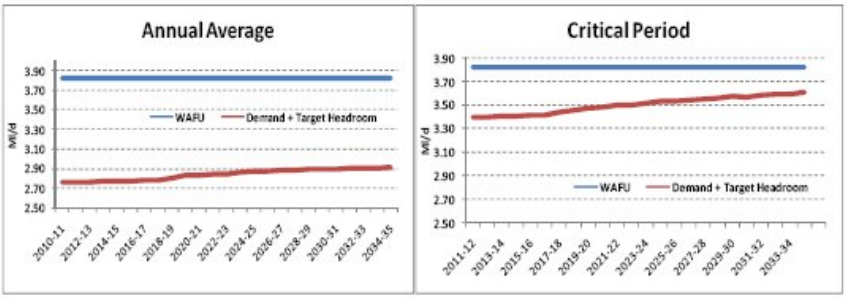
Generally, for the Dry Year Annual Average (DYAA) scenario and CP scenario, the zone is in surplus throughout the planning period, hence no final planning solutions are needed.

Figure 4-10 - Water Resources: Zone 8107 Pilleth

8107 Pilleth

PR04 Status
This zone was in surplus.

Current Status
Both the Annual Average and Critical Period planning scenarios are in surplus throughout the planning period. The maximum surplus under the Annual Average scenario is 1.06 Ml/d in 2010 and 0.42 Ml/d under the Critical Period scenario in 2010.



Final Planning Solution
No schemes required.

Source: DCWW draft WRMP March 2008

4.3.12 Water Resources Summary – Zone 8110 Vowchurch

Figure 4-10 summarises the draft water resources position for this zone. Vowchurch WRZ is fully dependent on the Vowchurch boreholes with a licensed abstraction of 4.0 Ml/d. The Dry Year Annual Average Deployable Output (DO) is 3.66 Ml/d, with a peak week demand (06-07) of 2.88 Ml/day.

Generally, for the Dry Year Annual Average (DYAA) scenario, the zone is in surplus throughout the planning period.

With respect to the Critical Period scenario however, water availability is less assured. Under the baseline scenario, there is a marginal supply surplus until 2009-10. After 2009-10, demand exceeds supply by a marginal 0.07 Ml/day, equivalent to 11.5 l/p/d. The Supply Demand balance is thus in deficit by some -0.21 Ml/day. This increases to -0.31 Ml/day by 2034-35.

Whilst the supply deficit is marginal (and for a short duration period only), DCWW must demonstrate a final planning solution to offset the deficit. The final planning option is to upsize the Trunk Main from Hereford at a cost of

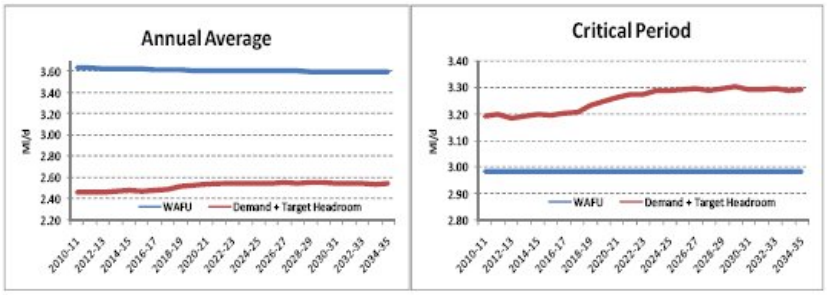
£0.43M, yielding an additional maximum 0.32 Ml/day at full implementation, closer to 0.22 Ml/day in operation.

Figure 4-11 - Water Resources: Zone 8110 Vowchurch

8110 Vowchurch

PR04 Status
This zone was in deficit to a maximum of 0.2 Ml/d. To resolve this, a combination of leakage and pressure reduction and water efficiency schemes for non-household customers was implemented with a total capital expenditure of £0.2 million.

Current Status
The Annual Average planning scenario is in surplus throughout the planning period, by a maximum of 1.31 Ml/d in 2009/10. However, the Critical period planning scenario is in deficit throughout the planning period, reaching a maximum of 0.32 Ml/d in 2029/30.



Final Planning Solution
To resolve the deficit in the Critical Period planning scenario, the following Option has been selected:

- Upsize trunk main from Hereford

Welsh Water has funding to begin work on this scheme immediately and once completed will deliver up to a maximum of 0.32 Ml/d by 2028/29.

Source: DCWW draft WRMP March 2008

4.3.13 Water Resources Summary – Zone 8111 Whitbourne

Figure 4-11 summarises the draft water resources position for this zone. Whitbourne WRZ is fully dependent on the runoff river source from the River Teme abstraction point. The maximum licensed abstraction is 9.0 Ml/d. The Dry Year Annual Average Deployable Output (DO) is 8.4 Ml/d. The Critical period DO is 7.0 Ml/day, with a peak week demand (06-07) of 6.7 Ml/day. The reason for the reduction in DO is not clear.

Hence peak demand is already close to the Deployable Output for this Zone.

Under the DYAA scenario, the Zone is in surplus throughout the planning period. Under the CP scenario, the Available Headroom is equal to the Target Headroom, hence a Supply-Demand balance of 0.0.

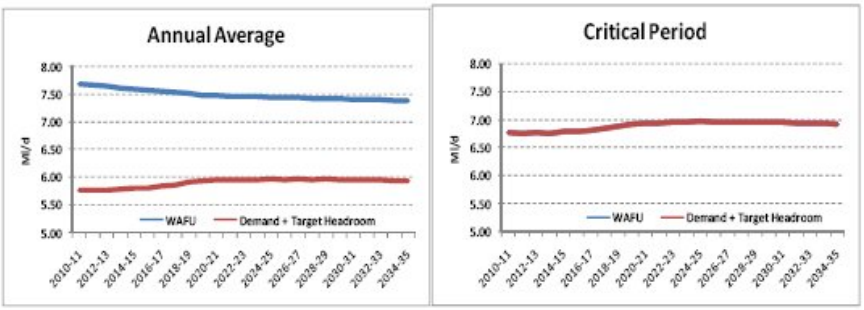
No Final Planning schemes are thus envisaged for this Zone.

Figure 4-12 - Water Resources: Zone 8111 Whitbourne

8111 Whitbourne

PR04 Status
This zone was in deficit to a maximum of 0.1 Ml/d. To resolve this, a combination of leakage and pressure reduction and water efficiency schemes for non-household customers was implemented with a total capital expenditure of £0.2 million.

Current Status
The Annual Average planning scenario is in surplus throughout the planning period, whilst under the Critical Period planning scenario supply is equal to demand. The maximum surplus under the Annual Average scenario is 2.07 Ml/d in 2008/09.



Final Planning Solution
No schemes required.

Table 4-5 – Water Resource Zones and Public Water Supply Abstractions

Sources by WRZ	Abstraction Licence	Licensed Abstraction Quantity Ml/day	Licence Constraints	Average Actual Abstraction (2006/07) Ml/day	Maximum Treatment Capacity Ml/day	Peak Week Demand (2004/05) Ml/day	Peaking Factor
WRZ 8101 - Ross-on-Wye							
		2.27	Mothballed (Nitrates)				
		9.00	Bulk WaterAgreement <= 11 Ml/d				
		1.96	Partly Utilised				
Sub-total		**13.23**		**7.70**		**11.0**	**1.43**
WRZ 8103 – Hereford CU							
		52.0			58.0		
		3.27	Mothballed				
		1.14	Mothballed				
		1.00			1.00		
		3.30			3.30		
Sub-total		**60.71**		**37.6**		**41.0**	**1.09**
WRZ 8105 – Llyswen							
		5.00			4.60		
Sub-total		**5.00**		**3.23**		**3.14**	**??**
WRZ 8107 – Pilleth							
		0.39					
		3.82			3.80		
Sub-total		**4.21**		**2.70**		**2.90**	**1.07**
WRZ 8110 – Vowchurch							
		4.00			4.00		
Sub-total		**4.00**		**2.42**		**2.88**	**1.19**
WRZ 8111 – Whitbourne							
		9.00			6.90		
Sub-total		**9.00**		**5.56**		**6.71**	**1.21**
Grand Total		**96.2**		**57.75**		**67.63**	**1.17**

Note: Information on Licence numbers and locations restricted at request of DCWW

Table 4-6 – Summary of Key Changes in WRZ Forecasts (Final Planning, Dry Year)

Sources by WRZ	Baseline Value 2006-07	Planning Period 2009-10	Planning Period 2019-20	Planning Period 2029-30	Planning Period 2034-05	% adjustment	DCWW Household change	Herefordshire RSS Increase 06 - 26
WRZ 8101 - Ross-on-Wye								
Deployable Output Ml/d	9.0	9.0	9.0	9.0	9.0	0.0%		
Distribution Input Ml/d	5.87	6.09	6.63	6.87	7.08	+ 21%		
Unmeasured Households	5200	4680	3310	2350	1980	- 62%	- 3220	
Measured Households	2750	3720	6590	9050	10170	269%	+ 7420	
Cml Net Increase in Households	0	450	1950	3450	4200			
Target Headroom Ml/d	0.24	0.30	0.52	0.64	0.64	160%		
Supply-Demand Balance Mld	2.25	2.61	1.85	1.49	1.28	- 43%		
WRZ 8103 – Hereford CU								
Deployable Output Ml/d	56.30	56.30	56.30	56.30	56.30	0.0%		
Distribution Input Ml/d	35.51	39.27	38.39	38.50	39.01	+ 10%		
Unmeasured Households	31360	27650	18310	12270	10090	- 68%	- 21270	
Measured Households	19270	24830	40370	52610	57890	200%	+ 38620	
Cml Net Increase in Households	0	1850	8050	14250	17350			
Target Headroom Ml/d	1.78	1.83	2.84	3.72	3.51	98%		
Supply-Demand Balance Mld	13.53	13.26	13.13	12.14	11.83	- 12%		
WRZ 8110 - Vowchurch								
Deployable Output Ml/d	3.60	3.65	3.63	3.62	3.61	0.0%		
Distribution Input Ml/d	2.13	2.20	2.31	2.31	2.32	+ 9%		
Unmeasured Households	1494	1370	1030	770	670	- 55%	- 824	
Measured Households	720	910	1450	1900	2110	193%	+ 1390	
Cml Net Increase in Households	0	66	266	456	566			
Target Headroom Ml/d	0.13	0.12	0.22	0.25	0.23	+ 77%		
Supply-Demand Balance Mld	1.02	1.31	1.07	1.04	1.05	+ 3%		
WRZ 8111 - Whitbourne								
Deployable Output Ml/d	8.40	8.35	8.12	8.04	8.01	- 5%		
Distribution Input Ml/d	5.41	5.37	5.44	5.40	5.43	+ 0.4%		
Unmeasured Households	3370	3090	2320	1750	1530	- 55%	- 1840	
Measured Households	1980	2360	3480	4400	4800	142%	+ 2820	
Cml Net Increase in Households	0	100	450	800	980			
Target Headroom Ml/d	0.28	0.27	0.49	0.55	0.51	82%		
Supply-Demand Balance Mld	1.94	2.05	1.54	1.45	1.44	- 25%		

4.4 RoC Stage 4 Action Plan

4.4.1 Water Resources Impacts and Actions

The River Wye SAC RoC Stage 4 Site Action Plan [8] was released to Herefordshire Council on 15th June 2009, and consequently there has been insufficient time to appraise in detail the Preferred Options details from this lengthy and complex document.

Our summary assessment covers only those principal water sources that directly affect Herefordshire, specifically those identified in **Table 4-7**.

River Wye

With regard to Environmental Outcomes 1 & 3, in essence, the Environment Agency has concluded that for River Wye abstractions the reduction of current maximum abstraction licence limits (either voluntarily or through existing powers) would severely impact the operational flexibility of the public water supply abstractions because the existing licence limits are used periodically to meet peak demands for water. This approach was therefore discounted in favour of more promising options that would meet the EOs with less impact on the abstractors.

This is the EA opinion with which DCWW disagrees. The licence constraints proposed do however severely impact operational flexibility according to DCWW.

The preferred option has been to “Introduce/ amend existing Licence Constraints”.

With regard to the key licence at Broomy Hill, the Environment Agency has proposed that the existing maximum daily licensed quantities of this licence will remain unchanged at 52 Ml/d.

Other detailed information has been withheld at the request of DCWW.

River Lugg

For the River Lugg abstractions, under the maximum licence scenario the HD ERF is not achieved in the River Lugg at low flows (i.e. below Q83 on an annual average flow duration curve). Therefore, to achieve EO1 in the Lugg, the Environment Agency investigated changes to the Stage 4 abstractions causing the failure of the HD ERF (including the two exempt trickle irrigation abstractions).

The specific DCWW public water supply abstraction affected at Pilleth is also likely to be restricted, since it acts in combination with other abstractions (i.e. agricultural).

The approach selected to address the potential adverse effects on the River Lugg, was “Limit abstraction” and this was applied to both licensed and currently licence exempt trickle irrigation abstractions. Within this approach there were two principle options considered.

- to impose new hands-off flow (HOF) conditions
- to reduce abstraction volumes at low flows (impose cut-back rates)

The difference between these two options is that a HOF stops abstraction below certain river flows whereas a cut-back rate allows abstraction to continue but at a reduced rate.

4.5 Water Rights Trading

Water Rights Trading is the transfer of rights to abstract water from one person to another. It involves the trading of rights only, not the trading of actual water. The transferred rights are set out in a new abstraction licence. Water Rights Trading is one way of making the best use of the limited water available for abstraction. It gives current holders of abstraction licences the opportunity to trade the rights to some or all of their water. This in turn allows people to access water in areas where no new abstraction licences are available.

The Environment Agency and OFWAT completed a joint project [19] to investigate the barriers to water rights trading and recommend options to overcome these barriers.

The project started in July 2008 and is now complete. The project assessed the state of trading in England and Wales, considered international examples of trading, did research into the barriers to trading and made recommendations for removing the barriers.

The project's final report makes recommendations to encourage future water rights trading under four categories. These are:

- mechanisms to give the market more information and facilitate bringing traders together
- measures for liberalising the administrative processes associated with trading
- measures around the nature of licence conditions

- measures which could help move towards more sustainable abstraction in the shorter-term.

These issues are also explored in a related document from the Environment Agency which examines the options for alternative ways to allocate water [10]. This study explored whether the current first come first served (FCFS) water allocation system in England and Wales is capable of dealing with future demand and supply pressures and, if not, what alternative approaches and mechanisms could be adopted.

The elements that should be incorporated into a future allocation system are:

1. An approach that is an evolution from the current first come first served allocation mechanism which includes legacy allocations as now based on first come first served, minimum flows for environment, time limiting of all licences, new

provisions to prioritise water use in severe drought and a greater role for trading

2. Use of differential abstraction prices to send signals and incentives (not cost recovery pricing)

3. Possible inclusion of small scale solutions with beneficial potential (such as farmers' abstraction groups operating as collectives, or combined water and land management practices e.g. SCaMP programme operated by United Utilities and RSPB).

4. Collaborative planning partnerships with stakeholders building on Water Framework Directive's River Basin Management Plans (RBMPs) as the process emerges and matures.

5. Auctioning of all or some licences by sector by sector, or altogether, after a minimum flow or quota has been set aside for the environment or auctioning of new licences only.

6. Prioritisation of new supply infrastructure. Some stakeholders believe that this should be the policy goal driving any new approach, from which the design of the allocation mechanisms would follow.

7. More integration of spatial planning decisions, resource availability and allocation to support a balanced supply and demand in the future.

4.6 Summary of Main Issues

4.6.1 Current Raw Water Availability

The CAMS outcome directed by the Environment Agency has concluded that all of the five Water Resource Management Units (WRMUs) covering Herefordshire are at the fully licensed or 'No Water Available' status. This means that any increases in demand for water e.g. population growth or agricultural consumption will have to be met through a combination of:

- Decreased demand
- Increased efficiency of use
- Licence revocations (unused, expired or terminated licenses)
- Licence trading schemes
- Seasonally and/or flow dependant new licences

The Environment Agency's stated position [5] is that demand management as a principal tool to reduce abstraction pressure will make abstraction more resilient to change.

In view of Herefordshire as a key Growth Area, raw water availability and the ongoing license position may become a key factor for each sector of potable water, industrial usage, and agriculture.

We note however that the 'No Water Available Status' is borderline with respect to 3 of the five WRMUs. For WRMUs 8, 10 and 17, the percentage of time that the Licensed Scenarios (LS) are above the ecological River Flow Objectives (eRFO) for each WRMU are 94%, 93% and 95% respectively. Values greater than 95% would put a WRMU into the 'Water Available' category.

However, WRMU 1 (lower Wye below Hereford) is in a greater state of deficit, with the LS depleting the eRFO for 21% of the time. Hence the upstream WRMUs water availability is being over-ridden to protect the lower Wye.

Nevertheless, under current scenarios i.e. at 'No Water Available' status (excluding future Habitats RoC reductions and/or deteriorating climate change effects beyond those envisaged under UKCP09, see below), Herefordshire Council will have a significant role to play in promoting reduced water demands by the baseline population, and in promoting water neutrality (i.e. increased demand by RSS growth offset by increased efficiencies) for new housing.

4.6.2 Water Resources Strategy for Wales and the Twin-track approach

With regards to the resilience of raw water supplies, the Environment Agency (Wales) stated position [5] is that a range of measures will need to be implemented rather than relying exclusively on controlling abstractions to address the wider and longer-term impacts of climate change on the environment.

- Reducing pressure from abstraction
- Careful choice of supply and demand management options
- Large scale reservoirs (principally for public water supply)
- Small scale 'High Flow' Reservoirs, (principally for agricultural abstraction)

The Environment Agency expects water companies to adopt a twin-track approach to managing water supply and demand. Companies should look first at a full range of options for reducing water demand. Only when these are insufficient or economically unjustifiable should companies progress the development of new supply side measures.

To cope with climate change, managing demand is particularly important where there are acute pressures on water resources, and/or high levels of growth are planned. The EA argues that demand management options generally have a lower carbon foot-print.

4.6.3 Habitats RoC Sustainability Reductions

The principal amendments are summarised in **Table 4-7**. In terms of quota at Broomy Hill, there is a reduction to 46.9 Ml/day during April – June. However, Table 4-6 shows that this reduction will not affect the raw water availability position

for Hereford CU WRZ as this is generally in a strong position of surplus (see **Table 4-6**).

The amendments to cover EO2 are less clear in terms of how Broomy Hill may have to be operated in future. DCWW emphasises that EO2 outcomes do not impact deployable output from Broomy Hill.

The licence position on the River Lugg is also unclear as of September 2009. If Lugg restrictions are to be imposed during summer months or low flows, which is also likely to be the period of greatest demand in a critical period, Deployable Output may be affected. DCWW has stated that reductions in the Lugg licences will create a significant deficit in Pilleth water resource zone.

The EA Stage 4 Action Plan (draft) is under review as of September 2009. DCWW has confirmed that it will clarify its deployable output position in a revised WRMP as soon as it has clarified the implications of licence amendments under sustainability reductions.

4.6.4 Climate Change Factors

Impacts of climate change are a key critical issue, and DCWW has itself confirmed that climate change reductions in water availability may become a predominant factor in Headroom calculation for some zones.

Currently, for its licensed constrained Deployable Outputs (most notably Hereford CU), DCWW has made the assumption that there will be no significant reductions in water availability. (The effect of increasing uncertainty about future water demand as opposed to supply is reflected in the increasing Target Headroom shown for most WRZs across the planning period).

In essence, UKCP09 and the EA River Flows 2050 study predictions suggest that summer rainfall may reduce by upto 40% in the West Midlands-East Wales area. River flows in September may be up to 30 – 50% lower in September for example.

These reductions, if realised, have a significant risk of compromising water availability and DCWW Deployable Output from run of river supplies such as at Broomy Hill. These predictions derive from the High Emission scenario however, and DCWW has emphasised that these are not considered under water resources planning scenarios. Furthermore, the River Wye is a regulated river and benefits substantially from regulation releases from the Elan Valley system that support low flows.

The Environment Agency position with regard to climate change impacts on Abstraction Licences is unclear at present. It is conceivable that by 2050, if river flows have systematically declined by 30 – 50% for some months, the Environment Agency may conceivably be stipulating ‘across the board’ reductions in abstraction quantities of similar proportions by means of ‘Hands Off’ conditions.

The potential impact of these reductions i.e. post 2034/35 cannot be assessed at this time. DCWW emphasises that it has assessed climate change impacts within its supply-demand balances as far as 2034/35, and would not estimate impacts or headroom beyond this date until the next cycle of WRMPs.

Increased water efficiencies, reduced demand and aims of 'water neutrality' should be priority areas for investigation in terms of the impact of new housing by Herefordshire Council.

4.6.5 Housing Forecasts and Increased Demand

Table 4-6 taken from the DCWW Final Planning forecasts illustrates that for the 4 principal WRZs covering Herefordshire, all are likely to be in positive Supply-Demand balance across the planning period.

Although its dWRMP forecasts are now outdated, and require revision, DCWW assumptions model a net increase in housing of 10716 units by 2019-20 across these 4 zones. This is broadly comparable to the current Herefordshire RSS projections, which as of 2008 show a balance of 11538 units to be built by 2026.

It is reiterated that the generally static nature of demand across the WRZs as shown in the DCWW water resource Tables is largely due to an assumption that Unmeasured households will voluntarily move across to being Measured Households through the planning period, at a rate of between 2 – 4% each year.

Table 4-7 – Water Resources Impacts – Wye SAC RoC Stage 4 Action Plan

Licence	Location	Preferred Option to Deliver Environmental Outcomes 1 & 3	Preferred Option to Deliver Environmental Outcomes 2
		Information restricted and under review	
		Information restricted and under review	

4.7 Issues for Action – Water Resources and Water Abstraction

Table 4-8- Issues for Action – Water Resources and Water Abstraction

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions (where identifiable)
4a	4 WRMUs across Herefordshire all at 'No Water Available' status. Increased demand will have to be offset by increased water efficiency, reduced demand, licence trading or conditional licences	Herefordshire DCWW EA	EA has confirmed policy on licenses generally, see text.
4b	3 WRMUs actually marginal, but used to protect WRMU 1 (lower Wye) where majority of abstraction is used outside Herefordshire.	EA	None
4c	Confirmation by DCWW that reduction to Broomy Hill abstraction to 46.9 Ml/d from 52 Ml/d (April – June) will not create supply deficits.	DCWW EA	DCWW awaiting reassessment upon RoC finalised licence reductions
4d	Confirmation by DCWW that reduction to River Lugg abstractions will create significant deficit in Pilleth WRZ. Seasonal and Low Flow HoF and cut-back conditions now proposed.	DCWW	DCWW confirms that Lugg reductions will create deficit for Pilleth WRZ.
4e	Summer rainfall may approach -40% below current values, river flow -50% by 2050. If realised, implications for raw water availability and abstraction licensing are profound.	EA DCWW Herefordshire	Under high emissions scenario only. DCWW emphasises that supply-demand balances are adequate to 2034/35 including climate change.
4f	Incorporating all new housing (subject to spatial strategy and trajectories), 4 key WRZs all show supply-demand surplus across planning periods for Dry Year Annual Average scenario.		None
4g	Impact of revised spatial strategies and trajectories must however be tested against RoC reductions and climate change assumptions in combination.	Herefordshire	Strategic sites and phasing still under review.
4h	Active consideration to be given to achieving 'water neutrality' at County level	Herefordshire	Herefordshire reviewing potential policy implications. DCWW would not lead on this.
4i	Supply-demand surpluses shown by DCWW depend very substantially on significant reductions in Unmeasured households, typically 2.5%/year. Is this realistic? What is 2009-10 data?	DCWW	DCWW confirms meter uptake rate at 2-3%/year

5. WATER SUPPLY, DEMAND AND CONSUMPTION

This Chapter focuses on current and future water demand and consumption for both potable water supplies and agriculture. Government policy is set out, and the changes in behaviour needed to achieve this are discussed. Water efficiency Best practice issues are discussed. Water Neutrality as a Council target is discussed.

5.1 Public Water Supply – Infrastructure Constraints

DCWW responded to Herefordshire Council in June 2009 in relation to general constraints regarding essential infrastructure. These comments are summarised under **10.4 Consultation Responses**

DCWW has also supplied a standardised summary statement for each potential housing land site concerning water supply, wastewater and wastewater treatment. These are provided for Hereford and the Market Towns individually, see Section 10, Tables 10-1 to 10-6.

These can be examined on a site by site basis to identify potential future infrastructure constraints.

As DCWW has confirmed on a number of occasions, it cannot commit funding to future infrastructure improvements until such funding is approved by OFWAT through the AMP Review process. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment plan, developers may be required to fund the essential improvements.

DCWW would emphasise that water services infrastructure requirements need to be assessed on an individual basis. It cannot provide this assessment until it is informed where the specific development will be allocated.

It has given assurances to Herefordshire Council that there are no high level constraints at Water Treatment Works level. Should the proposed growth for Herefordshire city materialise, then its initial indications are that the trunk water mains serving the city from both north and south would need to be upsized to ensure security of supplies.

5.2 Public Water Supply - Current Consumption

5.2.1 Per Capita Consumption – Herefordshire

Per capita consumption (pcc) is the amount of water used by each individual at home. Nationally, on average in 2007/08,148 litres of water per person per day were used, but levels of pcc vary quite markedly and in relation to whether or not the supply is metered. In 2008, national average consumption ranged from 107 litres per person per day to 176 litres per person per day. The water companies reporting the highest use per person are all in south east England.

As levels of water metering increase, average water use per person tends to reduce. This is because 'Measured Households' who have a water meter generally use 10 to 15 per cent less water than 'Unmeasured Households' [5]. Therefore, the Environment Agency argues that compulsory installation of meters for new housing and retrospective installation of meters in existing dwellings is a significant tool in reducing water consumption.

DCWW wishes to emphasise that the Government target of 130 l/p/d is a DEFRA target for England only. Areas supplied by Welsh Water fall under the jurisdiction of WAG, and not DEFRA, regardless of whether that area falls within England or Wales. WAG has not set a target and DCWW would refer Herefordshire to WAGs Strategic Position Statement on Water for the relevant government policy.

Table 5-1 summarises the pcc position for the 6 Water Resource Zones covering Herefordshire. Some significant comparisons can be drawn. As of 2008-09, the forecast is that only 42% of the housing stock will be metered.

Table 5-1 – Comparison of PCC in Herefordshire by WRZ

Water Resource Zone (WRZ)	Unmeasured Households 000's	PCC Unmeasured l/p/d	Measured Households 000's	PCC Measured l/p/d
Zone 8101 – Ross-on-Wye	4850	*178*	3400	*141*
Zone 8103 – Hereford CU	28830	*167*	23030	*132*
Zone 8105 - Llyswen	2160	*168*	1330	*141*
Zone 8107 - Pilleth	2390	*156*	920	*129*
Zone 8110 - Vowchurch	1410	*165*	850	*145*
Zone 8111 - Whitbourne	3180	*197*	2240	*171*
Total or Average	42820	*172*	31770	*143*

Source: DCWW dWRMP – WRP Tables – Forecast 2008-09

The 6 zone average figures are somewhat higher than the DCWW regional average figures, which are 126 l/p/d and 157 l/p/d for Measured and Unmeasured Households respectively.

The highest consumer is Whitbourne (Unmeasured households), which uses 53% more per capita than the lowest user (Pilleth, Metered households). This is a very large range; the Whitbourne figure is some 33% above the national average, and

implies significant extravagant use of water by households in this zone, as does the Unmeasured consumption rate for Ross-on-Wye WRZ.

Overall within Herefordshire, the Unmeasured household consumption is 16% above national average, and the Measured household consumption is slightly below national average. Taken together the Herefordshire consumption is 6% above national average, but there would appear to be significant scope to reduce existing consumption in certain areas.

5.2.2 DCWW Leakage Policy and ELL

Citing from the dWRMP, *"Welsh Water is committed to delivering stringent leakage targets, agreed with OFWAT, on an annual basis. Over the last ten years we have halved the total amount of leakage across Wales. We communicate our free reporting Leak-Line via our vans, company publications, customer bills and our website."*

Welsh Water's experience is that proactive action to tackle leakage on customers' supply pipes is currently the most cost effective area of water efficiency for investment. It maintains that it applies a consistent and proactive policy on customer leakage since 2001. Under this policy it provides a free leak detection and repair service for the first leak on a customer's supply pipe. In 2006-07 there were 249 supply pipes replaced free under this policy.

Table 5-5 shows that depending on zone, total leakage generally accounts for 19 – 30% of the Distribution Input (assuming a Dry Year Annual Average scenario).

DCWW sets leakage targets at the zonal level in line with current best practice. This is determined by OFWAT through a new approach known as Sustainable ELL as set out in the OFWAT Guidance [20]. In particular this includes an assessment of the environmental value of water.

The level of losses from water systems is often considered by observers from outside the industry to be unacceptable. Environmentalists and regulators have expressed concerns at the level of losses, and believe that lower levels should be achievable. However, any water company has to work within current operating budgets and seek additional finance if these are not sufficient. Leakage control can be expensive, and water companies will seek to achieve an economic balance between the costs of leakage control and the benefits that accrue. This balance between costs and benefits is common in many fields, and the idea of the economic level of operation is commonplace in many industries.

DCWW emphasises that it has no driver to further reduce leakage in zones where there is a supply-demand surplus. DCWW maintains that it will seek to drive down leakage only where it is economic to do so.

The Environment Agency and some industry leakage experts argue that water as a raw resource is greatly under-valued. Clearly, if the cost of raw water was to increase markedly (through increased tariffs for example) then the ELL would reduce significantly also, and active leakage control would necessarily become much less marginal.

5.2.3 DCWW Leakage Analysis 2006 – 2035

The issues of ELL aside, the DCWW Water Resources Final Planning Tables (WRP4-FP) have been analysed in terms of leakage over the planning period 2006-07 to 2034-05, and show some significant issues, as summarised in **Table 5-5** and **Table 5-6**.

Between Water Resource Zones, as shown in **Table 5-6**, there are some significant issues with respect to water cycle efficiencies. First, Distribution Losses (water lost through the system excluding customer supply pipe leakage) is by far the largest component of total leakage. Table 5-4 shows that for Hereford CU this amounts to an average of 6.19 Ml/d across the planning period. Measured households in Hereford CU typically consume 132 l/p/d, so this distribution leakage amounts to an equivalent consumption of 46,894 people!

Generally the data shows that distribution losses, (the principal component of overall leakage) are hardly reduced over the planning period for any of the zones. Similarly, with the exception of Vowchurch, leakage rate per property does not significantly alter, indeed in several zones it actually increases.

The WRP4-FP Tables in the dWRMP appear to show a marked reduction in equivalent total leakage per property, but this is very misleading with respect to individual property leakage. With distribution losses on the distribution system (trunk mains) more or less constant, then obviously a significant increase in housing will lower the apparent leakage per property. Whilst this is arithmetically correct, it disguises the fact that overall there is generally no active reduction in distribution losses or supply pipe leakages across the planning period.

Vowchurch is peculiar in that it has initially the highest per property leakage rate across the 6 zones (28 l/prp/day), but DCWW maintains that it will manage to reduce this dramatically to 8 l/prp/day by the end of the planning period. The mechanism by which this will be achieved is not clear within the dWRMP, and 8 l/prp/day is significantly below the regional average. This is as a result of an enhanced leakage reduction programme for this zone, which is appropriate only where it is the least cost economic solution.

5.3 Public Water Supply - Future Consumption

5.3.1 DCWW and Future Water Consumption

In its dWRMP DCWW sets out its future forecasts of per capita consumption by each WRZ. These are summarised at intervals in **Table 5-7**.

We note that several of the WRZs forecast per capita consumption well in excess of the Government's aspirational target of 130 l/p/day. In particular all of the residual unmeasured households (which are greatly reduced in number from the 2006-07 baseline figures) nevertheless are forecast to consume water at rates significant higher than the national average.

Areas supplied by DCWW however fall under the jurisdiction of Welsh Assembly Government (WAG), and DCWW maintains that WAG has not set a target for water consumption generally (see 5.3.2 below). Furthermore, WAG and DCWW do not support compulsory metering.

DCWW emphasises that it has included in its demand forecasts future technology and innovation changes using data from the Market Transformation Programme. This assumes levels of changing appliance replacement and sizing modifications.

Accepting that all zones are in a state of supply-demand surplus, nevertheless there still remains the principle of whether or not it is socially or environmentally acceptable for certain sectors of the population to be consuming at these rates. Reduced consumption, however small, offsets climate change effects and contributes to lower carbon emissions.

DCWW therefore currently has no specific target to reduce overall water consumption to the national target of 130 l/p/day.

Overall demand (as defined by Distribution Input) IS generally static for most zones, with the exception of Ross on Wye and Llyswen. This is achieved however by moving unmetered households across to metered or 'measured' households, which would theoretically reduce per capita consumption by some 10 – 15%.

5.3.2 WAG Policy Statement – Planning for Sustainable Buildings

In May 2009 the Welsh Assembly Government (WAG) issued a Ministerial Interim Planning Policy Statement on Planning for Sustainable Buildings [21].

Generally, development proposals should include features that provide effective adaptation to and resilience against the current and predicted future effects of climate change.

To move towards more sustainable and zero carbon buildings in Wales, the Assembly Government expects that the following standards will be met:-

- Applications for 5 or more dwellings received on or after 1 September 2009 to meet Code for Sustainable Homes Level 3 and obtain 6 credits under issue Ene1 - Dwelling Emission Rate.

- Applications for 1 or more dwellings received on or after 1 September 2010 to meet Code for Sustainable Homes Level 3 and obtain 6 credits under issue Ene1 - Dwelling Emission Rate.

- Applications received on or after 1st September 2009 for non-residential development which will either have a floorspace of 1,000 m² or more, or will be carried out on a site having an area of one hectare or more, to meet the Building Research Establishment Environmental Assessment Method (BREEAM)6 'Very Good' standard and achieve the mandatory credits for 'Excellent' under issue Ene1 - Reduction of CO2 Emissions.

Whilst the Statement explicitly addresses climate change and carbon footprints, the above criteria set an implicit target for water consumption also, since Level 3 homes under the Code should have a per capita consumption of not more than 105 l/h/day, see **Table 5-3**

Within Local Development Plans, WAG advocates that Local Planning Authorities should assess strategic sites to identify opportunities for higher sustainable building standards (including zero carbon) to be required. In bringing forward standards higher than the national minimum Local Planning Authorities should ensure that what is proposed is evidence-based and viable. Such policies should be progressed through the Local Development Plan process in accordance with relevant requirements of legislation and national policy.

5.3.3 Metering

In the Water Resources Strategy for Wales [5], with respect to demand management the Environment Agency is of the view that water metering and sliding scales of charges can play an important role in increasing efficiency, providing affordability concerns are addressed. The EA is also of the view that as levels of metering increase, average water use per person will reduce. This is because metered households tend to use 10-15% less water.

However, WAG and Welsh Water do not support compulsory metering, and contrary to the above assertion, DCWW is of the view that it has no evidence to support reductions in consumption as a result of metering, and certainly not at the volumes proposed. It maintains that its metered customers have opted to move to a metered bill predominately for financial reasons, driven by the fact that they are low occupancy households. Metered consumption is therefore skewed and is not reflective of an average metered household.

DCWW wishes to make clear that its policies on water efficiency at zonal level are driven by need – i.e. where the supply demand balance necessitates and where enhanced demand reduction is the least cost, economic solution in that zone.

Meter uptake values used within the Draft WRMP are based upon actual current trends of uptake over a ten year period. However within that period DCWW has experienced uptake at a considerably higher level (up to 3.2%). It has no justification to assume a different uptake rate and it will review this annually.

5.3.4 DEFRA and 'Future Water' Targets

Future expectations of Government policy are set out in Future Water [3]. DEFRA is confident that with today's technology for metering, tariffs and water efficiency that per capita consumption of (PCC) water can be reduced, through cost effective measures, to an average of 130 litres per person per day (l/p/d) by 2030.

It assumes that developments in new technology and future innovation will improve the cost effectiveness of these measures over time and that this can drive consumption down further to an average of 120 l/p/d per day by 2030.

These water consumption targets are an important matter for review between DCWW and Herefordshire.

The Welsh Assembly Government and DEFRA have commissioned an independent review of charging for water and sewerage services for households in England and Wales. Among other issues, the review will consider the effectiveness and fairness of methods of charging and the role of metering.

DCWW has pointed out that it is guided by WAG policy, and that it has included in its demand forecasts future technology and innovation changes using data from the Market Transformation Programme. The Government aspirational target is not the target of the WAG according to DCWW.

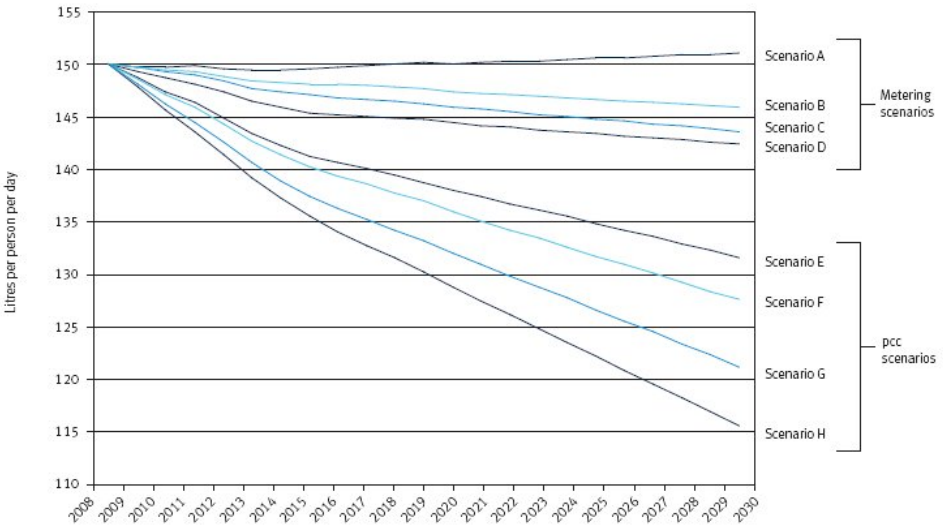
5.3.5 Environment Agency Targets

The Environment Agency asserts that there needs to be a determined effort to reduce the amount of water society uses, from current levels of around 150 litres per person per day. Environment Agency research shows how per capita consumption can be progressively reduced by policies such as tighter design standards for buildings, and increased levels of metering.

The work concludes that DEFRA's aspiration for 130 litres per person per day is realistic, particularly given that there are areas within water companies that already have averages at or below this level. The Environment Agency asserts that the technology is readily available, but also that these aspirations may need tightening in the future as pressures increase. **Figure 5-1** summarises various possible per capita consumption scenarios under different metering and efficiency policies.

Under Scenario A, the 'Do nothing' or 'Business as Usual' situation, pcc is expected to remain at 150 l/p/d. Under the most optimistic scenario, H, with near universal metering and all new homes operating to 85 l/p/d (Sustainable Homes Code 5 & 6), the average pcc might approach 115 l/p/d.

Figure 5-1 – EA Forecasts of PCC under Differing Policies



Scenario	pcc scenario					Metering scenario			
	Business as usual[1]	Internal water efficiency[2]	External water efficiency[3]	New homes built to a standard of 110 l/h/d	New homes built to a standard of 85 l/h/d	Only new houses and those who opt to be metered	Water company projected metering rates[4]	Near-universal metering in seriously water stressed areas by 2030[5]	Near-universal metering in seriously water stressed areas by 2020 [6]
A	✓					✓			
B	✓							✓	
C	✓						✓		
D	✓								✓
E		✓							✓
F		✓	✓						✓
G		✓	✓	✓					✓
H		✓	✓		✓				✓

Source: Water Resources Strategy for England and Wales 2009 – Environment Agency

5.3.6 The role of OFWAT

Water companies have had a duty to promote the efficient use of water by all their customers since February 1996. As a minimum OFWAT expects all companies to provide information to customers about:

- the sensible use of water in the home and garden
- how to conduct a self-audit of household consumption
- the availability of cistern and other water saving devices
- the availability of supply pipe leakage detection/repair
- how to report a leak
- how to get further information

OFWAT provides a Water Efficiency Initiative – Good Practice Register which is a checklist of water efficiency options that companies should consider when planning their water efficiency activities.

With regard to metering, OFWAT's position is that whilst it considers metering to be the fairest method of charging for water, it does not advocate universal metering because, in many areas, the extra capital and operating costs of metering might outweigh the benefits in water savings.

Water companies in areas of serious water stress will be able to compulsorily meter customers from 2010 but only if their 25 year water resource plans, which take account of social and environmental costs, identify compulsory metering as the most economic way to balance supply and demand for the future. Other options include:

- promoting more efficient usage of water
- development of new resources

5.4 Industrial and Business Water Supply – Current Consumption

Currently this has not been assessed in detail as it is not clear what industrial or business expansions are likely as a result of the Core Strategy. Table 5-2 however shows that Non-household water use is a significant proportion of the consumer demand for water within Herefordshire, approaching 40% of consumption across Herefordshire.

It is recommended that Herefordshire Council should adopt a precautionary approach in its Core Strategy analysis and ensure that the foul and water resource supply demand is available to support likely allocations/future development. It should also pursue water resource efficiency and reduction for industrial and commercial uses, perhaps tied to BREEAM and the water neutrality objective that is being progressed.

DCWW has previously confirmed that it would provide detailed comments on water services capacity for specific sites only when it has been advised that these sites have been confirmed by the LPA.

Table 5-2 - Water Consumption by Non-households

Water Resource Zone (WRZ)	Unmeasured Households Ml/d	Measured Households Ml/d	Non-household Ml/d	Non-household % of demand
Zone 8101 – Ross-on-Wye	2.37	0.84	1.38	30%
Zone 8103 – Hereford CU	13.32	5.38	12.1	39%
Zone 8105 - Llyswen	1.01	0.33	0.74	36%
Zone 8107 - Pilleth	0.91	0.21	0.66	37%
Zone 8110 - Vowchurch	0.64	0.23	0.76	47%
Zone 8111 - Whitbourne	1.55	0.69	1.89	46%
Total or Average	19.8	7.68	17.53	39%

(Assuming Dry Year Annual Average baseline scenario and forecast year 08/09) – Values Ml/day

In Vowchurch and Whitbourne WRZs, business consumption approaches half of the total.

It is self-evident that a systematic campaign of water use reduction and improved water efficiency will be most effective if it starts with the largest proportional users of water both by sector and by zone. A simple 'quota score' can be devised multiplying % of demand x quantity, to yield a proportionate score of water use.

On this basis water use reduction efficiency would start in Hereford CU, followed by Whitbourne, Ross-on-Wye and Vowchurch in decreasing priority.

5.5 DCWW Water Efficiency Initiatives

5.5.1 Web Resources

Welsh Water uses a variety of approaches in promoting water efficiency. These include the provision of information to customers on water efficiency and a comprehensive programme of educational activities. It has given particular emphasis to the development of educational initiatives as these provide future populations with an understanding of the issues and challenges associated with water use.

In common with most UK water companies, DCWW operates a high profile water efficiency initiative from its **website**. This provides advice and information about water efficiency throughout the home.

Of particular assistance are the downloadable and informative Water Audits for Homes, Businesses and Schools, which provide guidance on relative use of water by appliances and checklists for undertaking water usage audits.

Figure 5-2 – DCWW Home Audit Water Use Calculator

Water use calculator – how much do you use?
Use the table below to work out your water use

Water use calculator – how much do you use?

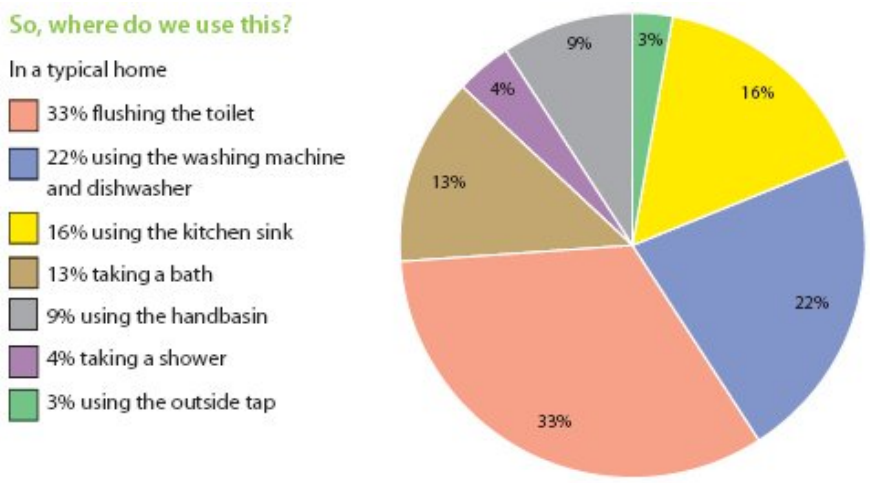
Activity	Average amount of water used (litres)		Number of times each day		Daily total
Bath	80	X		=	
Power shower (with a pump to increase the pressure)	90	X		=	
Ordinary shower	35	X		=	
Old cistern (if the toilet has a water saving device such' as a hippo bag please deduct 3 litres each time the toilet is flushed)	9	X		=	
New toilet cistern (with dual flush)	6	X		=	
Handwashing and cleaning your teeth without the tap running (per person per day)	6	X		=	
Handwashing and cleaning your teeth with the tap running (per person per day)	10	X		=	
Using a washing machine (full or not)	80	X		=	
Using a washing machine on a half load setting	60	X		=	
Using a washing machine which is a water efficient model	55	X		=	
Using a dishwasher	35	X		=	
Using a dishwasher on a half load setting	20	X		=	
Using a dishwasher which is a water efficient model	22	X		=	
Washing dishes by hand	6	X		=	
Cooking and drinking (per person and per day)	10	X		=	
Total for the household per day				=	
Number of people in the house				=	
Average use per person per day				=	

Figure 5-3 – DWR Cymru Water Efficiency Initiative

Source: http://www.dwrcymru.co.uk/english/waterefficiency/index.asp

Figure 5-4 summarises the micro-component consumption of typical household water use.

Figure 5-4 – Micro-component Consumption Typical Household



Typically, 1/3rd of all domestic consumption is used to flush toilets. Modern low flush toilets typically have a 4/6 litre flush capability, but an older toilet cistern can use up to 10 litres per flush, whilst more modern cisterns use between 7 and 9 litres per flush.

More efficient use of toilets, dishwashers and washing machine offer the greatest scope for existing households to lower their daily consumption.

5.6 Demand Scenario and Neutrality Modelling

A significant disadvantage of the Water Resources Planning Tables devised by the Environment Agency with respect to Growth Areas is that they do not readily distinguish between existing housing stock (and per capita consumption) and new housing. This information can be disaggregated from the Tables, but this process is complex and time-consuming.

We consider that Herefordshire Council should be aware of Government long-term water demand targets as set out by DEFRA in respect of new housing, and plan a strategy accordingly. One of the objectives might be to aim for water neutrality for example. This can only be done if there is a clear distinction between per capita consumption (and future trends) of existing households, and new ones arising from the growth strategy.

Accordingly, we have devised an extremely powerful but easy to use scenarios model, which will allow the sensitivity modelling in combination of the following:

- Changes to the quantity and trajectory of measured existing households

- Changes to per capita water consumption of the same
- Changes to the quantity and trajectory of measured new households
- Changes to per capita water consumption of the same

The principal outcomes are the calculated values for Distribution Input, Total Baseline Consumption, Total New RSS Consumption, the Available Headroom, and the final Supply-Demand balance, all for each year of the planning period.

Separate models are available for each of the 4 principal WRZs affecting Herefordshire (Ross on Wye, Hereford, Whitbourne and Vowchurch).

Investigating numerous permutations of the key variables has already yielded some interesting potential outcomes with regard to water neutrality for example, and DCWW strategy on leakage reduction etc. The model operates within Excel, and replicates precisely the supply-demand balances provided by DCCW in their WRP Tables, when the same base data are entered.

Evidence of this is provided in **Table 5-8** which shows that for the specific example of DCWW Final Planning Table WRP4-FP for Hereford CU (Dry Year Average) used as a verification check, all key outputs are matched to within 1%. The differences are either attributable to rounding, or because the trajectory modelled within the spreadsheet makes fixed assumptions about year on year % increases or decreases.

The DCWW WRP Tables not unreasonably assume an equal distribution of new housing across the planning period, but one can already be confident that this is NOT how the housing will develop. The model therefore allows the simulation of a range of alternative housing trajectories, so the precise change in annual total consumption can be identified. Alternative trajectories include:

- Equal across planning period
- Front loaded so that 66% of new housing is complete by 2016
- Back loaded so that 66% of new housing occurs in 2027 – 2034
- Centred, with 70% of new housing occurring between 2018 – 2025
- Two Phase, with peaks in 2015 and 2027
- Random, where the model assigns a random amount of housing (but not more than xx% of total required in any one year. XX% can be controlled).

The model could be used for any number of applications, most notably for:

- Identifying potential bottle-necks in water supply infrastructure if there is a surge in housing construction in any particular zone.
- Examining how water neutrality might be achieved in any particular WRZ

- Establishing trajectories and quantities of water consumption as a strategy to relieve pressure on specific (Sewage Treatment Works) STWs which may be at capacity.

An example output is provided as Table 5-9. Some brief hands-on training is recommended before using the model.

5.7 Code for Sustainable Homes

5.7.1 Introduction

In 2008 the Government confirmed a mandatory rating against the Code would be implemented for new homes from May 2008.

The Code [22] measures the sustainability of a new home against categories of sustainable design, rating the 'whole home' as a complete package. The Code uses a 1 to 6 star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level and, within England, replaces the EcoHomes scheme, developed by the Building Research Establishment (BRE).

5.7.2 Mandatory Ratings

From May 2008, all new social housing in England must be built to a minimum of Code Level 3. The Code is voluntary for privately built housing. However, also since May 2008 all new homes are required to have a Code rating in the Home Information Pack (HIP). This means that homes built to, and assessed against the Code, must include the Code certificate within the HIP.

Table 5-3 – Code for Sustainable Homes – Water Consumption Ratings

Code Level	Potable water consumption l/p/d	Surface water run-off
❶	120	Peak runoff & annual volume <= pre-site status
❷ ❷	120	
❸ ❸ ❸	105	
❹ ❹ ❹ ❹	105	
❺ ❺ ❺ ❺ ❺	80	
❻ ❻ ❻ ❻ ❻ ❻	80	

In May 2009 the Welsh Assembly Government (WAG) issued a Ministerial Interim Planning Policy Statement on Planning for Sustainable Buildings [21]. For example, to move towards more sustainable and zero carbon buildings in Wales, the Assembly Government expects that the following standards will be met:-

Applications for 5 or more dwellings received on or after 1 September 2009 to meet Code for Sustainable Homes Level 3 and obtain 6 credits under issue Ene1 - Dwelling Emission Rate.

Hence, new properties in Wales will have to be built to a standard of 105 l/p/day in terms of water consumption.

5.8 Water Efficient Buildings

5.8.1 Regulatory Framework

The Government is pursuing a range of initiatives aimed at improving the water efficiency of new buildings. Regulation is changing rapidly. A reduction in water consumption in new homes has been addressed by CLG through a review of Part G of the Building Regulations (due to come into effect in October 2009) and the Code for Sustainable Homes.

The Government is in the process of setting water efficiency targets for non-domestic buildings, but at the moment the BREEAM standards provide the relevant nationally described scheme. Supporting whole-building efficiency mechanisms includes limiting the use of high water using fixtures and fittings through review of the Water Fittings Regulations by DEFRA.

Building Regulations – whole building standard

The Government has just updated Part G of the Building Regulations, which will come into force in October 2009. The new draft sets a whole building standard of 125 litres per person per day for domestic buildings. This comprises internal water use of 120 litres per person per day, and in that respect is in line with Code Levels 1 and 2, plus an allowance of 5 litres per person per day for outdoor water use. This will be specified using the methodology set out in the "Water Efficiency Calculator for New Dwellings" also used for the Code for Sustainable Homes.

Code for Sustainable Homes

Introduced in 2007, the Code for Sustainable Homes is the Government's main tool for improving the environmental specification of new homes. Points are awarded for achieving set standards in 9 different aspects of development. There are seven levels of specification ranging from level 0 (the Building Regulations) to level 6 (zero carbon).

The Code is the appropriate national standard to be used through the planning system to ensure water efficiency is implemented in new housing development. All new homes are required to be assessed against the Code and a Code or nil-rated certificate must be included in the Home Information Pack. As a condition of financing housing associations, The Homes and Communities Agency requires that all new homes built with public money meet at least Code Level 3 from May 2008, Level 4 from 2012 and Level 6 from 2015.

For the private sector, the Code is a voluntary initiative, although the Government does plan to tighten building regulations to reflect higher levels of the energy aspects of the Code between now and 2016.

Through the planning system, the Government has given local authorities the option of asking for higher than mandatory Code levels for both private and public funded homes in order to reflect local conditions and priorities (see PPS1 Supplement on Climate Change).

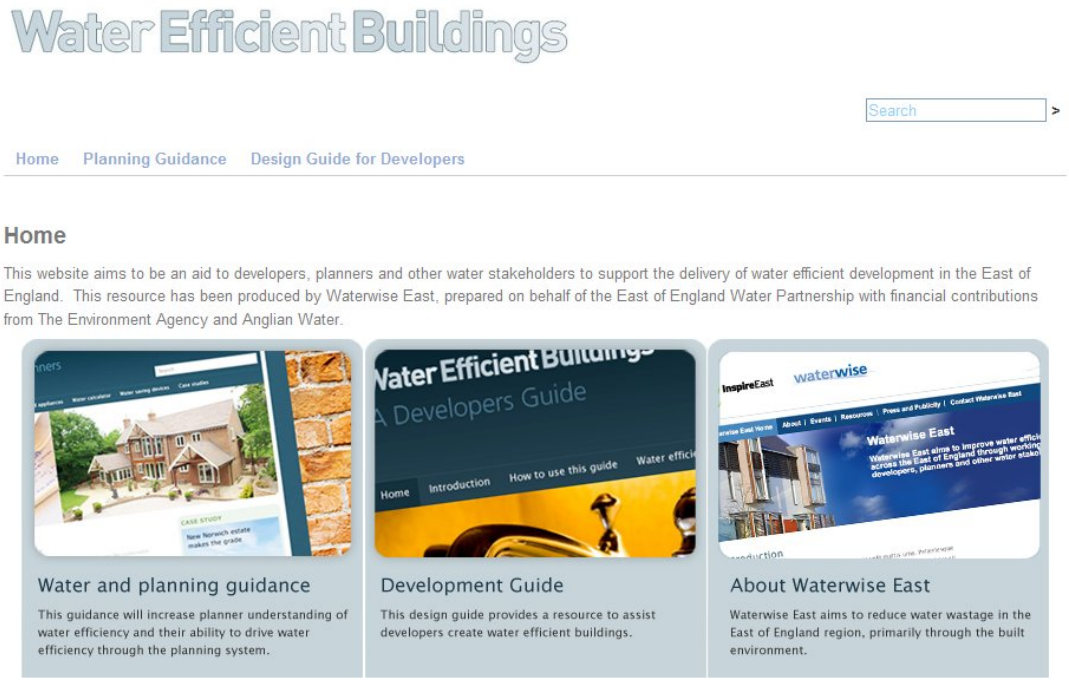
5.8.2 Support for Planners

Waterwise is a UK NGO focused on decreasing water consumption in the UK and building the evidence base for large scale water efficiency. It is the leading authority on water efficiency in the UK and its website www.waterwise.org.uk provides a valuable resource on water efficiency for planners and developers.

The companion website www.water-efficient-buildings.org.uk supports anyone involved in the production of a new building (including planners, developers, Housing Associations, self-builders, architects etc) to understand the need for water efficiency, complying with legislation and most importantly how to deliver water efficient buildings that work for the end consumer.

Resources are split into 2 sections: Water and planning guidance (for planners) and the Design Guide (for developers) although there are many overlaps between the two:

Figure 5-5 – Water Efficient Buildings website



The **Water and planning guidance** has more information on the following:

- Water Efficiency Background – covering regulations (including Part G of the Building Regulations and the Code for Sustainable Homes) and the costs of water efficiency
- Water efficiency and the planning system – covering how planners can drive water efficiency in their area
- Integration of water issues into the planning system – containing descriptions of the evidence needed to determine local policy

- Policy Guidance – explaining how to craft water efficiency policies and accompanying text, with examples and critiques of real-life policies.

The **Design Guide** has more information on the following:

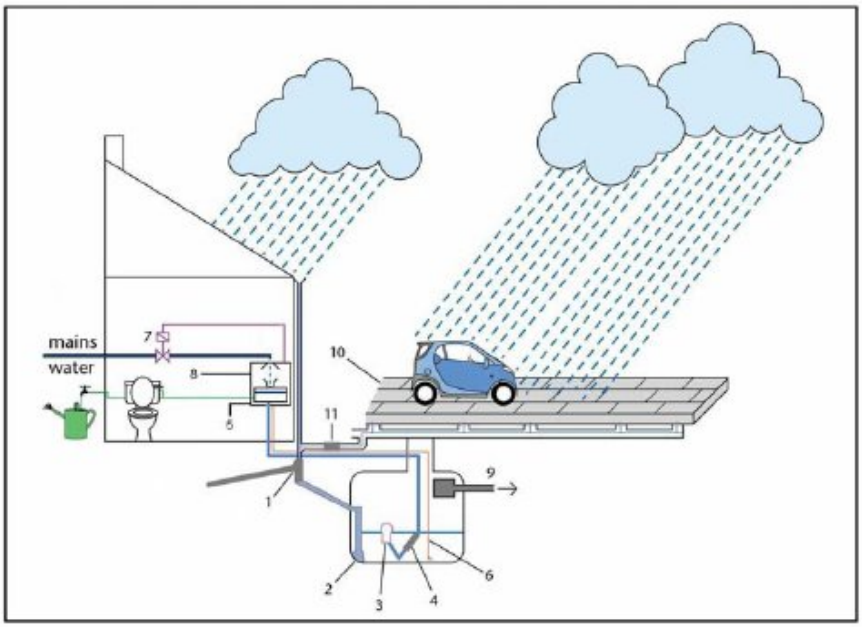
- Water Efficiency Background – covering regulations (including Part G of the Building Regulations and the Code for Sustainable Homes), costs and householder attitudes to water efficiency
- Fittings and Appliances - illustrating how to achieve water consumption specifications to meet targets set by regulations, through the use of water efficient products currently available
- Water Consumption Calculators - This section explains the water consumption calculators that are used to work up whole building specifications for water using fittings and appliances under the Code for Sustainable Homes and Part G of the Building Regulations
- Case Studies of water efficient developments

5.9 Rainwater Harvesting

5.9.1 Concepts

The Environment Agency has published guidance on Rainwater Harvesting [23]. The EA contends that the large number of new houses to be built over the next few years will increase the competition for available water between the environment and people. Reducing demand for mains water can help to reconcile these competing needs. One way of reducing demand is to use a rainwater harvesting system to provide water for domestic uses that do not require water treated to potable standard.

Figure 5-6 – Example Commercial Rainwater Harvesting System



Source: Harvesting Rainwater for Domestic Uses: Environment Agency 2008

The potential savings that can be made from rainwater harvesting depend on both the demand for non-potable water and the amount of rainwater that can be supplied, which depends on the roof area available for collection and the amount of local rainfall. Savings achieved by rainwater harvesting systems will be greater in larger buildings, such as industrial/commercial buildings and schools, due to their larger roof areas and potentially greater demand for non-potable water.

The Environment Agency is promoting the use of SUstainable Drainage Systems (SUDS), including rainwater harvesting, to retain and control surface water. The need to reduce storm water discharge rates may therefore be an incentive for choosing rainwater harvesting systems.

Rainwater harvesting systems are not yet common in England and Wales, for two main reasons:

- The high cost of the systems compared to the low cost of water
- Concern that the quality of the water may pose a health risk

Additionally, only metered customers (all industrial and commercial customers and around 30% of domestic properties) will benefit financially by using these systems. The majority of domestic customers, who do not pay for water by volume, have no immediate financial incentive to install rainwater harvesting systems.

5.9.2 Implementation Issues

The cost of the equipment needed for a basic household rainwater system starts at around £2,000. Plumbing and fitting costs can exceed £1,000, depending on factors such as soil type and size of system, and whether excavation equipment is on site. This cost will increase as the size of tank and the installation of a system become more complex.

The financial benefits from a small-scale rainwater harvesting system are limited by the low cost of mains water in England and Wales compared with other European countries. However, this cost varies significantly across water company boundaries. Rainfall patterns and maintenance requirements are among the long-term variables that will also influence the savings made.

Larger-scale housing developments with shared maintenance and infrastructure are more likely to make the systems financially attractive because of economies of scale and coordination of maintenance programmes. These systems also tend to be installed during construction, which makes them more cost effective than retro-fitted systems.

The Agency guidance cites a number of examples where rainwater harvesting systems have been installed.

The Environment Agency concludes that:

- Relatively cheap and simple water conservation devices, such as low flow taps, aerated showers, low flush toilets and simple rainwater butts, can offer short payback periods and should be considered before rainwater harvesting or recycling of 'grey-water'.

- Reducing the potential uses of rainwater (by reducing toilet flush volumes) will increase the economic payback period for a rainwater system i.e. make them less financially attractive

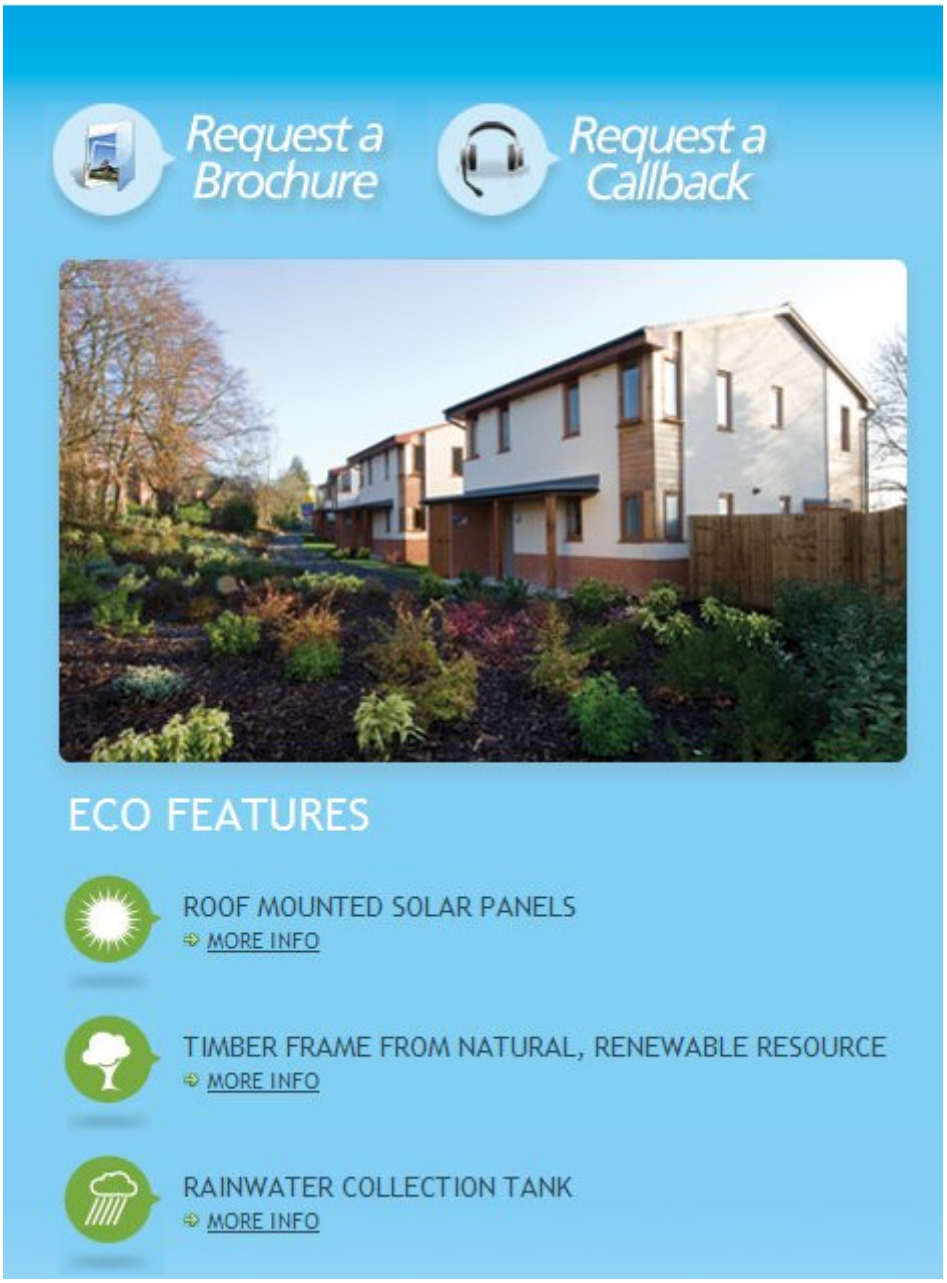
- As water is relatively inexpensive in England and Wales, a domestic scale rainwater system can have a long payback period. Some commercial or industrial systems have significantly shorter payback periods.

5.9.3 Case Study – David Wilson Homes 'Greenfields'

Greenfields, a David Wilson homes development overlooking the Test Valley in Hampshire, is built using renewable timber from managed forests, providing solar heating for water and for the building, and incorporates as standard a rainwater harvesting system from Rewatec Ltd (www.rewatec.co.uk).

Roof guttering collects rainwater which is then stored and used for washing, toilet flushing and garden uses.

Source: www.rewatec.co.uk



Source: David Wilson Homes, www.dwh.co.uk

5.10 Agricultural Water Supply – Current Consumption

A comprehensive Water Cycle study must address water consumption across all sectors. Indeed, in the case of Herefordshire, as set out under Section 4.2, water consumption by agriculture is potentially the 'biggest player'.

If water cycle constraints such as raw water availability or insufficient water to meet ecological river flow objectives become significant issues, water consumption should be appraised proportionately.

Section 4.2 established that taking all licenses into account, potable water actually only accounts for some 23% of all abstractions within Herefordshire. Irrigation abstractions account for 61% of all water licences by volume.

Consequently, it is self-evident that water usage and efficiency savings are most effectively realised first in the agricultural sector in preference to the public water supply sector. For example, a 10% reduction in agricultural water abstraction across Herefordshire is equivalent to a 26% reduction in public water supply abstraction in terms of absolute volume.

Furthermore, there is a fundamental distinction between water use and water consumption, expressed generally as the % consumptiveness of the activity. For example, localised hydro-electric schemes or fish-farms tend to return virtually all of the water abstracted directly to the source within a short distance, and have a % consumptiveness of close to 0%. In the other words the water is returned for downstream use within the local water cycle. This is the case for public water supply schemes such as Hereford CU where the bulk of the abstracted water is actually returned to the River Wye via the local STWs, and the abstraction tends to be regular and systematic across a period of a full year.

Conversely, agricultural abstractions are a consumptive use, concentrated in the drier catchments in the driest months, and can be the largest abstractor in some catchments in dry summers. Many forms of irrigated agriculture are highly consumptive i.e. return little or no water to the source, since water is used and lost either through processes or evapotranspiration.

5.10.1 Largest Abstractors by Licence

To provide a snapshot of agricultural water usage, the GIS databases can be interrogated to identify both the location and the quantity of the largest users.

Using GIS base layers:

- **HWCS Abstractions Wye SWA**
- **HWCS Abstractions Teme SWA**

It is possible to extract data via SQL queries that establish, as in **Evidence Map 5-1**, all abstractions greater than 1000 m³/day within Herefordshire that are designated Purpose Code AAGR400 or AAGR420, IFAD350 or IMIN60.

Table 5-4 – Summary of Large Abstractors for Irrigation or Industry

Quantity / Catchment	1000 – 2000 m³/d	2000 – 3000 m³/d	3000 – 5000 m³/d	5000 – 7000 m³/d	+ 7000 m³/d
River Wye Surface Water	24	7	3	1	2
River Teme Surface Water	6	1			
River Wye Groundwater	1		2	1	
River Teme Groundwater					

In summary there are 37 abstractors removing more than 1000 m³/day from surface water in the Wye catchment for irrigation or industrial purposes, and 4 with similar groundwater licenses.

The Teme catchment has no groundwater abstraction greater than 1000 m³/day within Herefordshire, and only 7 surface water abstractions, all under 3000 m³/day.

Clearly, on a risk based approach, if the Herefordshire Council objective was to aim towards water neutrality, it would focus first on the largest abstractors in terms of efficiencies.

DCWW also supplies a number of agricultural and commercial businesses under its public water supply licence that are not reflected in the above Table.

5.10.2 Demands from Trickle Irrigation – Wye catchment

Trickle irrigation is currently exempt from the abstraction licensing regime. It was found from the RAM assessments that the inclusion of trickle abstractions made a significant difference to the HD ERF, especially in the River Lugg, where the largest amount of trickle abstraction occurs.

With respect to the Habitats RoC process it has been established that trickle irrigation has the potential to cause extended periods of low flow in combination with licensed abstractions causing failure of the HD ERF.

In the River Wye SAV Stage 4 Action Plan the Environment Agency comments "*Although each trickle irrigation abstraction has effectively been considered as a licensed abstraction, we cannot guarantee that the volumes used in our assessments will be identical to those that will be applied for once such abstraction becomes regulated. Therefore, there is a risk to the Wye RoC that our proposals and recommendations to satisfy the EOs could require subsequent re-assessment. However, until trickle irrigation abstractions are brought into regulation and the exact licence volumes are applied for, there is no way of quantifying these risks at this stage.*"

DCWW has commented that the RoC sustainability reductions to its licences are explicitly linked to trickle irrigation (especially in the Lugg catchment) and it will be

unable to finalise licence impacts until these abstractions are licensed and their full impact understood.

5.10.3 Demands from Trickle Irrigation – Teme catchment

The River Teme has become an important source of water for irrigation and there are numerous spray irrigation licenses in force. The change in land use from pasture to arable has increased potential for diffuse pollution. Diversification in the farming sector has also seen the development of fish farming and fishery enterprises, which are dependent on surface water sources.

Cultivation of farmland for potatoes is increasing in the catchment with some farmers utilising trickle irrigation, which whilst presently exempt from the need for an abstraction licence will require one following the implementation of parts of the Water Act 2003.

We understand that there are similarly large trickle irrigation abstractions currently unregulated in the catchment of the River Leadon which are believed to be having a detrimental effect on eRFOs.

As of September 2009, the Environment Agency confirmed that this investigation is ongoing, and consequently we are unable to quantify this further.

The Agency has confirmed that progressively trickle irrigation will become subject to abstraction licensing. Dependent on conditions, it is likely that such abstractions will be subjected to Hands off Flow conditions, which is not the case at present.

5.11 Agricultural Water Supply – Future Consumption

Perhaps even more so than potable water, agricultural water use has the greatest potential to impact on the County wide water balance. There are two mutually reinforcing issues that may in future tend to produce a 'multiplier effect'.

- Increased local population leading to greater demand for agricultural produce. Herefordshire has seen a significant increase in soft fruit production and extended growing seasons through the use of polytunnels

- Climate change leading to increased water demand by irrigated crops. Drier summers increase the Potential Soil Moisture Deficit, and extended seasons increase water need.

With regard to the first issue, obviously this cannot be quantified easily, but it would be reasonable to assume that demand for produce would match the % increase in Herefordshire population over the planning period.

With regard to the second issue, there is increasing evidence that climate change impacts will have a very significant impact on agricultural water demands.

Research into the sustainability of water resources at Cranfield University has addressed this question, to make predictions about the increasing need of potato crops under climate change. For example, compared to the 1961 to 1990 baseline, by 2050 early and main-crop potatoes are likely to need around 20% and 30% more irrigation water respectively.

The East of England Development Agency (EEDA) funded Cranfield Water Efficiency Project [24] studied the ways in which water is managed on the region's farms and gave farmers advice about irrigation and managing their water usage. As pressures mount on the region's water supply, the project provided important guidance for local and national agriculture. Findings and recommendations may well be appropriate to Herefordshire.

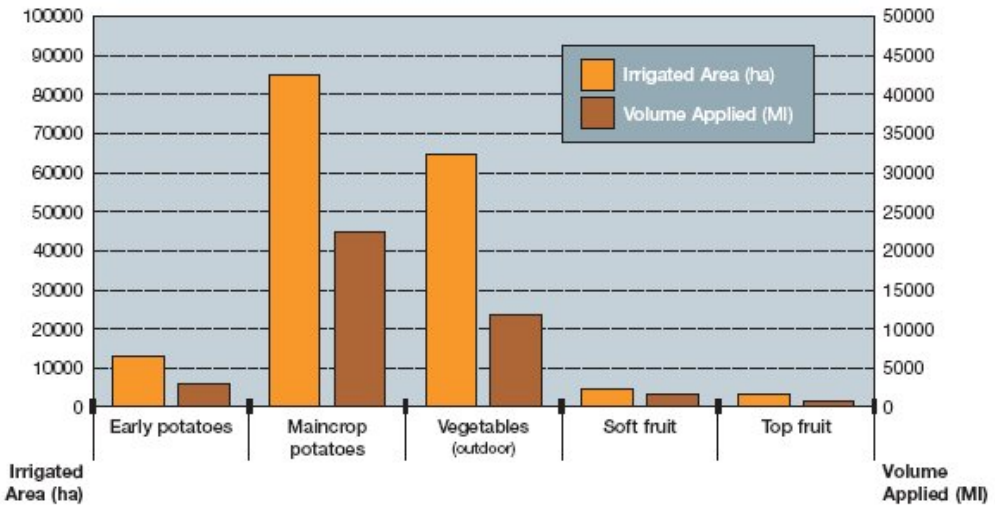
CCW has commented that given the finite capacity of the water reserve and the need to prioritise water supplies, urgent consideration needs to be given to leakage (and evaporation) issues within agricultural water supply infrastructure and to the efficiency/desirability of spray irrigation in general.

5.11.1 Irrigated Crop Trends

Over the last 20 years, there have been significant changes in the composition of the crops irrigated nationally. The proportion of irrigation on grass, sugar beet, and cereals has declined steadily. In contrast there has been a marked increase in irrigation of high value crops, particularly potatoes and vegetables for human consumption.

In 2005, irrigated horticultural crops accounted for 74% of the total irrigated area, and 86% of the total volume of irrigation water applied, see **Figure 5-7**. This trend is at least partly driven by the major supermarkets' demand for quality, consistency, and continuity of supply, which can only be guaranteed by irrigation.

Figure 5-7 – Composition of Crops in Irrigated Agriculture



Source: Climate Change Impacts on Water for Horticulture – Cranfield University

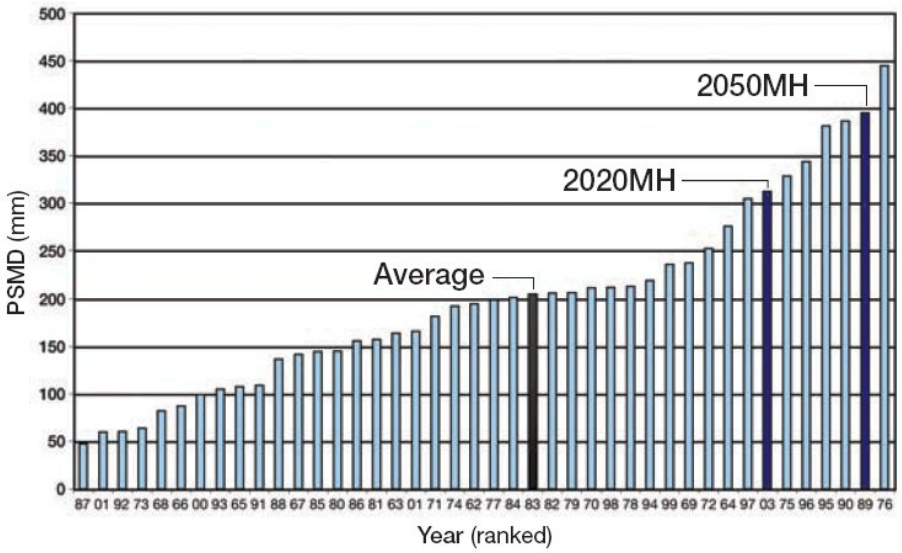
Within Herefordshire, the land used for soft fruit production has increased by 61% since 2001, but still accounts for only 2% of cropping land in the county. Over recent years the value of fruit has increased by 16% to £285 million reflecting increased demand.

5.11.2 Irrigation Needs

On an individual farm, irrigation needs vary depending on crop type and the daily balance between precipitation and evapotranspiration (ET) and the resultant fluctuations in soil moisture status. Because climate change will influence temperature and rainfall patterns, there will be direct impacts on soil moisture.

These impacts can be modelled using an agro-climatic indicator known as the "potential soil moisture deficit" or PSMD.

Figure 5-8 – Recorded PSMD – Eastern England



Source: Climate Change Impacts on Water for Horticulture – Cranfield University

Figure 5-8 shows the ranked maximum PSMD reached each year for a farm site in Eastern England based on the daily balance between rainfall and ET over a 30 year period.

The years in which the PSMD are highest correspond to drought years in which irrigation demands were highest (e.g. 1975-76, 1989-90, 1995-96 and 2003). In irrigation terms, the average year corresponded to 1983. However, with climate change, an average summer year for the 2020 medium high emissions scenario (2020MH) is expected to be more like the summer experienced in 2003. Similarly, for 2050MH the equivalent year is 1989, one of the driest on record. This suggests that average years in the future will become much more extreme, and more typical of our current "very dry" years.

5.11.3 Supplementary Planning Document – Polytunnels

With a significant increased use of polytunnels for agricultural soft fruit production within the County, Herefordshire Council has prepared a supplementary planning document (SPD) to help potential applicants prepare their planning applications [25]. It will also provide useful information to officers of the Council and other interested parties on how the Council expects the many issues to be addressed within planning applications, not least water management issues.

Policies DR4 and DR6 of the UDP provide guidance on the need to protect the availability and quality of water resources. Water is an essential resource, the pollution of which can have serious effects on drinking water supplies (including private water supplies) and ecology. Inappropriate agricultural activities can be a risk to both surface and groundwater quality and quantity.

In particular, groundwater requires particular protection from both contamination and over-exploitation. The availability of groundwater can be affected by changes in land use such as the increased use of large-scale agricultural polytunnels, which may restrict recharge through increases in impervious surfaces or the diversion of flows. Groundwater forms part of the base flows of watercourses and is vital to ensure the dilution of discharges, maintenance of water supplies and biodiversity. Both water efficiency and water neutrality (betterment) are key elements of the Government's climate change (reduction) agenda.

The Environment Agency seeks detailed information on proposed water use and water management from prospective polytunnels developers; hence these are material considerations in determining whether or not to grant planning permission. This is particularly important in the context of both low flow problem areas and where there may be a potential detrimental impact on the water environment of SSSIs and SACs, as well as Special Protection Areas (SPAs) and Ramsar Sites (such as sedimentation, pollution or adverse impacts on biodiversity).

In the case of SAC/SPA/Ramsar sites it may also be necessary for applications to include a Habitats Regulations Assessment (HRA) in line with the EC Habitats Directive (1992).

Planning applications for polytunnels on a significant scale (on sites of 1 hectare or more) should therefore detail the proposed water use in the context of the catchment area and water management techniques through the production of a detailed Water Resources Study/Audit. In cases where small scale polytunnels are not proposing to use water irrigation from low flows or in areas away from SSSIs or SACs then a brief statement of water use and efficiency techniques could suffice.

The Water Audit could include the identification of a number of water efficiency measures such as, for example:

- rainwater harvesting from water run-off from the polytunnels and/or recirculation programmes
- use of buffer zones around polytunnels to help prevent chemical leaching into streams and nearby watercourses.

This Water Audit will be assessed in detail by the Environment Agency, as part of the application for approval.

5.11.4 Climate change impacts on agro-climate

Information from the latest climate change scenarios, produced by the UKCIP, can help to assess the impacts of climate change from an agricultural view point. Agro-climate maps have been produced for the different scenarios that show how potential soil moisture deficits (PSMD) may change in the future.

PSMD is the potential accumulated soil moisture deficit that builds up through the summer months and reflects the daily balance between summer rainfall and evapotranspiration (ET) - the main drivers of irrigation demand.

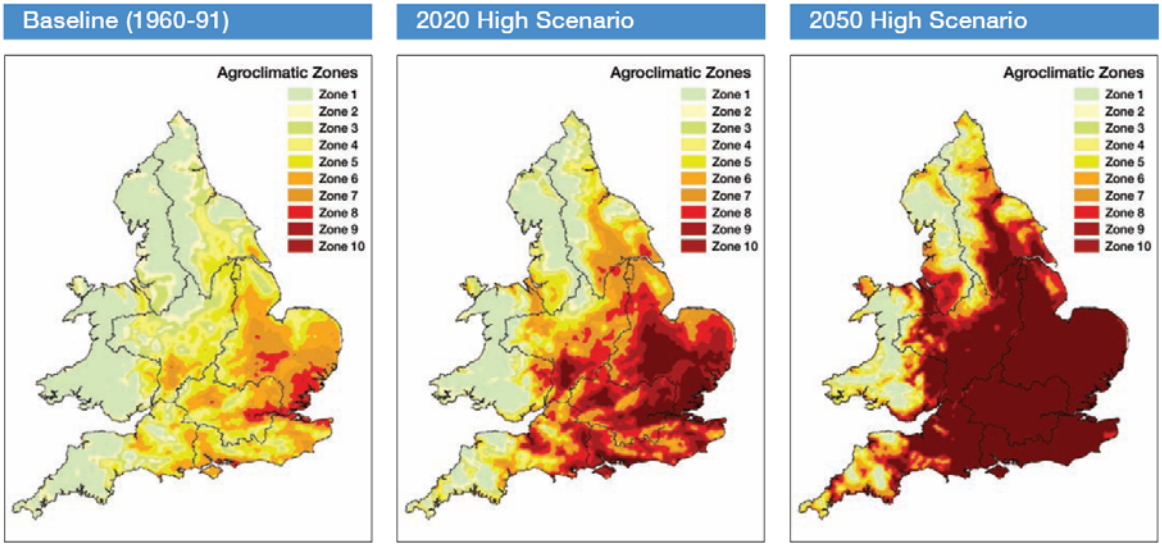
Figure 5-9 shows for typical agro-climate zone maps from the baseline, 2020s and 2050s how the drier zones move over time. They generally increase in area and spread from the south and east towards the north and west. The most critical zones where irrigation needs are greatest include parts of Suffolk, Kent, **areas in West Midlands**, Nottinghamshire, and the south coast.

Under the extreme of High Emissions, by the 2020s, the irrigation needs of **central England** will be similar to those experienced now in eastern England, and by the 2050s eastern, southern, and central England will have irrigation needs greater than those currently experienced anywhere in England.

These changes are likely to have serious impacts on outdoor horticultural crop production, particularly those sectors dependent on water for irrigation. In the future we are likely to experience more frequent summer droughts and hence an increase in irrigation demands as a result of higher summer temperatures, lower summer rainfall, and higher evaporation.

Cranfield University and the Environment Agency have carried out research into the impacts of climate change on irrigated horticulture [26].

Figure 5-9 – Predicted Changes in Summer Agroclimate



Source: Climate Change Impacts on Water for Horticulture – Cranfield University

These changes are likely to have serious impacts on outdoor horticultural crop production, particularly those sectors dependent on water for irrigation. In the future we are likely to experience more frequent summer droughts and hence an increase in irrigation demands as a result of higher summer temperatures, lower summer rainfall, and higher evaporation.

A balancing issue is the prediction of wetter winters. This may increase the opportunities for storing water when stream flows are high, usually in the winter, and using it in the drier summer months when flows are usually much lower. This is likely to require the construction of significant on-farm storage facilities by irrigation abstractors.

5.11.5 Options for Improved Agricultural Water Efficiency

There are two pre-eminent practical solutions to future water resources management for agriculture, and the ongoing overview of licences by the Environment Agency.

Formulation of Water Abstractor Groups

Individual abstractors have very little negotiating strength and can become isolated, but by working together they can deal with water resource issues more effectively. Six “WAGs” (Water Abstractor Groups) have already formed successfully in the UK - four in East Anglia, one in Lincoln and another in Northumberland, and others are starting to form. Most have formed in response to water resource threats, and are based on catchment or aquifer boundaries, cutting across the normal crop sector boundaries.

Perceived benefits of local abstractors working together in this way are:

- Better communication with the Environment Agency over water resource and abstraction licensing issues
- Sharing of catchment and environmental data
- More efficient use of technical support
- Opportunities for joint staff training
- Easier Licence Water trading
- Possibilities for joint licences and/or joint reservoirs

On-farm Storage Reservoirs

Many growers, particularly in Eastern England, are investing in on-farm water storage reservoirs, either individually or as groups. These are filled at times of high flow, principally in winter, and provide a secure resource for the following summer, known as 'winter water harvesting'.

Reservoirs are an expensive and capital intensive investment that requires careful justification, but they can significantly increase the business asset value of the farm and provide additional resources and a welcome certainty for negotiating supply contracts. In some parts of the country, grants are available through the new Rural Development Programme for England (RDPE).

Perceived benefits of on-farm reservoirs are:

- Greater flexibility, security and control of available water
- Additional abstraction in catchments "closed" to new summer licences
- A marketing advantage for farm business
- Increased land asset value
- Slower filling and higher peak rates of application
- Reduced abstraction charges (winter charges are 1/10th of summer charges)
- Reduced environmental impacts of abstraction avoiding potential conflicts
- Additional income through amenity and conservation
- Additional income through water rights trading with neighbours

The Environment Agency & Cranfield University has prepared specific guidance on planning and commissioning reservoirs for agricultural water use [27].

It is a stated action (Action A3) in the Environment Agency's Water Resources for Wales [5] strategic plan that it will:

- Promote efficiency measures and small-scale storage reservoirs for agriculture in the context of the twin track approach

Environment Agency Regulatory Approach

The Environment Agency has confirmed that it is considering a number of integrated actions to achieve better utilisation of available water licensed to agriculture:

- Revoke licence which not used for 4 or more years
- Reduce licence volumes to reflect actual usage and "best practice"
- Trading unused licence volume

- Shared licence e.g. different farmers use on different days
- Review of Hands off Flows conditions

Some more will come into play as demand increases and climate change produces increasingly frequent low flows (if any).

5.12 Water Neutrality

5.12.1 Concept

Water Neutrality is a new approach to water conservation and efficiency. This approach considers whether new demand for water should be offset in the existing community, by making existing homes and buildings in the area more water efficient. New homes should be 'extra-efficient' in relation to national consumption standards.

The definition of water neutrality (used by Government and the Environment Agency) is:

"For every new development, total water use across the wider area after the development must be equal to or less than total water use across the wider area before the development."

Where significant levels of new housing growth are planned between now and 2020 these new households and businesses will need water. In some areas this demand can be met by new sources, but in other areas the choices of how to meet new demand are more limited.

If the development was to be 'water neutral' then the total demand for water should be the same after new development is built, as it was before. That is, the new demand for water should be offset in the existing community by making existing homes and buildings in the area more water efficient.

A water neutral development would thus require that the water needs of new development are met through more efficient use of existing water resources, rather than the development of new resources. This differs from normal water resource planning and is an aspirational aim, which the Environment Agency currently consider appropriate for exemplar developments and/or areas with serious water availability issues.

Key measures that in combination could help achieve water neutrality include:

- Making new developments much more water-efficient
- Offsetting' new demand by retrofitting existing homes and other buildings with more efficient devices and appliances
- Expanding metering of existing homes in the area and introducing innovative tariffs for water use to encourage households to use water more efficiently.

- Achieving offsetting by improved efficiencies in other sectors

This is a potentially challenging task. In areas such as Herefordshire where there is not an overt 'shortage' of water, the economic marginal costs would have to be assessed carefully, whilst also taking into account the long-term hidden costs of carbon foot-printing, social impacts and environmental damage if water shortages were to become a regular occurrence over the very long term (post 2050).

To date the most significant case study on water neutrality relates to the Thames Gateway [28, 29], where detailed investigations have been carried out. The most promising measures to achieve water neutrality are summarised below.

5.12.2 Metering

The introduction of compulsory metering (in existing properties) was included in all pathway scenarios. A saving of 10% on per capita average annual water demand was assumed. Metering accounted for around ten percent of all water saved in each scenario reaching neutrality. Paying for the water used provided an important financial incentive to households and was the measure that had the greatest acceptance by residents in the Gateway who were surveyed as part of this study.

5.12.3 Variable Tariffs

One of the charging schemes explored in the Thames Gateway study was the introduction of a 'rising block' variable tariff. Under this tariff structure, the cost for each unit of water above a certain threshold would be charged at a higher rate, encouraging consumers to use water efficiently.

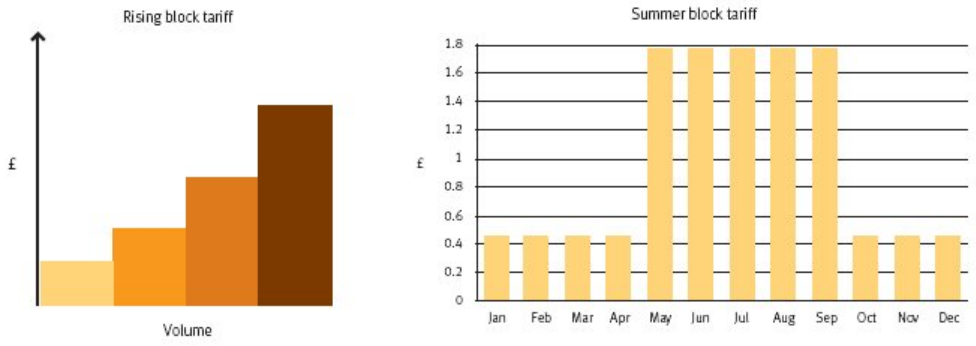
Variable tariffs were included in three neutrality scenarios. A saving of 5% in per capita average annual demand was assumed. Variable tariffs were applied to all metered homes and accounted for 22 percent of all the water saved in those scenarios. This is a low-cost option, but a lack of evidence means the potential water savings are uncertain. Awareness of the purpose and benefits of variable tariffs amongst surveyed Gateway residents was low.

Innovative tariffs allow an amount of water to be used, sufficient for basic needs, at an affordable rate. Progressively higher charges apply as more water is used over this specified threshold or during periods where stresses on supply are greatest.

For example, rising block tariffs mean that everyone gets the basic water they need at a lower price but that those who choose to use more water must pay more. Summer block tariffs mean that if people choose not to increase water use significantly in the summer they can reduce their overall water bill.

Figure 5-10 illustrates the concept of a rising block tariff. On option is to charge more for water during summer periods only. Such an approach might be highly relevant to agricultural water consumption.

Figure 5-10 – Examples of Variable Tariff Structures



5.12.4 Code for Sustainable Homes

Building new homes to higher water efficiency standards offers substantial water savings (see 5.4). In the study, this sector accounted for 9 to 17% of the total water saved. Residents in the Gateway wanted to see all new homes built to high environmental standards.

5.12.5 Retrofitting Efficient Appliances

The retrofitting of existing homes with simple 'fit and forget' measures such as variable flush toilet devices, low-flow showerheads and low-flow tap inserts would help to save 23 to 47 percent of the total water saved across the Thames Gateway by 2016.

Retrofitting appears relatively cost-effective, with variable flush devices the most cost-effective device. The effort required to persuade householders to introduce and keep using such measures could add substantially more to the costs and uncertainty. Residents were supportive of efforts to improve the water efficiency of homes, and found 'fix and forget' solutions particularly appealing.

In terms of implementing a retrofit programme, residents preferred an incentive-based approach with the distribution of free water efficiency packs, to more interventionist or regulatory-based approaches.

Figure 5-11 illustrates how many existing homes would need to be retrofitted with water efficient devices to offset the demand for a single new CSH standard house. In Herefordshire for example, assuming all new house were built to an average Code Level 3/4 standard, then to offset the entire RSS housing requirement of 16,600 houses this would require some 112,880 houses to be retrofitted, significantly more than the entire current housing stock.

As ever, the most effective approach to achieving water neutrality is likely to be a concerted approach encompassing all sectors.

Figure 5-11 – Existing Homes Needed to Offset Demand from CSH Home

New home standard	Retrofit combination including variable flush	Retrofit combination including ultra-low flush toilet
CSH Level 1/2	7.6	4.5
CSH Level 3/4	6.8	4.0
CSH Level 5/6	5.4	3.1

Source: Environment Agency – Towards Water Neutrality in the Thames Gateway 2008

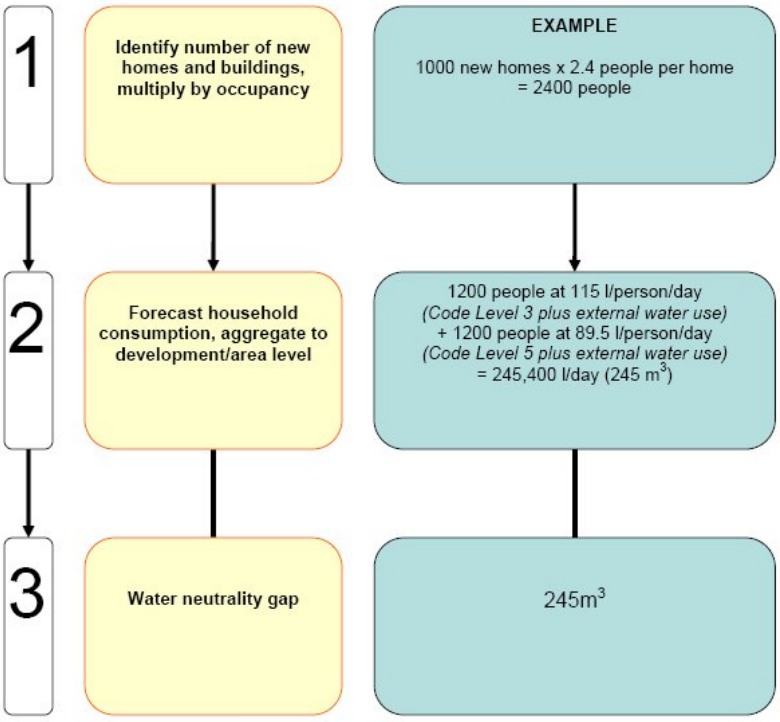
5.12.6 Calculating the Water Neutrality Gap

To determine the scale of the water neutrality challenge, an estimation of how much additional water the new development will use once it is occupied is needed. This will provide the 'goal' for water neutrality – i.e. the amount of water that needs to be saved through demand management measures - 'the water neutrality gap'. In simple terms the gap can be most simply calculated as shown in Figure 5-12.

In Step 1 additional estimates should be undertaken for non-households, although workforce and customer numbers and non-domestic water use can be highly variable and difficult to estimate. DCWW however provides detailed breakdowns of Measured Non-household consumption in its Water Resource Planning (WRP) Tables of the dWRMP.

Technically, Target Headroom should be added to the basic per capita water consumption estimates to account for uncertainty of actual water use and seasonal variability. In essence a range of measures need to be tested that can reduce water use elsewhere

Figure 5-12 – Calculating the Water Neutrality Gap



Source: Environment Agency Water Neutrality High Level Guidance 2008

5.13 Water Neutrality in Herefordshire

In the published Herefordshire Council Sustainability Strategy 2006 – 2009 [30] there is one use of the word 'water'. The Herefordshire Council website makes no reference to water efficiency or water conservation measures.

As a Growth Area, and a planning authority with significant public commitments to a Sustainability Strategy, we urge Herefordshire Council to give serious consideration to engaging with other key stakeholders in the possibility of making the Growth Area 'water neutral'.

While implementing individual water efficiency measures is not new in the UK, delivering such an encompassing programme of measures is. As such, eco-towns and other exemplar developments would be piloting the concept, and should take a flexible and adaptive approach, working in partnership with key stakeholders in the development and wider area. It is unlikely that one organisation would be able to develop the plan, fund, implement all of the necessary measures and monitor progress, so a co-ordination body should be identified and a delivery model developed so all parties are clear on their respective roles.

To this end a special EXCEL based scenario tool has been specially developed for the Water Cycle studies to examine a wide range of water supply and demand scenarios, covered in 5.6 earlier in this Chapter.

It should be emphasised that 'water neutrality' is a high level definition. It does not limit itself necessarily to potable water consumption issues. In the Thames Gateway, the wider area considered included agricultural and industrial and businesses uses.

The water neutrality concept should be applied at an appropriate geographical scale that enables the additional demand for water from a new development to be directly off-set by reducing existing demand in the surrounding area. The environmental benefits of off-setting should relate to where the water is abstracted, and consider where the water is returned, particularly if going beyond neutrality.

5.13.1 Reduced Flows to Treatment

Even if the supply-demand balance is positive over the planning period, and there is no obvious pressure on water resources, it is self-evident that the greater the demand (and consumption) for potable water, the greater the sewage effluent return flow to treatment. It can be argued however that the overall BOD load to treatment is often not significantly reduced by reduced water consumption, since the concentration of the effluent merely increases, and it is the BOD load v treatment capacity that is the limiting factor for many STWs.

However, where sewerage systems and/or Sewage Treatment Works are at or near their hydraulic operational limits in terms of flow and/or the Discharge Consent, as is likely to be the case for several if not many STWs in Herefordshire,

then there may be an argument in favour of water neutrality largely because for a deferred period at least, asset life is prolonged and new infrastructure expenditure can be delayed as average and total flows to the STW do not increase.

The Environment Agency is also keen to point out that from a household expenditure standpoint, excessive water use has a double cost to the householder, since typically most water bills charge for both water supply and sewerage (sewerage typically 95% of the water volume consumed). Hence, a reduction in water use typically reduces both the supply and the wastewater charge

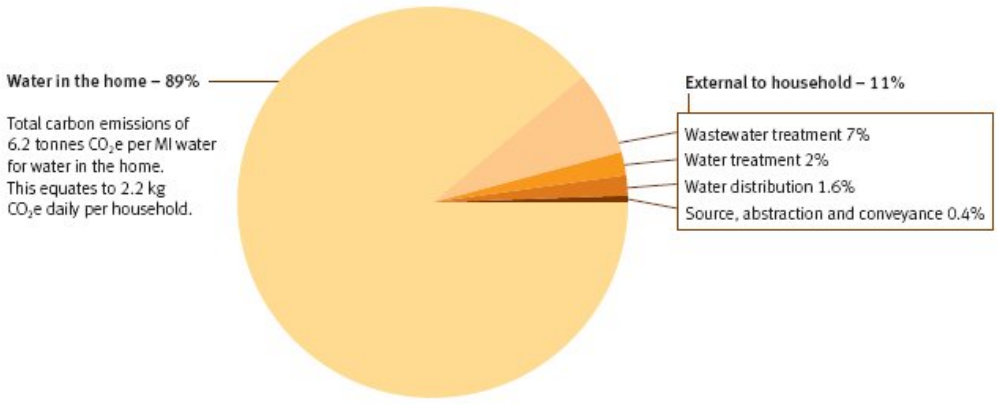
Scenarios to achieve water neutrality by numerous permutations can be tested by Herefordshire Council with the powerful but easy to use sensitivity model developed for the Water Cycle study.

5.13.2 Water Consumption Carbon Emissions

Although it is largely outside the scope of the Outline Water Cycle study, it is worth emphasising the carbon emissions associated with water demand generally. These are summarised in **Figure 5-13**.

Water supply and wastewater treatment account for a proportionately small percentage of overall emissions (11%), but the principal argument to pursue demand management and water efficiency measures lies with the significant carbon emissions used by households, most usually in terms of water heating.

Figure 5-13 – Carbon Emissions by Water Industry and Household Use



Source: Environment Agency Water Resources for England & Wales 2009

The Environment Agency research suggests that simple demand management measures, particularly those which reduce the amount of hot water used in the home, have huge potential not only to promote water and energy efficiency but also to reduce the carbon footprint of water supply, use and disposal.

Although a lesser proportion of the whole, it is evident that demand management measures will also lead to less wastewater, resulting in less energy being used on treatment to maintain the water quality in the receiving waters.

If Sewage Treatment Works are already treating to Best Available Techniques (BAT), environmental quality can only be maintained, in the face of increasing wastewater flow, by treating to standards better than BAT. This is likely to be expensive and carbon intensive. Demand management may be part of a more attractive solution.

5.13.3 DCWW Position on Water Neutrality

DCWW has stated that it is very concerned by the proposal for a water neutrality study in Herefordshire and is unclear on the driver for this. Currently it has indicated within the Draft WRMP that there is adequate water available to meet development to the proposed level within the RSS. A number of the proposals listed above are not within the power of Herefordshire Council to deliver and in direct conflict with Welsh Water strategy and more importantly WAG policy. WAG does not support a policy of compulsory metering. DCWW is reviewing the use of variable tariffs but only to support affordability issues, again in line with WAG policy.

Based on current supply demand balances, it would be unable to drive increased water efficiency or demand management at zonal level. This is obviously dependant upon its forecasts (which are currently being reviewed for the next revision of the WRMP) and any changes in licences. However, any policy which it would undertake at zonal level would be the optimised, least-cost option identified through its water resource planning process and not specifically driven by a neutrality study.

However, DCWW would offer support if Herefordshire Council opted for this approach as it recognises that it is a key stakeholder. It has already discussed with the Council its planned activity to support councils to deliver Sustainable Urban Drainage (although it should be noted that OFWAT has not supported Welsh Water in this area in the Draft Determination).

It is also very keen to improve development legislation to implement the requirements of the Code for Sustainable Homes. It has actively discussed this already with WAG and the EAW. However, a number of the assumptions driven by this Code already form part of its baseline demand forecasts.

5.13.4 Environment Agency Position on Water Neutrality

The Environment Agency is generally supportive of the aim of water neutrality in the context of the evidence base on climate change, which may be included as a policy objective within the Core Strategy. The Water Neutrality High Level Guidance [29] outlines its position, as a goal for achieving water efficiency. It provides guidance on the implementation of such, utilising techniques as suggested in section 5.12 of this report.

The current internal Environment Agency guidance is to seek Code for Sustainable Homes Level 3 for new homes i.e. a standard of 105 l/p/d. This is consistent with the recent Welsh Assembly Government Ministerial Interim Statement [21] and is significantly less than the consumption rates for new RSS related housing growth

by DCWW in its water resource supply-demand forecasts which generally assume that new households will consume at the same rate as existing metered households, typically 129 – 171 l/p/d, see **Table 5-7**.

This is an unavoidable feature of the Environment Agency generated supply-demand Tables, which do not allow a subtle distinction between existing Metered households (potentially using old fittings with higher consumption), and new build which may have the latest CSH standard fittings.

Our Scenario Model described under **5.6** overcomes this by allowing RSS housing projections to be separated from existing housing stock, with independent rates of consumption.

Assuming that all new households in Herefordshire would be implemented to minimum Code 3 standard, then the + point is that the current DCWW 2008 WRMP forecasts are conservative.

5.13.5 Water Neutrality in Whitbourne WRZ – Case Study

The baseline situation in Whitbourne WRZ concerning all forms of water demand is summarised in **Table 5-10**.

With respect to agricultural water, GIS queries show that there are 20 licenses abstracting a maximum of 21.65 Ml/day from surface water within the Wye boundary of the Whitbourne WRZ area. There are 13 licenses within the Teme boundary of the Whitbourne WRZ area abstracting 19.56 Ml/d. There are 16 licenses abstracting 0.635 Ml/day from groundwater sources in the Wye area. There are no licensed groundwater abstractions in the Teme area. Total of agricultural water abstraction is therefore 41.8 Ml/day.

With respect to public water supply, total demand (pcc consumption plus distribution losses) amounts to 5.14 Ml/day. Hence public water supply constitutes only 12.3% of the licensed total abstraction.

Based on DCWW's own data (dWRMP, WRP4 Tables Whitbourne), **Table 5-11** shows for public water supply in isolation that even with distribution losses at a slight increase, it is possible to achieve water neutrality across the planning period. For example, ignoring agricultural consumption, potable water consumption is forecast to reduce from 5.11 Ml/day in 2009/10 to 4.80 Ml/day in 2034/35.

The neutrality is being achieved because in effect Unmeasured households (currently assessed by DCWW as having a per capita consumption rate of 200 l/p/day) are being moved across to Measured households (at an approximate annual rate of 3% per year), and are assumed to have a reduced per capita consumption of 170 l/p/day. New RSS houses are assumed in this example to consume at the national target rate of 130 l/p/day.

In simple terms the rate of increase in water consumption due to new houses is more than offset by the rate of decrease attributable to Unmeasured households becoming Measured households.

Hence, the consumption impact in new RSS housing is marginal, and is less than a 15% reduction in distribution losses for example.

It should be noted that the 0.18 Ml/day consumption attributable to new housing at the end of the planning period is equivalent to a 0.43% reduction in agricultural water consumption. Hence, water neutrality at the County scale can be relatively easily achieved by focusing on agricultural efficiencies rather than potable water.

Table 5-5– Water Resource Zones and Supply-Demand Summary

(Assuming Dry Year Annual Average baseline scenario and forecast year 08/09)

Water Resource Zone / Supply-Demand Component		WRZ 8101 Ross-on-Wye	WRZ 8103 Hereford CU	WRZ 8105 Llyswen	WRZ 8107 Pilleth	WRZ 8110 Vowchurch	WRZ 8111 Whitbourne
Total Water Available for Use Ml/d (08/09)	L50	9.00	54.36	4.44	3.82	3.64	7.72
Distribution Input Dry Year Ml/d	L14	6.29	39.29	3.05	2.64	2.21	5.37
Distribution Input Normal Year Ml/d	$L14_{CP}$						
Distribution Input Critical Period	$L14_{N}$	N/A	48.17	3.66	3.25	2.88	6.31
Distribution Losses Ml/d	L15	1.42	6.73	0.82	0.74	0.49	1.01
Unmeasured household population	L18	13,270	79,740	6,040	5,850	3,900	7,870
Unmeasured household consumption	L35	2.37	13.32	1.01	0.91	0.64	1.55
Unmeasured household pcc l/h/d	L36	178	167	168	156	165	197
Measured household population	L21	5,970	40,850	2330	1,660	1570	4.01
Measured household consumption	L39	0.84	5.38	0.33	0.21	0.23	0.69
Measured household pcc l/h/d	L40	141	132	141	129	145	171
Measured & unmeasured non-hshld	L43,L46	1.38	12.1	0.74	0.66	0.76	1.89
Total Leakage Ml/d	L48	1.58	7.60	0.89	0.80	0.56	1.13
Leakage per property l/pr/d	L49	164	129	207	202	200	168
Available Headroom (08/09)	L51	2.71	15.06	1.39	1.18	1.43	2.34
Target Headroom (08/09)	L52	0.31	1.81	0.17	0.13	0.12	0.28
Supply-Demand Balance (08/09)	L53	2.41	13.25	1.23	1.05	1.30	2.07
Total Water Available for Use (34/35)	L50	9.0	54.36	4.44	3.82	3.59	7.38
Available Headroom (34/35)	L51	1.92	15.34	1.15	1.13	1.27	1.95
Target Headroom (34/35)	L52	0.64	3.51	0.28	0.23	0.23	0.51
Supply-Demand Balance (34/35)	L53	1.28	11.83	0.87	0.90	1.05	1.44
Total leakage as % of input (Dry Year)		25%	19%	29%	30%	25%	21%
Peaking factor (Dr Year to Normal Year)							
Total consumption as % of input		73%	78%	68%	67%	74%	77%

Notes:1) All values Ml/day

Table 5-6– Assessment of Leakage Reduction over Planning Period

Sources by WRZ	Baseline Value 2006-07	Planning Period 2009-10	Planning Period 2019-20	Planning Period 2029-30	Planning Period 2034-05	Average for Planning Period	% change for Planning Period 09/35
WRZ 8101 - Ross-on-Wye							
Distribution Losses Ml/d	1.55	1.22	1.56	1.61	1.65	1.52	
Unmeasured Households 000's	5200	4680	3310	2350	1980		
Unmeasured Households USPL Ml/d	0.09	0.08	0.06	0.04	0.04		
Leakage/property (Unmeasured) l/day	17.3	17.1	18.1	17.0	20.2	17.9	
Measured Households	2750	3720	6590	9050	10170		
Measured Households USPL Ml/d	0.04	0.06	0.10	0.14	0.15		
Leakage/property (Measured) l/day	14.5	16.1	15.2	15.5	14.7	15.2	
WRZ 8103 – Hereford CU							
Distribution Losses Ml/d	4.58	6.78	6.35	6.55	6.70	6.19	
Unmeasured Households 000's	31360	27650	18310	12270	10090		
Unmeasured Households USPL Ml/d	0.49	0.43	0.28	0.19	0.16		
Leakage/property (Unmeasured) l/day	15.6	15.5	15.3	15.5	15.8	15.5	
Measured Households 000's	19270	24830	40370	52610	57890		
Measured Households USPL Ml/d	0.27	0.38	0.57	0.75	0.82		
Leakage/property (Measured) l/day	14.0	15.3	14.1	14.2	14.2	14.4	
WRZ 8110 - Vowchurch							
Distribution Losses Ml/d	0.51	0.48	0.63	0.64	0.65	0.58	
Unmeasured Households 000's	1494	1370	1030	770	670		
Unmeasured Households USPL Ml/d	0.04	0.04	0.03	0.02	0.02		
Leakage/property (Unmeasured) l/day	26.8	29.2	29.1	25.9	29.8	28.2	
Measured Households 000's	720	910	1450	1900	2110		
Measured Households USPL Ml/d	0.01	0.01	0.01	0.01	0.01		
Leakage/property (Measured) l/day	13.8	10.9	6.9	5.3	4.7	8.3	
WRZ 8111 - Whitbourne							
Distribution Losses Ml/d	1.68	1.03	1.15	1.17	1.17	1.47	
Unmeasured Households 000's	3370	3090	2320	1750	1530		
Unmeasured Households USPL Ml/d	0.06	0.06	0.04	0.03	0.03		
Leakage/property (Unmeasured) l/day	17.8	19.4	17.2	17.1	19.6	18.2	
Measured Households	1980	2360	3480	4400	4800		
Measured Households USPL Ml/d	0.03	0.04	0.06	0.07	0.08		
Leakage/property (Measured) l/day	15.1	16.9	17.2	15.9	16.7	16.4	

Source: DCWW dWRMP WRP4-FP

Table 5-7 – Forecast Distribution Input and per capita consumption by WRZ

Sources by WRZ	Baseline Value 2006-07	Planning Period 2009-10	Planning Period 2019-20	Planning Period 2029-30	Planning Period 2034-05	Average for Planning Period 09/35	% change Planning Period 09/35
WRZ 8101 - Ross-on-Wye							
Distribution Input Ml/d	5.87	6.09	6.63	6.87	7.08		
Pcc Unmeasured Households l/p/d	157	179	180	180	181		
Pcc Measured Households l/p/d	126	140	138	136	138		
WRZ 8103 – Hereford CU							
Distribution Input Ml/d	35.51	39.27	38.4	38.5	39.01		
Pcc Unmeasured Households l/p/d	155	168	168	168	169		
Pcc Measured Households l/p/d	124	131	128	127	129		
WRZ 8105 - Pilleth							
Distribution Input Ml/d	2.52	2.64	2.63	2.65	2.69		
Pcc Unmeasured Households l/p/d	151	157	158	157	158		
Pcc Measured Households l/p/d	127	129	126	125	126		
WRZ 8107 – Llyswen							
Distribution Input Ml/d	2.60	3.07	3.17	3.23	3.29		
Pcc Unmeasured Households l/p/d	156	168	169	169	170		
Pcc Measured Households l/p/d	133	140	137	136	137		
WRZ 8110 - Vowchurch							
Distribution Input Ml/d	2.13	2.20	2.31	2.31	2.32		
Pcc Unmeasured Households l/p/d	152	165	167	166	168		
Pcc Measured Households l/p/d	135	409	248	176	153		
WRZ 8111 - Whitbourne							
Distribution Input Ml/d	5.41	5.37	5.44	5.40	5.43		
Pcc Unmeasured Households l/p/d	165	199	199	199	201		
Pcc Measured Households l/p/d	146	171	168	166	168		

Source: DCWW dWRMP Dry Year Final Planning Tables WRP4-FP

Table 5-8– Scenario Modelling – Calibration with DCWW WRP4-FP

WRP Table Ref	Component	DCWW Value 08/09	HC Value 08/09	% error		DCWW Value 33/34	HC Value 33/34	Modelled Annual change %	% error
L5	Water Available for Use	54.36	54.36			54.36	54.36		
L14	Distribution Input Ml/d	**39.29**	**39.29**			**38.87**	**38.53**		-1%
L15, L47	Distribution Losses + Void Properties USPL Ml/d	6.75	6.75			6.69	6.75		
L16, L32	Operational use, water taken unbilled, Ml/d	0.90	0.90			1.15	1.15	+1%	
L19	Unmeasured households 000's	**28830**	**28830**			**10490**	**10390**	-4%	-1%
L36	Unmeasured household PCC l/p/d	167.1	167			168.5	167.0		-1%
L35	Unmeasured household consumption Ml/d	13.32	13.34			5.15	4.81		
L34	Unmeasured USPL Ml/d	0.45	0.45			0.16	0.16		
L22	Measured households 000's	**23030**	**23030**			**56870**	**56970**		+0.2%
	Balance check on total of households (measured & unmeasured)	**51860**	**51860**			**67360**	**67360**		
L40	Measured household PCC l/p/d	131.8	132			128.3	130		
L39	Measured household consumption Ml/d	5.38	5.38			14.17	14.11		
L38	Measured household USPL Ml/d	0.33	0.33			0.81	0.81		
L25, L27	Measured & Unmeasured non-households 000's	5480	5480			6280	6208		-1.2%
	Measured & Unmeasured non-households unit consumption	2208	2208			1700	1712		+0.7%
L43, L46	Measured & Unmeasured non-households consumption Ml/d	12.1	12.06			10.68	10.63		
L42, L45	Measured & Unmeasured non-households USPL	0.08	0.08			0.08	0.09		
L48	Total Leakage (L15+34+38+42+45+L47)	7.60	7.59			7.74	7.81		
	Balance check on Distribution Input (All uses, consumption and leakage)	**39.23**	**39.29**	+0.15%		**38.89**	**38.51**		
L51	Available Headroom (L5 – L14)	15.06	15.07	+0.07%		15.49	15.83		
L52	Target Headroom	1.81	1.81			3.55	3.79	+3%	+6.7%
L53	Supply-Demand Balance	13.25	13.26	+0.07%		11.94	12.04		+0.8%

Notes:

1. The Table summarises data for baseline year 08-09 (i.e. year ending March 09), and for forecast period 33-34 (i.e. year ending March 34).
2. Change in baseline property as follows: Assume baseline housing stock of 51860 at end of 2008 of which 28830 are unmeasured. By end of 2034, unmeasured households are reduced to 10490, so measured baseline stock must increase by 18340 to balance giving 41370 of measured original households. (HC model assumes 41470 properties due to approximate reduction factor against unmeasured households of -4%/year).
3. Change in new RSS property as follows: DCWW assumes total measured households by March 34 of 56870, or increase of 56870 – 41370 = **15,500** new properties due to RSS allocations
4. Generally, allowing for rounding errors and approximations due to the growth factors assumed, the HC model reproduces the water resource supply-demand balance to within 1%

Table 5-9 – Water Demand Scenario and Neutrality Model – Example Output

Herefordshire Water Cycle Trajectory Scenarios

Table 5-9 - Water Demand Scenario and Neutrality Model – Example Output

Scenario Scenario 1a **Description** Calibration check aginst DCWW Water Resources Plan Table WRP4-FP

Water Resource Zone - 8103 **(Hereford CU)**

1. HEREFORD CU	Dwellings	Scenario		09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	TOTAL
WRZ Baseline 08/09	51,860	Auto sum of UMH & MH		51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860	51860
Constructed 06-08		Provide Baseline Inputs		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commitments 06-08		Provide Baseline Inputs	Trajectory	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSS Strategic Sites	15,500	< Provide Baseline Inputs	Equal	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	15500
Non-Strategic Sites		< Provide Baseline Inputs	Equal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSS Rural Villages		< Provide Baseline Inputs	Equal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSS Rural Villages 2		< Provide Baseline Inputs	Equal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total New Housing	15,500	Annual New Housing		620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	620	15500
		Cumulative New Housing		620	1240	1860	2480	3100	3720	4340	4960	5580	6200	6820	7440	8060	8680	9300	9920	10540	11160	11780	12400	13020	13640	14260	14880	15500	
Total Residential Dwellings	67,360	Cumulative Total Dwellings		52480	53100	53720	54340	54960	55580	56200	56820	57440	58060	58680	59300	59920	60540	61160	61780	62400	63020	63640	64260	64880	65500	66120	66740	67360	67360

2. WATER AVAILABILITY	Baseline 08/09	Scenario	Trajectory	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	
Deployable Output	56.3	<describe>	Static	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	56.30	
HRA sustainability reductions		<describe>	Static	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Climate change reductions	7.8	<describe>	Static	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	7.80	
WTW operations	1.94	<describe>	Static	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	
Water Available for Use	46.56			46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	

3. BL CONSUMPTION	Baseline 08/09	Consumption Scenario	Trajectory	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	
Distribution Losses	6.75	<describe>	Static	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	
Distribution Uses	0.90	<describe>	+ 1.0%	0.91	0.92	0.93	0.94	0.95	0.96	0.96	0.97	0.98	0.99	1.00	1.01	1.02	1.03	1.04	1.06	1.07	1.08	1.09	1.10	1.11	1.12	1.13	1.14	1.15	
Unmeasured Households BL	28,830	<describe>	- 4.0%	27677	26570	25507	24487	23507	22567	21664	20798	19966	19167	18400	17664	16958	16280	15628	15003	14403	13827	13274	12743	12233	11744	11274	10823	10390	
UMH PCC (l/h/d)	167	DCWW UMH 167 lpd	Static	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	167.0	
UMH USPL (Ml/d)	0.45	<describe>	Static	0.43	0.41	0.40	0.38	0.37	0.35	0.34	0.32	0.31	0.30	0.29	0.28	0.26	0.25	0.24	0.23	0.22	0.22	0.21	0.20	0.19	0.18	0.18	0.17	0.16	
UMH Consumption Ml/d	13.34			12.80	12.29	11.80	11.33	10.87	10.44	10.02	9.62	9.24	8.87	8.51	8.17	7.84	7.53	7.23	6.94	6.66	6.40	6.14	5.89	5.66	5.43	5.22	5.01	4.81	
Measured Households BL	23,030	<describe>	Automatic	24183	25290	26353	27373	28353	29293	30196	31062	31894	32693	33460	34196	34902	35580	36232	36857	37457	38033	38586	39117	39627	40116	40586	41037	41470	
MH PCC (l/h/d)	132	DCWW MH 132 lpd	Static	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	132.0	
MH USPL (Ml/d)	0.33	<describe>	Static	0.35	0.36	0.38	0.39	0.41	0.42	0.43	0.45	0.46	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.54	0.55	0.56	0.57	0.57	0.58	0.59	0.59	
MH Consumption Ml/d	5.38			5.65	5.91	6.16	6.40	6.62	6.84	7.05	7.26	7.45	7.64	7.82	7.99	8.15	8.31	8.47	8.61	8.75	8.89	9.02	9.14	9.26	9.37	9.48	9.59	9.69	
Non-households BL	5,480	<describe>	+ 0.5%	5507	5535	5563	5590	5618	5646	5675	5703	5732	5760	5789	5818	5847	5876	5906	5935	5965	5995	6025	6055	6085	6116	6146	6177	6208	
M&UM non-hshld PCC (l/h/d)	1,850	DCWW M&UM Nh 1850	- 1.0%	1831.5	1813.2	1795.1	1777.1	1759.3	1741.7	1724.3	1707.1	1690.0	1673.1	1656.4	1639.8	1623.4	1607.2	1591.1	1575.2	1559.4	1543.9	1528.4	1513.1	1498.0	1483.0	1468.2	1453.5	1439.0	
M&UM nh USPL (Ml/d)	0.08	<describe>	Static	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	
M&UM nonH Consumption Ml/d	12.06			12.00	11.94	11.88	11.82	11.76	11.70	11.64	11.59	11.53	11.47	11.41	11.35	11.30	11.24	11.18	11.13	11.07	11.01	10.96	10.90	10.85	10.79	10.74	10.68	10.63	

4. RSS CONSUMPTION	Baseline lpd	Consumption Scenario	Trajectory	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	
RSS Strategic Sites	130	DEFRA Target 130 lpd	Static	0.18	0.37	0.55	0.73	0.91	1.10	1.28	1.46	1.65	1.83	2.01	2.20	2.38	2.56	2.74	2.93	3.11	3.29	3.48	3.66	3.84	4.03	4.21	4.39	4.57	
Non-Strategic Sites	0		Static	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
RSS Rural Villages	0		Static	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
RSS Rural Villages 2	0		Static	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
ALL RSS Sites USPL	Automatic		Static	0.01	0.02	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.19	0.20	0.20	0.21	0.22	
Total All RSS Sites		New Consumption	Ml/d	0.18	0.37	0.55	0.73	0.91	1.10	1.28	1.46	1.65	1.83	2.01	2.20	2.38	2.56	2.74	2.93	3.11	3.29	3.48	3.66	3.84	4.03	4.21	4.39	4.57	

5. SUPPLY DEMAND	Baseline 08/09	Full Develpoment Scenario		09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	
Water Available for Use	46.56	<describe>		46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	46.56	
Distribution Input	39.29	<describe>		39.17	39.05	38.95	38.86	38.77	38.70	38.63	38.58	38.53	38.49	38.46	38.43	38.41	38.40	38.40	38.40	38.41	38.42	38.44	38.47	38.50	38.54	38.58	38.62	38.67	
Operations Losses & Leakage	8.51	<describe>		8.52	8.53	8.53	8.54	8.55	8.56	8.57	8.58	8.59	8.60	8.61	8.61	8.62	8.63	8.64	8.65	8.66	8.67	8.69	8.70	8.71	8.72	8.73	8.74	8.75	
Total Baseline Consumption	30.78	<describe>		30.46	30.14	29.84	29.55	29.26	28.99	28.72	28.46	28.21	27.97	27.74	27.51	27.29	27.08	26.88	26.68	26.48	26.30	26.11	25.94	25.76	25.60	25.44	25.28	25.13	
Total RSS New Consumption	0.00	<describe>		0.18	0.37	0.55	0.73	0.91	1.10	1.28	1.46	1.65	1.83	2.01	2.20	2.38	2.56	2.74	2.93	3.11	3.29	3.48	3.66	3.84	4.03	4.21	4.39	4.57	
Available Headroom	7.27	<describe>		7.39	7.51	7.61	7.70	7.79	7.86	7.93	7.98	8.03	8.07	8.10	8.13	8.15	8.16	8.16	8.16	8.15	8.14	8.12	8.09	8.06	8.02	7.98	7.94	7.89	
Target Headroom	1.81	Select trajectory >	+ 3.0%	1.86	1.92	1.98	2.04	2.10	2.16	2.23	2.29	2.36	2.43	2.51	2.58	2.66	2.74	2.82	2.90	2.99	3.08	3.17	3.27	3.37	3.47	3.57	3.68	3.79	
Suppply-Demand Balance	5.46	<describe>		5.53	5.59	5.63	5.67	5.69	5.70	5.70	5.69	5.67	5.64	5.60	5.55	5.49	5.42	5.34	5.25	5.16	5.05	4.94	4.82	4.69	4.56	4.41	4.26	4.10	

Table 5-10 – Water Neutrality Case Study of Whitbourne WRZ – Demand Data All Sectors

Whitbourne WRZ	Baseline Value 2006-07	Planning Period 2009-10	Planning Period 2019-20	Planning Period 2029-30	Planning Period 2034-05	Average for Planning Period 09/35	% change for Planning Period 09/35
Distribution Input Ml/d	5.41	5.37	5.44	5.40	5.43	5.41	
Distribution Losses Ml/d	1.68	1.03	1.15	1.17	1.17	1.13	
Unmeasured households							
Unmeasured Households	3370	3090	2320	1750	1530		
Unmeasured Households consumption Ml/d	1.35	1.52	1.19	0.91	0.80	1.11	
Unmeasured Households pcc	165	199	199	199	201	200	
Unmeasured Households USPL Ml/d	0.06	0.06	0.04	0.03	0.03		
Leakage/property (Unmeasured) l/day	17.8	19.4	17.2	17.1	19.6	18.3	
Measured Households							
Measured Households	1980	2260	3030	3600	3820		
Measured households consumption Ml/d (e)	0.52	0.67	0.90	1.07	1.14	0.94	
Measured Households pcc	146	168	168	168	168	168	
Measured Households USPL Ml/d	0.03	0.04	0.06	0.07	0.08		
Leakage/property (Measured) l/day	15.1	16.9	17.2	15.9	16.7	16.7	
Non-households							
Measured & Unm non-Households	1130	1160	1240	1330	1370		
Measured & Unm non-Households cons Ml/d	1.64	1.86	1.79	1.72	1.69	1.76	
Measured & Unm non-Households pcc							
Measured & Unm Households USPL Ml/d	0.02	0.02	0.02	0.02	0.02		
Leakage/property (Measured) l/day	17.7	17.2	16.1	15.0	14.6	15.7	
RSS Spatial Strategy Scenario 1							
RSS Housing trajectory	0	243	486	730	730		
RSS Households consumption Ml/d	0	0.06	0.11	0.17	0.17		
RSS Households pcc	0	130	130	130	130		
Water for Agriculture/Industry							
Agriculture consumption Ml/d	41.8	41.8	41.8	41.8	41.8		

Notes: Measured household consumption assumes 1.77 persons/property on 168 l/p/d
RSS housing trajectory assumes total of 730 houses by 2029 on 130 l/p/d

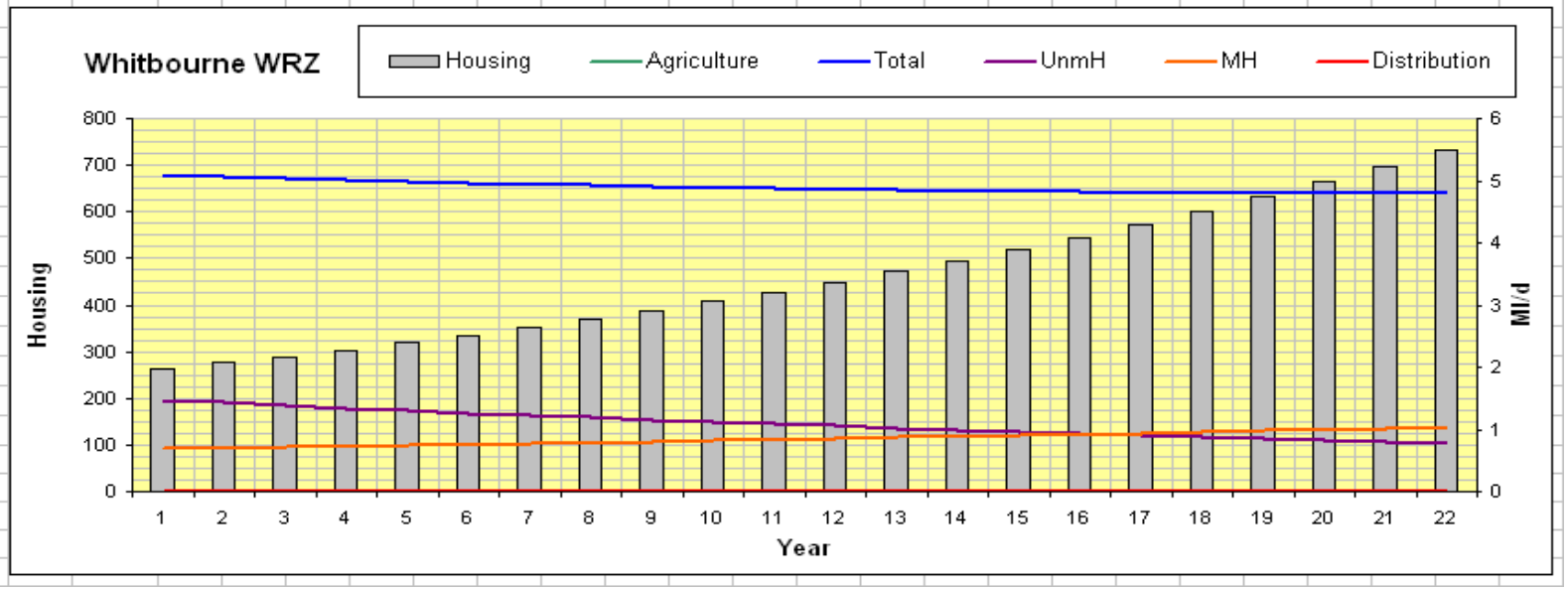
Table 5-11 – Water Neutrality Scenario – Whitbourne WRZ

Herefordshire Water Cycle Trajectory Scenarios — **Table 5.11 - Water Demand Scenario and Neutrality Model**

Scenario Scenario 1a **Description** Calibration check aginst DCWW Water Resources Plan Table WRP4-FP

Water Resource Zone - 8111

		Trajectory	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31
Houses	250	+ 5.0%	263	276	289	304	319	335	352	369	388	407	428	449	471	495	520	546	573	602	632	663	696	731
Distribution L	1.03	+ 0.5%	1.04	1.04	1.05	1.05	1.06	1.06	1.07	1.07	1.08	1.08	1.09	1.09	1.10	1.10	1.11	1.12	1.12	1.13	1.13	1.14	1.14	1.15
Baseline UMH	1.52	- 3.0%	1.47	1.43	1.39	1.35	1.31	1.27	1.23	1.19	1.16	1.12	1.09	1.05	1.02	0.99	0.96	0.93	0.91	0.88	0.85	0.83	0.80	0.78
Baseline MH	0.67	+ 2.0%	0.68	0.70	0.71	0.73	0.74	0.75	0.77	0.79	0.80	0.82	0.83	0.85	0.87	0.88	0.90	0.92	0.94	0.96	0.98	1.00	1.02	1.04
Baseline NH	1.86	- 0.5%	1.85	1.84	1.83	1.82	1.81	1.80	1.80	1.79	1.78	1.77	1.76	1.75	1.74	1.73	1.73	1.72	1.71	1.70	1.69	1.68	1.67	1.67
New RSS	0.06	+ 5.0%	0.06	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.14	0.14	0.15	0.16	0.17	0.18
Agriculture		Static																						
Total	5.14		5.11	5.08	5.05	5.02	4.99	4.97	4.94	4.92	4.90	4.89	4.87	4.86	4.84	4.83	4.82	4.82	4.81	4.81	4.80	4.80	4.80	4.80
Scenario 1a			5.11	5.08	5.05	5.02	4.99	4.97	4.94	4.92	4.90	4.89	4.87	4.86	4.84	4.83	4.82	4.82	4.81	4.81	4.80	4.80	4.80	4.80
Scenario 1b																								
Scenario 1c																								



5.14 Summary of Main Issues

5.14.1 Public Water Supply

The Government long-term target for England and Wales is to reduce per capita consumption to not more than 130 l/p/day. This should be a minimum target of new households, and there will probably be a significant requirement for retrospective metering and water efficiency initiatives for the larger proportion of currently unmeasured households in Herefordshire.

Overall within Herefordshire, the Unmeasured household consumption is 16% above national average, and the Measured household consumption is slightly below national average. Taken together the Herefordshire consumption is 6% above national average, but there would appear to be significant scope to reduce existing consumption in certain areas. Unmeasured households in Whitbourne and Ross-on-Wye Water Resource Zones are forecast to use 197 and 178 l/p/day, significantly higher than the current national average of 148 l/p/day, and very substantially more than the Government target of 130 l/p/day by 2030.

Generally, taking into account the RSS housing forecasts, and climate change impacts on demand (but not supply), DCWW shows that for a Dry Year Annual Average scenario all of its Water Resource Zones (WRZs) have a supply-demand surplus across the planning period.

Distribution Input, the simplest overall measure of water used is largely static for all zones across the planning period with the exception of Ross on Wye and Llyswen. However, this is achieved by DCWW assuming that currently unmeasured households (the majority) will be moved over to Measured Households, at a rate of 2 – 3% year on year.

DCWW has confirmed that Meter uptake values used within the Draft WRMP are based upon actual current trends of uptake over a ten year period. However within that period it has experienced uptake at a considerably higher level (up to 3.2%).

This strategy not only presupposes that metering will significantly increase, but that metered households will automatically reduce their consumption accordingly (probable, but not certain). Currently, DCWW shows no significant reduction in per capita consumption relative within each sector (Unmeasured and Measured) compared to current rates.

The Government target of 130 l/p/d is a DEFRA target for England only. Areas supplied by Welsh Water fall under the jurisdiction of WAG, and not DEFRA, regardless of whether that area falls within England or Wales. WAG has not set a target and DCWW would refer Herefordshire Council to WAGs Strategic Position Statement on Water for its government policy. WAG and Welsh Water do not support compulsory metering.

It should be made clear that Welsh Waters policies on water efficiency at zonal level are driven by need – i.e. where the supply demand balance necessitates and where enhanced demand reduction is the least cost, economic solution in that zone.

5.14.2 Agricultural Water Supply

Licensed agricultural water use accounts for some 61% of all licenses in Herefordshire. As a County with a substantial agricultural base, this water use is vital to the local economy.

Efficient use of this water is paramount. Herefordshire is probably typical of the national demand for water for irrigation likely to increase in all areas over the next 10 years, which could be 25 per cent higher by 2020. The recent trend of increasing demand for potato irrigation is expected to continue over the next 10 years, although the rapid rise in demand is likely to start to slow down by 2020. Water for irrigating vegetables will become an increasingly important use of water in the next 10 years.

Abstractors have to demonstrate to the Environment Agency that their water needs are necessary and efficient. In the case of Herefordshire, in view of the very large proportion that agricultural water represents, this is doubly necessary.

On the risk based approach, Herefordshire Council should be satisfied that the 37 largest abstractors of water in the County are all engaging in efficient practices. Future business expansion plans would be of interest.

It is interesting to observe that whilst water companies have to provide highly detailed and rigorous water resource management plans, collectively the largest users of water in the County do not.

Perhaps there is a role here for the Unitary Authority to take a long-term overview, since agriculture resources and employment are as much a key issue for the planning authority as residential employment and housing?

5.14.3 Agricultural Water Efficiency

CCW has commented that it welcomes the attention paid in this Water Cycle Study to the issues relating to agricultural sector use of water resources. Whilst it is accepted that agricultural water supply largely lies outwith the control of the LDF process, the continued exploitation of an increasingly vulnerable natural resource by the agricultural sector without some sort of strategic thought is a cause of concern and should be addressed.

CCW also has concerns regarding the current lack of a strategic approach to agricultural water resources in terms of potential effects on European sites and in respect of the Environmental Liability Directive. It is suggested that strong representations need to be made to DEFRA in respect of this issue as a matter of urgency.

5.14.4 Climate Change – Public Water Supply

In terms of demand, DCWW are confident that climate change impacts will not markedly influence the supply-demand balance i.e. consumption rates etc. are accounted for in the adjusted Target Headroom.

However, it is a significant issue that climate change effects on water availability have not been yet factored into the water resource planning. This is an urgent issue requiring attention by the three principal stakeholders.

River flows are predicted to reduce by 40 – 50% in summer months by around 2050. In this scenario, it is difficult to see that the Environment Agency would do anything other than stipulate increased HoF conditions or cut back to all licence holders in future years, to maintain ecological River flow objectives.

Hence, for summer months abstraction quotas might reduce by similar amounts to the proportionate reduction of Daily Mean Flow for example. Such reductions would basically constitute a reduction in Deployable Output, and this eventuality should be assessed if only on a 'what if' basis.

Herefordshire Council can assess for itself the implications on its housing strategy by use of the Sensitivity Model developed for this study.

5.14.5 Climate Change – Agricultural Water Supply

For agriculture, the potential impact of climate change on increased demand is expected to be high. Irrigation requirements could increase dramatically, and could move northwards and westwards in the UK as a result of climate change. By the 2020s, central England and **eastern margins of Wales** could experience conditions similar to those currently typical of the south and east of England.

The Environment Agency believes that the changing pattern of future dry years (increases in short droughts but little change in long duration droughts) may require significant adaptations in water resources policy and practice, both for public water supply and agriculture.

Research suggests that droughts may develop rapidly and end equally abruptly with the onset of wet winters. In this situation drought plans may need to be implemented more frequently and quickly than at present that would require changes to legislation, abstraction licensing and water consumption habits.

The impacts of climate change on County wide agricultural production trends and associated water use we believe are a key issue for Herefordshire Council, and are probably worth a specific study and investigation in conjunction with the Environment Agency.

The Environment Agency has a stated objective of promoting 'winter water harvesting' through increased use of agricultural reservoirs. Natural England is supportive of this approach to ease pressure on low flows. However, NE has also commented that LPAs (including Herefordshire Council) make it somewhat difficult through the planning process to implement these capital intensive structures because of the significant constraints placed on farmers in respect of landscape

issues in particular, restricted use polytunnels being a prime example. This deters farmers from investing in the necessary water infrastructure.

5.14.6 Water Neutrality

Herefordshire Council is urged to explore seriously the options for water neutrality across the County, including agricultural consumption. Water neutrality could potentially be achieved by a combination of:

- modest reductions in overall per capita consumption
- retro-fitting of water efficient appliances
- variable or block tariffs
- increased metering of households
- implementation of widespread CSH Code 3 to 5 new homes
- reduced demand for agricultural water by improved efficiencies
- encourage development of winter storage reservoirs

A number of these initiatives are of course not necessarily within Herefordshire Council's powers within the Local Development Framework. Nevertheless, partnership agreements with the Environment Agency and DCWW through the planning process can be envisaged to promote such activities

Welsh Water is very concerned by the proposal for a water neutrality study and is unclear on the driver for this. Currently Welsh Water has indicated within the Draft WRMP that there is adequate water available to meet development to the proposed level within the RSS. A number of the proposals listed are not within the power of Herefordshire Council to deliver and in direct conflict of Welsh Water, and more importantly WAG policy. WAG does not support a policy of compulsory metering. It is reviewing the use of variable tariffs but only to support affordability issues, again in line with WAG policy.

Based on current supply demand balances, it would be unable to drive increased water efficiency or demand management at zonal level. This is obviously dependant upon its forecasts (which are currently being reviewed for the next revision of the WRMP) and any changes in licences. However, any policy which it would undertake at zonal level would be the optimised, least-cost option identified through its water resource planning process and not specifically driven by a neutrality study.

CCW welcomes this report's consideration of 'water neutrality. However, in the light of water consumption issues within the agricultural and business sector, it is suggested that, although worthwhile, pursuit of water neutrality in the new domestic housing section alone will only make a relatively small contribution to resolution of water resource issues. Additional consideration needs to be given to the pursuit of water neutrality within the business/economic sector and agriculture.

5.15 Issues for Action – Water Demand and Consumption

Table 5-12 - Water Cycle Issues Identified – Water Demand and Consumption

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions
5a	DCWW assumes no per capita consumption reductions for any zone to 2035. DEFRA recommends target of 130 l/p/d. What is the DCWW strategy?	DCWW	DCWW policy governed by WAG. DEFRA targets not applicable to DCWW.
5b	Herefordshire consumption very high in certain WRZs, especially Whitbourne and Vowchurch. What is the DCWW efficiency initiative in these areas to reduce pcc?	DCWW	DCWW unable to drive water efficiency initiatives in supply-demand surplus WRZs.
5c	Distribution input across all zones forecast to remain static to 2035, but this depends entirely on moving unmetered properties across to metered properties at 2–3%/year. Is DCWW on target? How can this be monitored?	DCWW	DCWW confident that meter uptake rate is supported by evidence. Reviewed annually.
5d	Agricultural abstraction licences accounts for 61% of total abstraction. 48 licenses remove more than 1000 m³/d. What is the efficiency status and accountability of these abstractors?	EA	Set by Licence Conditions. Trickle irrigation to be brought into licensing regime.
5e	No equivalent Water Resources Management Plan for irrigation abstractors, but they are the largest consumer of water. Should Herefordshire and EA prepare a similar WRMP for agriculture?	Herefordshire EA	EA currently supportive of all options identified under 5.8.5
5f	Trickle irrigation believed to impact significantly on Ecological River Flow Objectives in River Leadon and River Lugg. May impact on water availability for all sectors in future, especially with climate change	EA Herefordshire	Trickle irrigation to be brought into licensing regime. Herefordshire SPD on Polytunnels addresses water management issues
5g	Climate change likely to be a very significant impact on horticulture. Increased demand for produce coupled with increased soil moisture deficits + increased evapotranspiration is triple whammy	Herefordshire	Herefordshire Council promoting efficient use of water through Polytunnels SPD. Water usage efficiency assessed by EA via planning permission. Increasing use of on-farm reservr
5h	Formulation of agricultural Water Abstractor Groups successful in other regions. Many more on-farm reservoirs probably needed in future. Does EA endorse these strategies?	EA	Amongst other policies, yes, but no obvious driver
5i	Herefordshire Council strongly urged to consider sustainability options to become 'Water Neutral'.	Herefordshire	Under review, but would not be led by DCWW

5j	Water neutrality would potentially defer needed improvements to Sewage Treatment Works (considerable in some areas) and allow some houses to be constructed ahead of infrastructure	Herefordshire DCWW	Possible, but very site specific and not possible to determine at Outline Stage
5k	Distribution losses typically account for 19 – 30% of distribution input. DCWW response on ELL and sustainability of these figures.	DCWW	DCWW policies on water efficiency at zonal level are driven by need – i.e. where the supply demand balance necessitates and where enhanced demand reduction is the least cost, economic solution in that zone.

6. SEWERAGE INFRASTRUCTURE

6.1 Sewerage Infrastructure Constraints

6.1.1 DCWW Identified Constraints

DCWW has supplied a standardised summary statement for each potential housing land site concerning water supply, wastewater and wastewater treatment. These are provided for Hereford and the Market Towns individually, see Section 10, Tables 10-1 to 10-6.

These can be examined on a site by site basis to identify potential future infrastructure constraints.

As DCWW has confirmed on a number of occasions, it cannot commit funding to future infrastructure improvements until such funding is approved by OFWAT through the AMP Review process. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment plan, developers may be required to fund the essential improvements.

DCWW would emphasise that water services infrastructure requirements need to be assessed on an individual basis. It cannot provide this assessment until it is informed where the specific development will be allocated.

6.1.2 Data Availability and DCWW Policy on Data

The Consultants requested access to several pieces of information regarding sewerage networks and Combined Sewerage Overflows (CSOs) in order to familiarise themselves with the water services infrastructure essential to the conduct of a Water Cycle study, but this was declined (issues summarised in the letter of 14th February 2008).

Specifically, the following basic information would not be provided:

- GIS/electronic compatible AutoCAD drawing of water distribution network
- Known hydraulic capacity constraints within systems
- Location and performance of Combined Sewer Overflows
- Access to the DCWW Asset Explorer system to identify basic components of the distribution and sewerage system
- Reported flooding locations from storm and/or combined systems

DCWW advised Herefordshire Council at the study Inception meeting in April 2007 that currently Herefordshire and its environs do not benefit from Drainage Area Plans. Consequently, most of the sewerage infrastructure was unquantified and unmodelled in terms of hydraulic capacity.

Consequently, although sewerage infrastructure could prove to be a principal constraint for new RSS housing in some areas, we are unable to report on any specific information or data for this part of the water services infrastructure.

Access to the sewerage network plans is available only via a web interface to DCWWs Asset Explorer system. The Consultant requested such access in addition to several other outstanding issues in the letter of 14 February 2008, and by subsequent emails, but none of these requests were responded to.

6.1.3 DCWW Policy on Funding of New Infrastructure

Capital Investment Programme submissions are made in 5 yearly cycles to OFWAT, and only after approved funding are improvements undertaken. LDPs help DCWW to understand the level of growth to guide investment.

However, DCWW will only invest for confirmed allocations, as this is the only basis for approval of funding by the regulator. Plans are prioritised to meet specific objectives, and due to the disparity in timeliness (AMP reviews 5 yearly, LDP 15-20 years), if a development needs to proceed in advance of DCWW's planned improvement, these essential services need to be acquired through planning obligations.

DCWW look to the Development Plan system to understand the level of growth within the local authority area and this forms the basis of submissions to OFWAT for funding. Development Plans normally have a 15 year timeline, whereby a Water and Sewerage Undertaker operates on a 5 year cycle. Water and Sewerage Undertaker's Investment Plans have to be affordable and dependant on the level of funding approved, there may be instances where developer contributions are expected for the provision of essential infrastructure improvements.

6.2 Performance of Existing Systems

6.2.1 Sewerage Hydraulic Capacity

Historically, many housing areas were drained by means of combined sewers, whereby household drainage not only disposed of foul sewage, but also storm water from roofs and paved areas. This had the economic advantage of using a single drainage line for two purposes.

However, with increasing population delivering increased quantities of Dry Weather Flow (DWF), in combination with increasing short-duration rates of precipitation, increasingly combined systems are becoming susceptible to overloading.

Determination of existing hydraulic capacities and potential flooding (hydraulic performance) is data intensive, generally requiring the preparation of Drainage Area Plans. Currently these are not available for Herefordshire, so the Outline Water Cycle Study is unable to identify any issues or constraints with regard to the impact of emerging spatial strategies on sewerage capacity.

On the basis of confidentiality, DCWW provided only the coarsest level of flooding data related to sewerage systems, at the level of District postcode, which essentially provides no useable information, reproduced as Table 6-1.

DCWW wishes to emphasise that hydraulic capacity information relates to confidential information which it does not issue within the public domain. It has agreed with Herefordshire Council directly that it would assess the impacts to its assets once meaningful information had been received relating to specific growth options within the council area. It maintains that this type of information involves running complex models with very detailed information. It would not allow this assessment to be carried out by external consultants and it would need to be reimbursed for the cost of such specific tasks outside of its planned Regulatory improvements.

In its consultation response DCWW maintains that flooding information can be provided at area level i.e. street level, but this information was not disclosed. It cannot disclose sensitive information about individual properties. It states that it has already agreed and shared what information would be publicly available both with the EA and Welsh Assembly Government for them to prepare their Critical Drainage Area plans. This information is publicly available. We take this to be the outputs of Table 6-1.

Table 6-1 – Property Flooding Related to Sewers

Postcode	Number of dwellings	Cause	Frequency
HR1	14	Unknown	Unknown
HR2	11		
HR4	13		
HR6	8		
HR7	1		
HR9	9		

6.2.2 Combined Sewer Overflow Performance

The Consultants asked for data and information on CSOs within Herefordshire, including the basic location of these assets, so they could be identified spatially in relation to possible emerging housing spatial strategies, but DCWW declined to supply this information directly. This information is apparently available through the Asset Explorer system, to which the Consultants were not given access.

Consequently, we are unable to identify any issues in relation to CSO location or performance in conjunction with new housing, although this interaction may prove to be a significant infrastructure constraint.

CSO performance is a significant and useful marker for general local sewerage performance. CSOs are designed to reduce hydraulic loading on the downstream system by diverting excess (combined flows) most usually during storm periods to an adjacent watercourse. CSOs generally have a prescribed performance in terms

of the volume and frequency with which they may discharge, and always require a formal Discharge Consent form the Environment Agency. Consent conditions relate to a requirement to pass forward a specific minimum flow derived from an industry standard calculation known as Formula A (based on population, per capita water use, infiltration and trade effluent), plus aesthetic control conditions.

Consequently, where CSOs are known to be operating frequently (even if within the consented limits) this is a reasonable indicator of probable hydraulic restrictions downstream, which would be exacerbated by increased loadings from new development, even though such loading from new systems is very likely to contribute only to the DWF component.

Currently the Environment Agency has identified only one CSO not meeting satisfactory performance, listed in Table 6-2. This has been identified in the DCWW Business Plan for improvement.

Table 6-2 – Unsatisfactory Combined Sewer Overflow Performance

River	Location	Discharge Consent	Trigger threshold	Frequency	Actions
Arrow	Pembridge	Unconsented	Formula A		DCWW Business Plan

The DCWW consultation response states that the location of all known CSOs is available as part of the sewer map already supplied to Herefordshire Council and Environment Agency, but the Consultants have been unable to access these data.

The hydraulic performance of CSOs would only be available through the modelling exercises mentioned above and the particular growth scenarios and rainfall patterns would need to be agreed before the hydraulic models could be run, however the discharge consent information for all CSOs is available publicly from the Environment Agency and also a list of any CSOs that do not currently perform to their required standard.

The Outline Water Cycle Study is unable to identify any issues or constraints with regard to the impact of emerging spatial strategies on hydraulic or water quality CSO performance.

6.2.3 Drainage Area Plans

The DCWW consultation response (August 2009) states that most of its sewer networks have been hydraulically modelled, some in very great detail, and this information has been built up over a number of years. Furthermore, that Drainage Area Plans (DAPs) exist for the major catchments in Herefordshire, but this was stated NOT to be the case in April 2007, Inception Meeting, and confirmed again in November 2007.

Citing DCWW, the information exists in various formats and in different software packages. It would not be suitable to transfer this information directly to Herefordshire Council. DCWW would propose that it would assess the capacity based on typical growth and rainfall scenarios agreed with Herefordshire Council and the cost of producing this information would be borne by Herefordshire Council.

Additionally, where flooding incidents are known, these are usually isolated incidents whereby potential developers have alternative options to consider i.e. water industry sewer requisitions or S106 T&CPA to accelerate the essential improvements to allow the development to proceed in advance of DCWW's planned Regulatory work.

DCWW states that the Critical drainage area work carried out by the Welsh Assembly Government, the EA and Welsh Water will not only provide information on sewer flooding but also fluvial and surface water flooding. Drainage Area Plans do exist for the major catchments in Herefordshire and these are continually updated. Specific areas where hydraulic models need to be run should be identified, specific growth scenarios identified and the system capabilities including CSO performance can then be identified. The cost of this work would need to be borne by Herefordshire Council.

The apparent availability of DAPs for Herefordshire was not disclosed to Herefordshire Council or its consultants until release of the draft WCS. Previously DCWW personnel had clearly advised the Consultants that no such studies or outputs pertaining to general hydraulic information were available.

Consequently, although sewerage hydraulic capacity could prove to be a principal constraint for new RSS housing in some areas, because we were advised that there were no data or outputs available from DAPs, we are unable to report on any specific information or data for this part of the water services infrastructure to inform the Water Cycle study.

6.3 Performance of Future Systems

6.3.1 Regulatory Framework

There are significant changes envisaged in the Governments new water strategy, enshrined in the Flood and Water Management Bill, 1.11

In essence, Local Planning Authorities and water companies will be obliged to work together through the mechanism of Surface Water Management Plans to provide:

- More adaptable drainage systems delivering reduced flood risk, improved water quality, and decreasing burdens on the sewer system
- Better management of surface water drainage, allowing for the increased capture and reuse of water; slow absorption through the ground; and more

above-ground storage and routing of surface water separate from the foul sewer system

- Better public appreciation of the causes and consequences of surface water run-off and the actions that can be taken to minimise the risks

DCWW has emphasised that it is fully aware of the requirements of the Flood and Water Management Bill and it would welcome working together with all Local Authorities, the EA and the Welsh Assembly Government in the development of Surface Water Management Plans. It should be noted that the approach in Wales may be different to that proposed in England.

6.3.2 Technical Framework

Design of new urban drainage systems will generally be in accordance with:

- **Sewers for Adoption 6th Edition, WRc, May 2006**.

In particular, SFA 6 includes detailed requirements for lateral drains and Sustainable Urban Drainage Systems (SUDS) in order that they can be offered for adoption.

All sewers that will subsequently be adopted by the sewerage undertaker must be designed and built in accordance with the requirements of Sewers for Adoption, 6th Edition. This document provides guidance on suitable return periods for use in the design of sewerage systems for various development types. In general terms, sewers should be designed to ensure that no flooding occurs above ground level for events with a return-period in the range of 30 to 50 years, depending on the development type.

A significant issue is that rainfall events that cause an exceedence of the adopted sewerage system are beyond the statutory responsibilities of the sewerage undertaker. This has been a major problem in the past, whereby EA Development Control Officers have requested that site runoff up to and including the 1% AEP event should not exceed green-field rates, but this is well beyond the capacity of most sewerage systems.

For events with a return-period in excess of 30 to 50 years i.e. beyond the stipulations of Sewers for Adoption, the solution inevitably lies with SUDS type drainage control, requiring especially consideration of the site drainage design in the very earliest stages.

- **Sewerage Risk Management Manual (SRM), WRc 2009**

The Sewerage Rehabilitation Manual 4th Edition has now been extensively revised, updated, extended and developed into the Sewerage Risk Management website at

The SRM presents an iterative, comprehensive risk based approach to the management of sewer system assets compatible with EN752:2008 Drain and Sewer Systems Outside Buildings and the UKWIR Common Framework, and is

able to take account of strategic drivers such as climate change adaptation and integrated urban drainage management.

Following the draft Flood and Water Management Bill 2009, there are now other significant technical guidance documents in place that should be referred to by DCWW and Herefordshire Council working in partnership, notably:

- **Surface Water Management Plan Technical Guidance – DEFRA, February 2009**.

This essential industry guidance has been produced based on evidence from the Integrated Urban Drainage Pilot Studies, which were funded by DEFRA, with a contribution from UK Water Industry Research Ltd (UKWIR).

6.4 Summary of Main Issues

6.4.1 Infrastructure Constraints

DCWW has supplied a standardised summary statement for each potential housing land site concerning water supply, wastewater and wastewater treatment. These are provided for Hereford and the Market Towns individually, see Section 10, Tables 10-1 to 10-6. These can be examined on a site by site basis to identify potential future infrastructure constraints.

As DCWW has confirmed on a number of occasions, it cannot commit funding to future infrastructure improvements until such funding is approved by OFWAT through the AMP Review process. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment plan, developers may be required to fund the essential improvements.

DCWW would emphasise that water services infrastructure requirements need to be assessed on an individual basis. It cannot provide this assessment until it is informed where the specific development will be allocated.

Natural England has expressed the view that the design of new housing to separate surface and wastewater flows to sewers and STWs may be a key issue to alleviate operational demands on some of the vital STWs serving growth localities. It would wish to see the storm water flows from development discharging to SUDs, but also contributing to the flow and water supply requirements for surface and ground water bodies and extant or created wetlands of biodiversity value.

Whilst we fully acknowledge DCWW's contention that its investment and forward planning are constrained by OFWAT and the Periodic Review, this approach in our view regrettably undermines the entire raison d'être of Water Cycle Studies which are intended to ascertain the key infrastructure constraints over the housing planning period and provide the evidence base to strategically site new housing growth in areas of least infrastructure and/or environmental impact. If these potential impacts cannot be assessed significantly in advance beyond a 5 year

period, even in outline, the Local Authority has no option but to forward plan for sites in the absence of this information.

This may result in inappropriately costly or untimely phasing of developments that might otherwise have been avoided, this being the main purpose of the Water Cycle Strategy that is supposed to evolve from evidence based Water Cycle Studies.

We have no answer to this structural impasse at this time.

6.4.2 Regulatory Framework

There are significant changes envisaged in the Governments new water strategy, enshrined in the Flood and Water Management Bill.

In essence, Local Planning Authorities and water companies will be obliged to work together through the mechanism of Surface Water Management Plans to provide:

- More adaptable drainage systems delivering reduced flood risk, improved water quality, and decreasing burdens on the sewer system
- Better management of surface water drainage, allowing for the increased capture and reuse of water; slow absorption through the ground; and more above-ground storage and routing of surface water separate from the foul sewer system
- Better public appreciation of the causes and consequences of surface water run-off and the actions that can be taken to minimise the risks

The Strategic Flood Risk Assessment for Herefordshire [2] has identified that Surface Water Management Plans may well be needed for major strategic sites south of Leominster and south-east of Hereford.

6.5 Issues for Action – Sewerage Infrastructure and Urban Drainage

Table 6-3 - Issues for Action – Sewerage Infrastructure and Urban Drainage

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions
6a	No data provided on current hydraulic performance of sewerage systems anywhere in Herefordshire.	DCWW	DCWW will assess these internally once strategic sites have been allocated.
6b	No data provided on current hydraulic performance of Combined Sewer Overflows anywhere in Herefordshire.	DCWW	DCWW will assess these internally once strategic sites have been allocated.
6c	Government strategy on integrated surface water management compels water companies and LPAs to provide Surface Water Management Plans in critical areas. Working Group needed.	Herefordshire DCWW	Awaiting review
6d	Probable SWMPs required in Leominster and Hereford on the basis of historical flood reports	Herefordshire DCWW	Awaiting review

7. WASTEWATER TREATMENT AND POLLUTION CONTROL

7.1 Urban Pollution Management

Urban water quality planning is essential to ensure development is sustainable. Recent advances in urban drainage modelling and water quality planning are helping to ensure a more sustainable water cycle. They have shown that sustainable and cost efficient solutions to the challenges of population increase, climate change and the Water Framework Directive (WFD) are only possible with a strategic, holistic and integrated approach to modelling and design.

The Urban Pollution Management Manual was a major research and development programme that was sponsored by the whole of the UK Water Industry. Many of the planning concepts and enabling tools in the Manual were substantially new at that time and address issues that are of great importance to the industry. The process outlined in the Manual has been widely adopted in the UK, and, in particular in areas with acute Combined Sewer Overflow (CSO) problems.

There are three concepts behind the urban pollution management methodology.

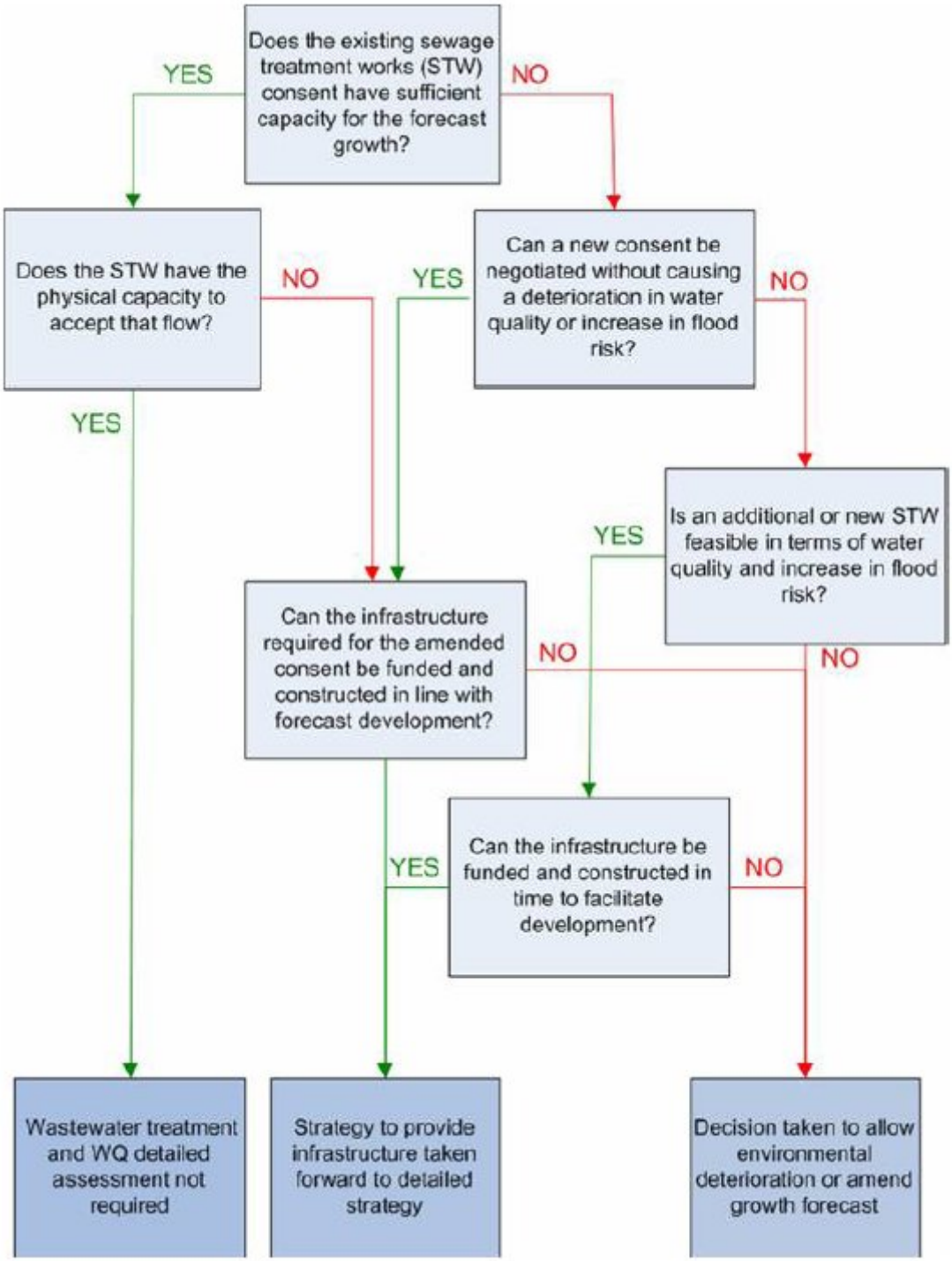
1. The need to consider the sewer system, treatment plant and the receiving water as an integrated system, whereby changes in one part of the system has implications for other parts.

2. The approach is underpinned by environmental standards, where compliance to defined standards needs to be demonstrated.

3. The level of detail of modelling should be risk-based and appropriate to the technical needs of the study. Simple tools are often sufficient to undertake a UPM study and more detailed modelling methodologies are only required where there is an economic case to do so.

Figure 7-1 extracted from the Environment Agency Water Cycle guidance [1](based on the Urban Pollution Management Manual [31]) shows how wastewater systems should be methodically assessed with regard to growth impact.

Figure 7-1 – Determination Process for Adequacy of Wastewater Systems



7.2 Wastewater Treatment Infrastructure Constraints

7.2.1 DCWW Identified Constraints

DCWW has supplied a standardised summary statement for each potential housing land site concerning water supply, wastewater and wastewater treatment. These are provided for Hereford and the Market Towns individually, see Section 10, Tables 10-1 to 10-6.

These can be examined on a site by site basis to identify potential future infrastructure constraints.

As DCWW has confirmed on a number of occasions, it cannot commit funding to future infrastructure improvements until such funding is approved by OFWAT through the AMP Review process. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment plan, developers may be required to fund the essential improvements.

DCWW would emphasise that water services infrastructure requirements need to be assessed on an individual basis. It cannot provide this assessment until it is informed where the specific development will be allocated.

7.2.2 Data Availability and DCWW Policy on STW Data

DCWW's stated position is that:

"*Sewage Treatment Works performance (including specific information on flows, sampling information and capacity) is a matter for water companies to report to its Regulator and this forms the basis of future capital investment.*

There are many other factors that need to be considered in assessing performance and headroom (e.g. age and type of works, operational consideration, control of storm water etc) and it is precisely for these reasons that this technical and process information is best done by water industry personnel and not others".

Source: DCWW Development Planning Manager, June 2009

7.3 Environment Agency Discharge Consents

7.3.1 Introduction

Operators wishing to discharge a polluting material legally into a watercourse must first apply to the Environment Agency for a 'Consent to Discharge' under the Water Resources Act. The Environment Agency calculates discharge consents based on the quality and volume of the waste water and the quality and volume of the receiving watercourse. The waste water must not contain more polluting material

than can be broken down in the river without significant impact on water quality or biodiversity.

The effective environmental protection and management of waterbodies receiving effluent discharges requires monitoring and understanding of mass release rate of pollutants. In this context mass means the load of the pollutant. This can only be achieved by combining flow measurement data (volume/time) with pollutant concentration (mass/volume). The result is therefore pollutant load (mass/time) e.g. g/day.

In simple terms 'load' is the product of concentration x flow.

The polluting capacity of treated sewage effluent is determined using BOD (Biochemical Oxygen Demand), which measures the capacity of the waste water to use up oxygen in the river and ammonia which also uses up oxygen in the river, but is also toxic in its own right. If a river is small and the volume of effluent large, then the quality of effluent must be high in order to protect river quality. If however the river is large then there is more dilution and a more relaxed standard can be applied to the effluent.

If a Sewage Treatment Works (STW) needs to expand due to new development it may be necessary to apply to the Environment Agency for a new consent for increased discharge. The Environment Agency may grant this, but is likely to set tighter limits on the pollutant concentrations to ensure the overall loading is unaltered. Hence, this represents a development pressure on the water services infrastructure.

Some STWs are currently discharging lower volumes than the consent permits and could therefore increase flow without having to apply for a new consent. An essential Water Cycle study task is to determine which STWs are approaching the limits of their consented discharges, or conversely have the capacity to improve quality or increase flow in order to accommodate any additional demand caused by new growth within the region.

7.3.2 General Wastewater Discharges in Herefordshire

For general reference and completeness, we have mapped every current Discharge Consent within Herefordshire. Consents for the Wye system are marked pink dots, the Teme system with grey dots. All of the Consent information as sourced from the Environment Agency is available through the following GIS layers:

- **HWCS Discharges Wye**
- **HWCS Discharges Teme**

There are currently 996 mapped Consents in the Wye (Herefordshire) and 36 for the Teme (Herefordshire). The data are mapped as **Evidence Map 7-2**, superimposed on the EA defined Ecological Status layers described in Chapter 2. The influence of each and every Discharge Consent to the receiving waterbody is readily apparent.

This map is also useful general indicator of point pollution pressure within every sub-catchment relevant to Herefordshire. Useful specific quantitative information could be derived through GIS SQL queries, such as totals of all Consented DWF for each individual sub-catchment. These could then be thematically mapped to produce intensity shaded 'general pollution pressure map' or similar outputs.

When related to other GIS base layers such as:

- **HWCS All Catchments**
- **HWCS Eutrophic Sensitive Waters**
- **HWCS EA Ecostatus 2010 Wye**
- **HWCS EA Ecostatus 2010 Teme**

powerfully informative maps can be produce that show pollution pressures in any number of forms in relation to the sensitivity of the receiving waters.

There are over 60 consented discharges to the Teme catchment as a whole (36 in Herefordshire); the majority are for sewage effluent or sewerage system overflows. The largest discharge is from Ludlow Sewage Treatment Works, which although technically outside Herefordshire, has potential impact on waterbodies within Herefordshire.

7.4 Sewage Treatment Works in Herefordshire

7.4.1 Locations and Catchments

Without active support from DCWW, a rudimentary assessment of sewage treatment infrastructure has been undertaken. It is a fundamental requirement for any Water Cycle Study properly identifying infrastructure constraints to development that:

- The location and relevance of each and every STW in relation to proposed developments is identified
- The current operating capacity of the STW is established in relation to its maximum potential capacity and in relation to its discharge consent.

Although these issues are of critical importance to the Local Planning Authority so that it may simply identify where likely constraints are in relation to their spatial strategies, DCWW was not prepared to provide even approximate locations of any of its STW assets. These locations however are readily identifiable from any 1:10 000 OS map, and accordingly we have mapped all known STWs from this alternative source.

Utilising GIS layers:

- **HWCS Sewage Treatment Works Wye**
- **HWCS Sewage Treatment Works Teme**

We have prepared a list of known STWs in Herefordshire operated by DCWW, who provided a list of such STWs together with their Discharge Consent licences. Cross-referencing this list to the Environment Agency supplied register of Discharge Consents we have prepared a list of STWs with basic operational data as far as we are able to obtain it.

Table 7-1 – Villages Served by Principal STWs (Herefordshire)

Principal STW	Villages served
Hereford Rotherwas	Hereford, Bishopstone, Kenchester, Credenhill, Burghill, Swainshill, Stretton Sugwas, Kings Acre, Lower Buliingham, Grafton, Tupsley, Bartestree, Hagley, Lugwardine, Withington, Holmer
Hereford Eign	*<as above>*
Lower Cleeve	Ross On Wye, Brampton Abbotts, Lea, Weston Under Penyard, Coughton, Walford Court, Green Meadows, Ham Green
Leominster	Leominster, Barons Cross
Bromyard	Bromyard
Moreton on Lugg	Moreton, Marden, Sutton, Wellington
Kington	Kington
Weobley	Weobley
Kingstone and Madly	Kingstone, Webton, Madley
Clehonger	Clehonger
Presteigne	Presteigne
Kingsland	Kingsland
Pembridge	Pembridge

7.4.2 Environment Agency MCERTS Monitoring

Under the Environment Agency regulated MCERTS Self Monitoring of Effluent Flow Scheme, all companies or operations discharging more than 50 m³/day DWF are obliged to self-monitor their discharge volumes, and record and report to the Environment Agency on a regular basis accordingly .

Consequently from these data (which according to the Environment Agency are in the public domain once received by them) it would be possible to establish directly the current level of discharge effluent in relation to the Consent. We have been unable to obtain this information, and hence are unable to make this assessment.

The Environment Agency has advised of data transfer issues between itself and DCWW which are unlikely to be resolved before March 2010, and we cannot therefore report on the MCERTS volumes.

7.4.3 OFWAT 'June return'

Volumes of sewage and effluent collected, treated and disposed are also a key requirement of the 'June return' submitted annually to OFWAT for regulatory purposes.

As stated under 7.1, DCWW regard all matters of STW capacity and performance as confidential and not a relevant issue for direct discussion under a Water Cycle study. However, with specific regard to water quality and wastewater collection, Water Cycle Study guidance explicitly requires the lead Authority to:

- Identify the capacity of the STW, both actual and consented, and identify when this capacity is likely to be reached.

Hence there is a fundamental gap between what data the water company is prepared to release and what Best Practice guidance dictates. In our view DCWW has internally sufficient data readily available to make a reasonable assessment of STW operational capacity, as set out in Table 7-2. DCWW refutes this, and has stated that there is not enough data in the June return to make a reasonable assessment of STW operational capacity. When looking at developer or trader requests for information Welsh Water consider implications on consent levels, hydraulic capacity, biological capacity on BOD/Amm/N/P to meet the existing and potential future consent requirements, operational constraints (including additional sludge processing capacities) and control of storm water discharges.

Large STWs are defined as those which receive an average loading in excess of 1500kg BOD5/day (including effluent from both domestic and trade sources, but excluding any allowance for non-resident population). This is roughly equivalent to a population of 25,000, and these are specifically reported on in the June return.

Table 7-2 – Data Relevant to STW Performance from OFWAT June return

OFWAT Data Table	Line	Performance Measure
Table 15 – Sewage Loads	1	Trade effluent load receiving secondary treatment (BOD/year)
Table 15 – Sewage Loads	2	Total load receiving secondary treatment (BOD/year)
Table 15 – Sewage Loads	6	Equivalent population served (resident)
Table 15 – Sewerage Service	9	Treatment capacity available (BOD_5/day)
Table 17b – Large STWs	3	Population equivalent of total load received (based on 60g/BOD/day

We are of the view that the Water Cycle study would be sufficiently informed for any STW by making a comparison of Table 15 Line 9 and Table 15 Line 2.

OFWAT regards these as basic statistics adequate to inform relative performance and efficiency assessments of STWs and we are of the view that they are equally appropriate at the level of a Water Cycle study. DCWW does not support this view.

7.4.4 Criteria for Assessment of STW Environmental Risks

The capacity of existing sewage treatment works to treat sewage from increased development can be considered in four broad categories.

1. The sewage treatment works is well within its consented discharge limits and therefore has the capacity to increase the volume of effluent it treats

2. The sewage treatment works is nearing the limit of its consent, but is likely to be granted a new consent because the increases in volume could be counterbalanced by improvements to the quality of the effluent

3. The sewage treatment works is already producing a good quality effluent. It may be difficult to improve the quality still further with the current technology.

4. The sewage treatment works can not increase the volume of water discharged without an increase in the risk of downstream flooding.

Source: West Midlands Regional Spatial Strategy (RSS 11)
The Impact of Housing Growth on Water Quality and
Waste Water infrastructure

Table 7-3Table 7-3 below summarises the Environment Agency criteria for STWs 'environmental risk categories' with respect to their Discharge Consents.

As we have not been provided with any STW specific data, we are unable to determine environmental risks as above. In the RSS Impact of Housing Report, the Environment Agency has made its own assessment for large STWs (>10,000 p.e.), which is reproduced in Table 7-4. We have modified this Table however to take account of the more recent RoC process.

Table 7-3 – Criteria for STWs Posing Environmental Risk

Environmental Risk	Criteria
BOD	
High	Consented BOD of <= 10 mg/l
Medium	Consented BOD of > 10 mg/l and < 15 mg/l
Low	Consented BOD of > 15 mg/l
Ammonia	
High	Consented NH_4 of <= 3 mg/l
Medium	Consented NH_4 of > 3 mg/l and < 10 mg/l
Low	Consented NH_4 of > 10 mg/l
Flow Risk	
High	Estimated inflow is >= 100% of Consented DWF
Medium	Estimated inflow is > 75% and < 100% of Consented DWF
Low	Estimated inflow is < 75% of Consented DWF
Note:	Estimated inflow is calculated as 0.180 x population equivalent in lieu of actual data from Water Companies and is assumed to be a representation of Dry Weather Flow (DWF).

Table 7-4 – Environmental Risks of Herefordshire Large STWs

STW Name	Consent	BOD Load p.e.	Flow Risk	Quality Risk	Overall Risk
Rotherwas STW	AH1001201	76862	Low	High	High
Eign STW	AH1001101	46690	High	High	Very High
Ross Lower Cleeve	AS1003701	13615	Low	Low	Low
Leominster	AN0228302	11715	Low	High	High
Ludlow		10500	Low	Low	Low
Ledbury STW	S/21/26211/R	9904	Low	High	High
Moreton on Lugg	AH1002201	4612	Medium	High	High

This relatively general assessment by the Environment Agency is superseded by and improved upon as a result of the Habitats Directive RoC process described more fully under 7.5.

7.4.5 Review of STW Capacity & Performance in Herefordshire

DCWW has provided highly summarised anecdotal data regarding 31 of its STWs in terms of available headroom. (Emtec September 2007). More recently, a summary of potential housing headroom was provided (Development Planning, June 2009).

The purpose of this review is to identify as fully as possible for the LPA's benefit where there are likely to be significant constraints to future development due to inadequate STW capacity. Clearly this information is approximate and subject to change, but it provides a flag to Herefordshire Council to request further details with specific regard to timing and costs of planned new infrastructure, which would be the subject of a Detailed Water Cycle study.

STWs with known issues such as tight constraints, RoC adverse impacts, Consent failures or approaching lack of capacity are summarised in **Table 7-88.**

We have also mapped these as GIS layer:

- **HWCS High Risk STWs**

This 'high risk' assessment is based on at least one of the following criteria:

a) STW with tight Discharge Consent posing environmental risk (especially Ammonia or Total Phosphorous)
b) STW with identified current hydraulic capacity issues or biological treatment issues
c) An STW with identified adverse impacts arising from the Review of Consents (RoC) process

The exact technical nature of these constraints requires urgent further detailed investigation, particularly with regard to a) time-span of necessary improvements b) costings.

Herefordshire Council must urgently establish these in order to ascertain the impact on possible emerging spatial strategies and their trajectories.

To assist this process, we have mapped simultaneously the additional layers:

- **HWCS All Catchments**
- **HWCS Spatial Strategies**

Together, as **Evidence Map 7-3** these layers illustrate the strategic growth areas and topographic sub-catchments most likely to be affected by STW constraints.

It is self-evident from **Table 7-4** and **Table 7-8** that there are significant potential constraints to RSS housing targets throughout Herefordshire as a result of inadequate sewerage treatment capacity at some 34 STWs (67% of all identified ST works).

We emphasise that this assessment is highly approximate at this stage, and by no means complete. It refers primarily to immediate STW status, and does not take account of the fact that an STW with currently available headroom may not actually be able to accommodate full planned housing growth in the future.

It is also probable that there are existing constraints on other smaller STWs, but without input from DCWW on this matter we cannot take it further.

7.5 RoC Stage 4 Action Plan

7.5.1 Water Quality Impacts and Actions – River Wye

Figure 2-3 confirms that a total of 30 sites were identified from the RoC Stage 3 process where no adverse impact could not be established for water quality reasons. GIS analysis shows that 16 of these sites fall within Herefordshire. 2 at Presteigne are technically in Wales, but are included because of their immediate proximity.

Evidence Map 7-4 illustrates the location of each adverse RoC site, superimposed on the WFD ecological status of the waterbody. The Teme catchment has not been assessed as part of this process due to lack of information.

Table 7-9 should be viewed in conjunction with Evidence Map 7-4. **Table 7-9** summarises for the 16 relevant Consents what actions are proposed to bring the site to meet environmental objectives (as summarised in **2.3.6**).

In summary, only 2 of the 16 adverse impacts directly affect the River Wye, namely Eign and Rotherwas STWs. The BOD and Ammonia Consents will be tightened here, to 28 mg/l BOD and 10.4 mg/l Ammonia. An AMP 4 upgrade for both STWs in combination is planned for completion by March 2010, allowing for an additional 3800 houses. The tightened Consents naturally mean that more of the treatment capacity is used to reduce the BOD and Ammonia loads of the effluent, hence there is less available headroom to accommodate future housing growth.

The remaining Consents all fall within the catchment of the River Lugg. Presteigne, Bromyard and Leominster are the three principal STWs affected.

Leominster will have a tightened Consent to 9 mg/l, further reducing the available headroom.

Leominster, Kington, Bromyard and Moreton-on-Lugg STWs all contribute to the diffuse pollution loading of phosphates in the River Lugg system, and consequently will have their Total Phosphorous Consent limit tightened to 1 mg/l P. This reduction will result in less available headroom to accommodate future growth.

7.5.2 Water Quality Impacts and Actions – River Teme

Many of the Teme catchment watercourses have stretches designated under the EC Directive on Freshwater Fish, which reflects on the quality of fresh waters needing protection or improvement in order to support fish life.

The Teme catchment provides a vital role in receiving the treated discharges from rural sewage treatment works and larger treatment centres at Tenbury Wells, Craven Arms, Church Stretton, Ludlow and Knighton. Improved sewage treatment is being implemented in the area to remove phosphates and protect and improve the water quality of the catchment.

Under the Habitats Review of Consents (RoC) process, the Teme is being assessed from its confluence to Tenbury. The RoC is only at the commencement of Stage 3, and no specific information is yet available on Consents.

Specific impacts from the RoC process have not yet been identified, but The Environment Agency has indicated that it is very unlikely that current water abstraction licences will be affected by the Appropriate Assessment. The key abstraction point is to the Whitbourne Water Treatment Works (Consent 18/54/09/08).

The Environment Agency is also of the view that the Leintwardine groundwater abstraction (Consent 18/54/09/367) does not have a direct impact on Teme flows, and is therefore unlikely to be affected by site actions.

7.6 Diffuse Pollution Pressures

7.6.1 Diffuse Pollution

Raised concentrations of pollutants, such as nitrate and phosphorus, can have serious effects on the health and diversity of fresh and marine waters including the organisms that live in those environments.

Diffuse pollution can also prevent the use of water for drinking and recreation, for example, from the presence of pesticides and faecal indicator organisms.

Additional pollutants such as sediments can affect the health of aquatic organisms, adding to the loss of species diversity.

Farming is not the sole cause of these problems, but it does contribute approximately 60 per cent of nitrates, 25 per cent of phosphorus and 70 per cent of sediments entering surface waters, amongst other pollutants.

This factor, in combination with STWs discharges, causes high phosphate levels which exceed target standards for Good Ecological Status (GES) for nearly all main river waterbodies and SAC/SSSI reaches in Herefordshire.

7.6.2 Agricultural and Urban Impacts Combined

In assessing diffuse pollution, we have not drawn a distinction between urban and/or agricultural impacts, nor is it easily feasible to do so. However, diffuse pollution impacts will tend to arise from the whole of the sub-catchment. Hence it is useful to assess diffuse pollution pressures within this context.

We have combined evidential layers such as:

- **HWCS All Catchments**
- **HWCS Villages**
- **HWCS EA Ecostatus 2010 Wye**
- **HWCS EA Ecostatus 2010 Teme**

This produces **Evidence Map 7-5**. This shows principally the current ecological status of all waterbodies. This is a useful proxy for assessing the general level of water quality and/or hydromorphology in the specific sub-catchment. The waterbody ID and many other attributes can be interrogated with the live GIS.

The number and proximity of existing villages to the waterbodies in a sub-catchment is a relevant pressure to be considered. Villages are not named on the map, but can be easily identified from the active GIS. Finally, the mapping of the emerging spatial strategy as a thematic proportional map gives a clear quantitative insight as to the possible degree of general pollution pressure from new or enlarged settlements.

Clearly, where waterbodies are at Poor to Moderate ecological status, then a high proportion of villages and/or new proposed developments will place further pressure on the ecological status of those waterbodies, possibly compromising the strategic river basin management plan objectives.

Evidence Map 7-5 shows a significant number of waterbodies in Poor ecological status in the Arrow and upper Lugg catchments. The Upper Frome sub-catchment has the worst ecological status, with several waterbodies at 'Bad ecological status.

The Habitats RoC process identified that the River Lugg phosphate target failed from below Leominster STW to the confluence with the Wye due to a combination of diffuse and consented inputs. The lower Wye is identified as a nutrient sensitive waterbody under the Urban Wastewater Treatment Directive.

We note also that there is significant housing pressure in the River Leadon catchment, and that both the upper and lower Leadon sub-catchments have waterbodies in poor ecological status. The lower Leadon is identified as a nutrient sensitive waterbody under the Urban Wastewater Treatment Directive.

Clearly the emerging spatial strategy should take account of the existing ecological status of these waterbodies, together with the identified actions from the Severn District River Basin Management Plan.

Where the emerging spatial strategy may impact on these objectives, specific mitigation strategies will obviously be required. For example, through:

- Improved adaptive land management to reduce levels of orthophosphate from horticultural and framed land.
- SUDS water quality interventions for general surface runoff
- Targeted reductions in use of detergents by households
- General reduction in per capita water demand and disposal to sewage treatment.

Although the Teme Valley is designated as a SSSI, the lower reaches of the catchment are affected by diffuse pollution, mainly consisting of nutrients and solids. These are generally thought to derive from agricultural sources and are currently perceived to have a significant detrimental effect on water quality.

The change in land use from pasture to arable has increased potential for diffuse pollution. Diversification in the farming sector has also seen the development of fish farming and fishery enterprises, which are dependent on surface water sources

7.6.3 RBMP Objectives for Waterbodies

It is necessary for the LPA to take account of the Water Framework Directive driven Severn District RBMP objectives with regard to spatial strategies.

The final RBMP consultation was issued in December 2008, closing on 22 June 2008. **Annex B: Objectives for Waters** of this document is highly relevant, as it summarises for every waterbody the objectives and targets to reach 'Good' ecological status by a specified target date.

We have identified in detail 14 waterbodies from the Severn RBMP that fall within Herefordshire and that are at either Poor or Bad ecological status, summarised in **Table 7-109** The status of these waterbodies will be particularly sensitive to new housing pressures.

Evidence Map 7-5 and **Table 7-109** should be viewed jointly to fully appreciate the ecologically most problematic waterbodies. To support the evidence base further, we have summarised in Table 7-8 also indicative housing quantities from the emerging spatial strategy (Scenario 1, May 2009), which conveys a useful insight into the extent of the housing pressure (or otherwise) on the waterbody.

From this analysis, it is self-evident that the following areas should require careful consideration with respect to high housing impact:

- River Lugg from Norton Brook to River Lugg
- River Arrow from Gilwern Brook to River Lugg
- River Frome from source to Tedstone Brook
- River Wye from Walford Brook to Bigsweir Bridge
- River Leadon from source to Preston Brook

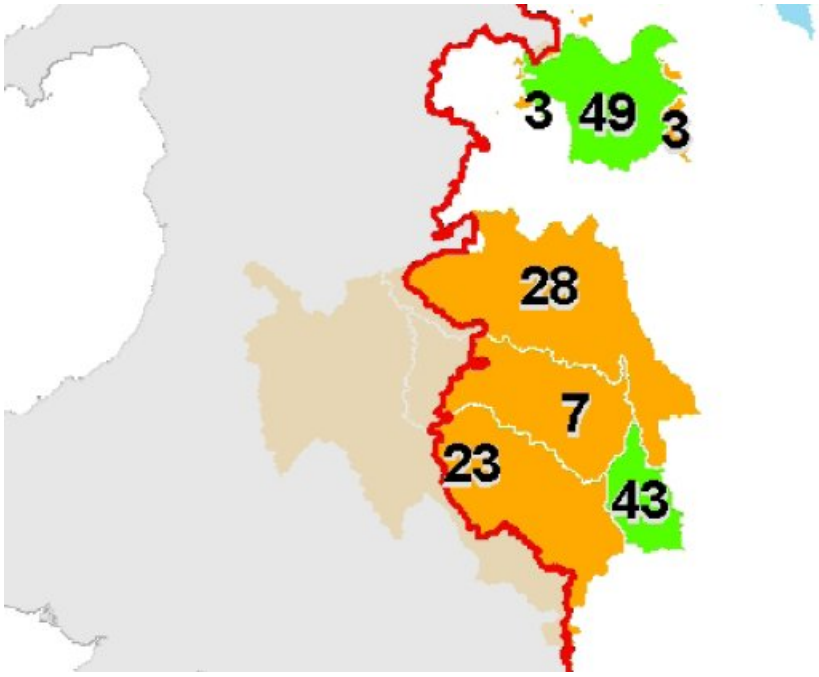
7.6.4 England Catchment Sensitive Farming Delivery Initiative

The England Catchment Sensitive Farming Delivery Initiative (ECSFDI) is part of DEFRA's Catchment Sensitive Farming (CSF) Programme which aims to tackle diffuse water pollution from agriculture in order to meet the objectives of the Water Framework Directive (WFD).

The ECSFDI also contributes to the achievement of domestic and international environmental targets, in particular 2010 PSA targets for SSSIs. The initiative was initially rolled out in April 2006 in forty priority catchments in England, and will continue to at least 2010-11. In October 2008 an additional 10 priority catchments were added to the existing 40.

Figure 7-1 illustrates the targeted catchments, some of which cover Herefordshire in its entirety.

Figure 7-2 – Location of Target Catchments under ECSFDI



Source: http://www.defra.gov.uk/foodfarm/landmanage/water/csf/delivery-initiative.htm

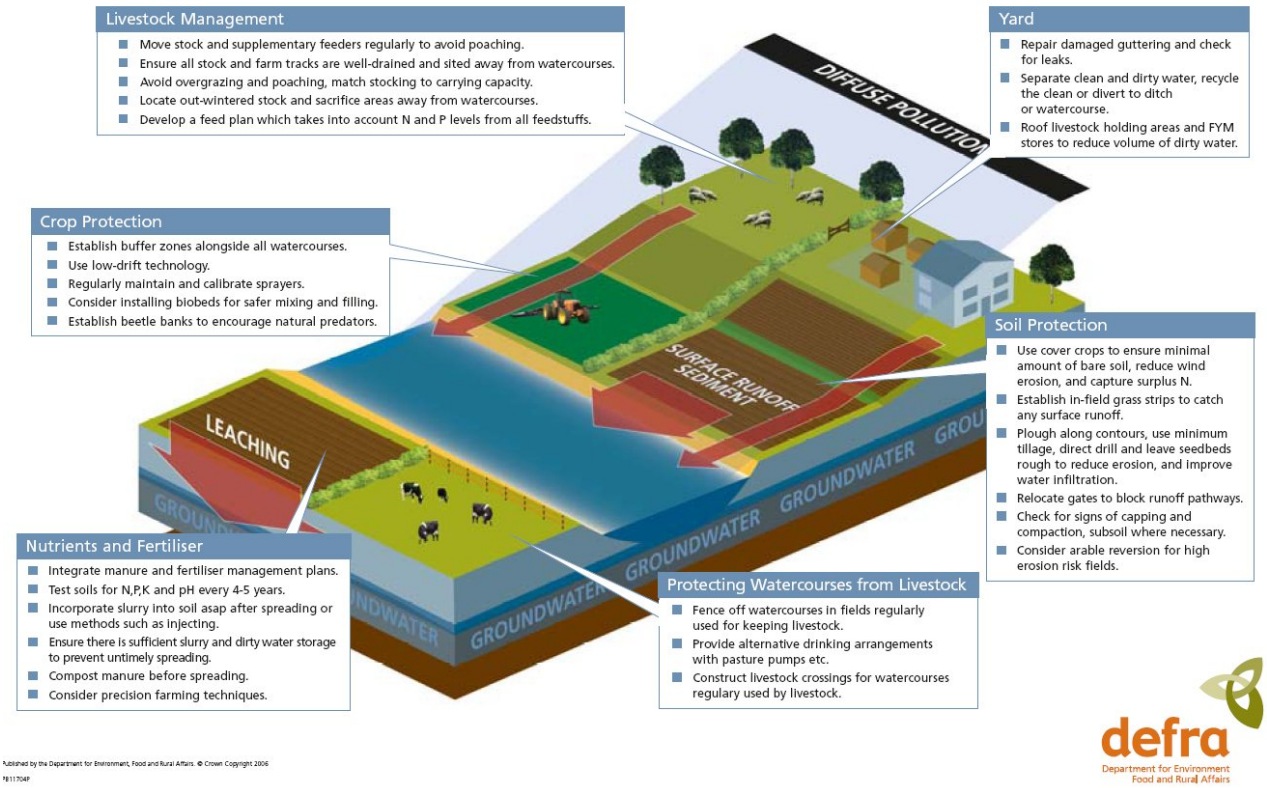
Catchment 7 is the River Lugg, Catchment 23 is the River Wye in England, Catchment 28 is the River Teme, and Catchment 43 is the River Leadon. The first three were primary selections in 2006. The Leadon has been added in 2008.

The ECSFDI is seeking to achieve reductions in diffuse water pollution from agriculture by encouraging CSF. This is land management that keeps diffuse emissions of pollutants to levels that are consistent with the ecological sensitivity and uses of rivers, groundwater and other aquatic habitats, both in the immediate catchment and further downstream.

In terms of farmer behaviours and practices CSF includes encouraging best practice in the use of fertilisers, manures and pesticides; promoting good soil structure to maximise infiltration of rainfall and minimise run-off and erosion; protecting watercourses from faecal contamination (e.g. with fencing and livestock crossings), and from sedimentation and pesticides (e.g. with buffer strips); reducing stocking density or grazing intensity; reverting to grassland etc.

Figure 7-2 summarises best practice behaviours.

Figure 7-3 – Best Practices to Reduce Diffuse Pollution from Agriculture



Source: http://www.defra.gov.uk/foodfarm/landmanage/water/csf/delivery-initiative.htm

Natural England is of the view that in many cases the land use/management approaches necessary to combat diffuse agriculture pollution can also assist water

infiltration and attenuation to serve flood risk abatement. There is a nationally funded initiative for DAP abatement in place for the whole of Herefordshire, which could be applied with various land management policies emanating from the Environment Agency Wye-Usk Catchment Flood Management Plan (see Herefordshire SFRA [2]).

7.7 Summary of Main Issues

7.7.1 Data Availability

The Environment Agency and Natural England have expressed serious concerns about the apparent inability of the Water Cycle Study to identify any detailed relevant long-term constraints and costings associated with sewerage and sewage treatment infrastructure in particular, (see consultation responses, Section 10).

DCWW has made its position clear in that it feels unable to supply any detailed operational or hydraulic constraints information on the grounds of (i) confidentiality (ii) technical complexity. The DCWW position is that where infrastructure improvements are not approved by OFWAT through the capital investment programme, all such improvements must be funded by developers.

Nevertheless, Herefordshire Council needs to prove the chosen locations and level of growth can happen without exceeding the STW discharge consents necessary to meet environmental protection and improvement standards for receiving water bodies. There are absolute nutrient loads for individual rivers beyond which deterioration is inevitable and water quality and related ecological improvements impossible.

The main evidence task is to show that the various elements in the Plan can actually be delivered. The new spatial planning system exists only to deliver positive outcomes (Para 1.5 of PPS12). PPS12 also outlines that the infrastructure planning process should identify and have evidence for, amongst other matters, cost and funding sources (Para 4.8 to 4.12 and 4.45).

In the absence of detailed evidence supporting the phasing, costs and delivery of new infrastructure requirements it is likely to lead to unsustainable development resulting from negative planning/reactive planning, which may in turn effect the water environment

7.7.2 Sewage Treatment Works

The study has identified 51 STWs discharging to the Wye system, and 51 discharge to the Teme system. In the case of the Teme, the significant majority are very small (< 25 m^3/day) works, for which we have been unable to obtain data.

The largest STWs in the Wye are the Rotherwas and Eign STWs at Hereford which together account for approximately 65% of total treatment capacity by population equivalent. The largest Works in the Teme system is at Ledbury, which accounts for 54% of the total treatment capacity in terms of population equivalent.

The current operational capacity of these works in relation to the incoming effluent load cannot be established as DCWW declined to share this information on the grounds of confidentiality. It has however provided a list of some STWs with an indication of what headroom (population equivalent) is available to accommodate new housing.

The time-span and the costs associated with upgrading or replacing these STWs where this may be necessary as a result of the growth strategy remains uninvestigated and is a priority for more detailed study. It will require a much greater level of co-operation between DCWW and Herefordshire Council than has been evident to date.

In summary, 34 of the 51 STWs identified under the ownership of DCWW have operational constraints, and are at the limit of their capacity. This includes all of the main market town STWs with the exception of Ross on Wye, which is reported to have some 1600 household headroom capacity (4000 p.e.)

Following recent AMP4 upgrading due for completion March 2010, Rotherwas and Eign STWs will have headroom capacity for some 3800 homes. This is a significant shortfall on the predicted balance of 5369 required in Hereford by 2026.

The Ledbury STW under Severn Trent Water has capacity for some 2500 houses, although some refurbishment work would be needed to the terminal pumping station.

It is strongly recommended that some form of 'time-line' matrix is produced for every STW, showing, against various housing trajectories, when operational limits will be reached, the possible deficit capacity, and the associated upgrading costs needed to bring the capacity into surplus. This will require close engagement with DCWW

7.7.3 Habitats Directive Review of Consents

16 sites have been identified in Herefordshire (Wye only) where no adverse impact could not be established.

With the exception of Herefordshire Pool, these all relate to DCWW STWs. The actions proposed generally require modifications to the Consents. Eign and Rotherwas will have their Discharge Consents tightened, which will reduce the headroom available for new housing.

The remainder of the adverse impacts are all within the Lugg catchment, and comprise the Leominster, Bromyard, Kington and Moreton-on-Lugg STWs with regard to tightened constraints. All of these STWs will therefore have reduced headroom to accommodate new housing.

The outcomes for DCWW with regard to STW operational capacity at these locations is not clear and requires clarification following the DCWW review.

7.7.4 Diffuse Pollution Pressures

There are significant pollution pressures from phosphates in the Lugg and Leadon catchments, generally ascribed 50:50 between sewage loadings and farming practice.

The River Lugg and River Arrow are currently designated as 'Poor' ecological status, and it has been established that there will be significant housing pressure particularly around Leominster that is likely to exacerbate this problem. The River Wye from the Lugg confluence (part of the SAC) is designated as a eutrophic sensitive waterbody, and hence mitigation measures will be required in conjunction with improved farming practice to provide mitigation measures.

Similarly, the River Leadon is a eutrophic sensitive waterbody, and is currently classed as 'Poor' ecological status. It also is likely to receive a significant increase in housing pressure that without mitigation will exacerbate the situation.

The Humber Brook s.e. of Leominster, and the Frome upstream of Bromyard are the worst rivers in Herefordshire in terms of overall ecological status, and will require specific mitigation measures if new housing is required in these sub-catchments.

The Environment Agency has confirmed that it would welcome discussion on the mitigation measures that may be necessary within those areas where housing pressure is likely to lead to adverse impacts upon the water environment, along with enhancements within the worst areas of ecological status e.g. Humber Brook near Leominster and on the Frome upstream of Ledbury.

The England Catchment Sensitive Farming Delivery Initiative (ECSFDI) is part of DEFRA's Catchment Sensitive Farming (CSF) Programme which aims to tackle diffuse water pollution from agriculture in order to meet the objectives of the Water Framework Directive (WFD).

The ECSFDI is seeking to achieve reductions in diffuse water pollution from agriculture by encouraging CSF. This is land management that keeps diffuse emissions of pollutants to levels that are consistent with the ecological sensitivity and uses of rivers, groundwater and other aquatic habitats, both in the immediate catchment and further downstream.

7.8 Issues for Action – Wastewater Treatment and Pollution Control

Table 7-5 – Issues for Action – Wastewater Treatment and Pollution Control

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions
7a	Headroom of 3800 houses approximately identified for Eign/Rotherwas STWs. Hence capacity shortfall of 1570 houses. Identification of upgrading issues and costs urgently required.	DCWW Herefordshire	Developer funded study required.
7b	Numerous minor STWs throughout Herefordshire are at capacity. Costs of upgrading and time-scales urgently needed to clarify Core Strategy.	DCWW Herefordshire	Developer funded studies required
7c	Impacts on capacity and headroom arising from RoC tightened Consents for Leominster, Bromyard, Kington, Bodenham and Moreton-on-Lugg STWs urgently required.	DCWW Herefordshire	Developer funded study required.
7d	Data on MCERTS monitored Dry Weather Flow absent for all STWs. Not supplied by DCWW due to 'confidentiality'. Data from STW but based on Average Daily Flow, not DWF	DCWW STW	MCERTS data format not yet resolved, and data unavailable
7e	No statement from EA in RoC Stage 4 about actions for RoC impact sites Presteigne, Weobley, Luston, Shobdon and Bishops Frome STWs. Needs clarification.	EA	DCWW 'fair share' of phosphate removal achieved by action at Leominster, Kington, Moreton and Bromyard STWs.
7f	Emerging housing spatial strategy should take detailed account of available STW headroom, assessing with time-line matrix when specific STWs will reach capacity, and costs to upgrade thereafter	Herefordshire DCWW	Requires consultation with DCWW after strategic sites have been short-listed.
7g	Diffuse pollution pressure from phosphates is significant in Leadon and Lugg catchments. Housing increase in these catchments significant also. Mitigation strategies should be considered.	EA Herefordshire DCWW	EA proposes catchment investigations, and Catchment Sensitive Farming initiatives. Pollution prevention at specific sites.
7h	Humber Brook and River Frome upstream Bromyard are at Bad ecological status. Are specific mitigation measures proposed? Impact of housing?	EA Herefordshire	Where 'Bad' status is certain, measures will be implemented. Where 'Bad' status is uncertain, EA will initiate more data collection

Table 7-6 – Herefordshire Sewage Treatment Works in Wye Catchment

Name	Current Population Served 000s	BOD Capacity of Works (PE)/day	Av DWF Inflow and Peak Flow m³/d	Influent Total BOD Load (PE)/day	Influent Trade BOD Load (PE)/day	Discharge Consent Number	Discharge Consent Av DWF m³/day	Discharge Consent Max Flow m³/day	Discharge Consent BOD mg/l	Discharge Consent TSS mg/l	Discharge Consent Ammonia mg/l	Discharge Consent Total P mg/l
Rotherwas				76862	16800	AH1001201	20667	49650	25	60	15	1
Eign				46690	13290	AH1001101	12400	24813	25	60	11	1
Ross on Wye				13615	1082	AS1003701	3632	9450	25	52	40	2
Leominster				11715	262	AN0228302	2850	8295	25	60	30	2
Presteigne				2419	360	AW1005101	1140	2287	25	40	9	
Moreton on Lugg				4612	1680	AH1002201	1086	3197	25	30	15	
Bromyard				4752	139	AL1000901	915	6394	25	35	5	
Kington				3034	251	AL1001501	701	2102				
Glasbury						AN0333401	475	950				
Goodrich						AS1001101	455	1365				
Weobley				1666	548	AL1003501	350	1050	19	60	7	
Ruardean Village						AS1003901	330	795				
Lydbrook						AS1002901	273	2164				
Kingstone & Madley				1473	26	AH1001901	250	1836	20	60	10	
Fownhope						AH1000901	230	550				
Clehonger				1050	17	AH1000401	230	408	25	37	18	

Name	Current Population Served 000s	BOD Capacity of Works (PE)/day	Av DWF Inflow and Peak Flow m³/d	Influent Total BOD Load (PE)/day	Influent Trade BOD Load (PE)/day	Discharge Consent Number	Discharge Consent Av DWF m³/day	Discharge Consent Max Flow m³/day	Discharge Consent BOD mg/l	Discharge Consent TSS mg/l	Discharge Consent Ammonia mg/l	Discharge Consent Total P mg/l
Bodenham						AL1000401	160	700				
Tarrington						AH1003701	155	388				
Peterchurch						AH1003001	154	334				
Pembridge				550	66	AL1002401	120	720	21	55		
Luston & Yarpole						AL1001701	102	614				
Much Dewchurch						AN0231301	80	240				
Pontrilas						AH1003301	74	222				
Longtown						AH1002101	69	410				
Kingsland				577	10	AL1001401	68	392	41	75		
							MCERTS	LIMIT				
Dilwyn						AL1001001	49	146				
Bishops Frome						AL1000301	39	116				
Norton						AW1004701	33	198				
Canon Pyon						AL1000901	32	95				
LLanigon						AW1003701	32	191				
Woolhope						AH1003901	32	96				
Pencombe						AL1002501	31	186				

Name	Current Population Served 000s	BOD Capacity of Works (PE)/day	Av DWF Inflow and Peak Flow m³/d	Influent Total BOD Load (PE)/day	Influent Trade BOD Load (PE)/day	Discharge Consent Number	Discharge Consent Av DWF m³/day	Discharge Consent Max Flow m³/day	Discharge Consent BOD mg/l	Discharge Consent TSS mg/l	Discharge Consent Ammonia mg/l	Discharge Consent Total P mg/l
Ruardean Woodside						AS1004101	20	55				
Preston on Wye						AL1002601	19	57				
Hergest Leominster						AL2002701	16	20				
Ivington						AL1001301	14	32				
Hay on Wye						AW1002301	?	21				
Preston Wynne						AH1003201	4	12				
Monkhide						AN0325201	4	12				
Pandy						AL1002901 ???	?	11				
Lucton						AL2001801	?	8				
Ruardean The Pludds						AN0121501	?	7				
Grosmont						AH1001001	2	6				
Evenjobb						AN0179501	?	?				

Table 7-7 – Herefordshire Sewage Treatment Works in Teme Catchment

Name	Current Population Served 000s	BOD capacity of Works (PE) or 000s	Av DWF Inflow and Peak Flow m³/d	Influent Total BOD Load (PE)/day	Influent Trade BOD Load (PE)/day	Discharge Consent Number	Discharge Consent Av DWF m³/day	Discharge Consent Max Flow m³/day	Discharge Consent BOD mg/l	Discharge Consent TSS mg/l	Discharge Consent Ammonia mg/l	Discharge Consent Total P mg/l
Ledbury		16233		9904	458	S/21/26211/R	3068		10	20	3 (S) 5 (W)	2.0
Colwall				2267	55	S/09/55757/R	636		10	45	3	
West Malvern				831	16	S/09/557621/R	422		10	20	15	
Leintwardine				853	160	S/09/55912/R	215		40	60		
Cradley				1147	22	S/09/55946/R	213		35	50	20	
Wigmore				635	0	S/09/55933/R	158		15	25	5	
Bosbury				331	6	S/21/25795/R	82		30	80		
Whitbourne				356	7		76					
Much Marcle				168	3	S/21/25390/R	32					
Brampton				85	2	S/09/55855/R	31					
Fromes Hill				191	4	S/21/25806/R	27		40	60		
Aston Ingham				90	2	S/21/25768/R	23					
Mathon				57	1	S/09/559081/R	23					
Gorsley				347	7	S/21/23213/R	20					
Putley Green				77	1	S/21/26650/R	19		25	45	10 (S) 20 (W)	
Clun												

Name	Current Population Served 000s	BOD capacity of Works (PE) or 000s	Av DWF Inflow and Peak Flow m³/d	Influent Total BOD Load (PE)/day	Influent Trade BOD Load (PE)/day	Discharge Consent Number	Discharge Consent Av DWF m³/day	Discharge Consent Max Flow m³/day	Discharge Consent BOD mg/l	Discharge Consent TSS mg/l	Discharge Consent Ammonia mg/l	Discharge Consent Total P mg/l
Aston on Clun												
Stokesay												
Knighton												
Bucknell												
Ludlow												
Ashford Carbonell												
Orleton												
Burford												
Clifton Upon Teme												
Suckley												
Evendine												

Table 7-8 – STWs Posing Environmental Risk or with Operational Constraints

Name	Discharge Consent (Operator)	Discharge Consent Max or FFT m³/day	MCERTS Actual FFT m³/day	Actual DWF / Consented DWF %	Reported Operational or Capacity Constraints	Treatment and/or Environmental Risks	Estimated Headroom 2008-09 (households)
					Market Towns		
Rotherwas	AH1001201 (DCWW)	49650	unknown		Pipe restrictions to/from biological filters at FFT AMP4 improvements will provide new headroom	RoC adverse site Process operating at capacity during Bulmers summer effluent. BOD and Ammonia affected. Consents may be affected by RoC process.	3800 (Eign + Rotherwas)
Eign	AH1001101 (DCWW)	24813	unknown		Inlet pumping station limited to current flows. Primary tanks inlet pipes restricted to 285 l/s Pipelines and storm storage tanks overloaded. AMP4 improvements will provide new headroom	RoC adverse site No biological capacity in primary tanks. Secondary treatment also at capacity during Bulmers summer effluent. Sludge plant at over-capacity. BOD and Ammonia affected.	3800 (Eign + Rotherwas)
Ledbury	S/21/26211/R (STW)				Terminal pumping station will need refurbished to accommodate increased flows	Unassessed Reported as high risk due to very tight Ammonia Consent.	2446
Ross on Wye	AS1003701	9450	unknown		Trunk sewer to Works has occasional capacity problems. AMP4 improvements will provide new headroom.	None at present	1600
Leominster	AN0228302	8295	unknown		Trunk sewer has capacity constraints in Etnam Street. Hydraulic capacity will be reached before biological capacity	RoC adverse site. Biological headroom will reduce significantly when Ammonia Consent reduced as part of RoC process.	1000
Bromyard	AL1000901	6394	unknown		Some hydraulic restrictions on trunk sewers to works. AMP4 improvements will provide new headroom. Restrictions at Petty Bridge PS	RoC adverse site. Filters are at capacity. Will have a tightened Consent of 1 mg/l P after RoC.	200
Kington	AL1001501	2102	unknown		Pipe-work to filters and storm tanks at capacity. AMP4 improvements will provide new headroom for UDP allocations only.	Filters and Humus tanks reported to be at capacity. Will have a tightened Consent of 1 mg/l P after RoC.	0
					Rural Settlements		
Presteigne	AW1005101	2287	unknown		No data AMP 3 upgrade	RoC adverse site. May have a tightened Consent of Total P after RoC	20 +
Moreton on Lugg	AH1002201	3197	unknown		Outlying Pumping Stations may be a restriction AMP4 improvements will provide new headroom for UDP allocations only	RoC adverse site Primary tanks and humus tanks at capacity. BOD and Ammonia affected. Will have a tightened	< 105

						Consent of 1 mg/l P after RoC	
Name	Discharge Consent (Operator)	Discharge Consent Max or FFT m³/day	MCERTS Actual FFT m³/day	Actual DWF / Consented DWF %	Reported Operational or Capacity Constraints	Treatment and/or Environmental Risks	Estimated Headroom 2008-09 (households)
					Market Towns		
Weobley	AL1003501	1050				RoC adverse site. May have a tightened Consent of Total P after RoC	< 50
Kingstone & Madley	AH1000401	1836			Insufficient hydraulic capacity in inlet PS, filter distributors, settlement tanks and reed beds	Primary and humus tanks at capacity. Reed beds at capacity.	0
Luston	AL1001701	614			Requires general upgrading	RoC adverse site.	< 20
Kingsland					Requires general upgrading		< 75
Shobdon					Requires general upgrading	RoC adverse site.	< 75
Ivington					Requires general upgrading		< 10
Dilwyn					Requires general upgrading		< 10
Pencombe					Requires general upgrading		< 20
Bodenham					Requires general upgrading	RoC adverse site. P to be reduced to 1 mg/l	< 30
Bishops Frome					Requires general upgrading	RoC adverse site	< 55
Canon Pyon					Requires general upgrading		< 25
Hay on Wye					Requires general upgrading		< 49
Preston on Wynne					Requires general upgrading		< 15
Bartestree					Connected to Rotherwas-Eign		N/A
Tarrington					Requires general upgrading		< 20
Petechurch					Requires general upgrading		< 40

Name	Discharge Consent (Operator)	Discharge Consent Max or FFT m³/day	MCERTS Actual FFT m³/day	Actual DWF / Consented DWF %	Reported Operational or Capacity Constraints	Treatment and/or Environmental Risks	Estimated Headroom 2008-09 (households)
					Market Towns		
Clehonger					Requires general upgrading		< 50
Woolhope					Requires general upgrading		< 15
Fownhope					Requires general upgrading		< 15
Much Dewchurch					Requires general upgrading		< 25
Longtown					Requires general upgrading		< 5
Pontrilas					Requires general upgrading. Due for upgrade but unknown until December 2009		< 45
Pandy					Requires general upgrading		0
Grosmont							0
Goodrich					Requires general upgrading		< 50

Table 7-9 – Water Quality Impacts – Wye SAC RoC Stage 4 Action Plan

Licence	Location	Identified Impact from Stage 3	Preferred Option to Deliver Environmental Outcomes
		Impacts in Isolation	
AH1001201 AH2000301	Rotherwas STW Eign STW	Actual and Consented toxic contamination of BOD and AMM. AMM circa 54% increase from 0.12 to 0.26mg/l as 90%ile. BOD circa 10% increase from 2.28 to 2.54mg/l as 90%ile.	Modify the Consent to meet the Water Quality targets. Calculations have given limits of BOD 28.7 mg/l and Ammonia 10.4 mg/l at both Rotherwas STW and Eign STW.
AN0228301	Leominster STW	Consented AMM circa 90% increase from 0.05 to 0.49 as a 90%ile. Dangerous Substances Review Required. Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Modify the Consent to meet the Water Quality targets. A final 'Solutions' report is awaited from DCWW. The consent limit to be included in the Modification will be 9 mg/l. Dangerous Substances Review completed. Modification to be issued by 31/03/2009.
AW1005101	Presteigne STW	Dangerous Substances Review Required Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Dangerous Substances Review completed. Modification to be issued by 31/03/2009.
AL1000602	Bromyard STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Dangerous Substances Review completed. Modification to be issued by 31/03/2009. P reduced to 1 mg/l 31/3/2010
AN0228302	Leominster STW Storm	Dangerous Substances Review Required	Modification issued 31st October 2006
AH2000301	Hereford Leisure Pool	Consented failure of CL levels down stream	Modification issued 12th March 2008
		Impacts in Combination	
AL4001802	Cadburys	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50. Now IPPC, already BAT, but included in review for purpose of accurate model. No actions.	Currently at 0.1 mg/l P (BAT). No action taken
AL1000401	Bodenham STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Reduce DCCW 'fair share' nutrient removal to 1.0 mg/l P
AN0228301	Leominster STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Reduce DCCW 'fair share' nutrient removal to 1.0 mg/l P P reduced to 1 mg/l 31/3/2010
AW1005101	Presteigne STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Unknown
AH1002201	Moreton on Lugg STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Reduce DCCW 'fair share' nutrient removal to 1.0 mg/l P Additional reduction of headroom. P reduced 31/3/2010
AN0071501	Hope under Dinmore	Actual and Consented failure of P target in Lugg.	Unknown

		Caused by point and diffuse inputs of circa 50:50.	
AW1004701	Norton Old STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Unknown
Licence	**Location**	**Identified Impact from Stage 3**	**Preferred Option to Deliver Environmental Outcomes**
AL1001701	Luston & Yarpole STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Unknown
AL1002701	Shobdon STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Unknown
AL1001501	Kington	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Reduce DCCW 'fair share' nutrient removal to 1.0 mg/l P AMP 4 upgrade due March 2010. P reduced 31/3/2010
AL1002401	Pembridge STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Unknown
AL1003501	Weobley STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Unknown
AL1000602	Bromyard STW	Actual and Consented failure of P target in Lugg. Caused by point and diffuse inputs of circa 50:50.	Reduce DCCW 'fair share' nutrient removal to 1.0 mg/l P

Table 7-10 – RBMP Objectives for Waterbodies at Bad or Poor Ecological Status

Name	Waterbody ID	Status 2010	Elements currently at High or Good Ecological status	Elements currently at less than Good Ecological status	Target by 2015	Target by 2027	Housing Pressure (units)
Lime Brook Source to R Lugg	GB109055042060	Poor	Ammonia, DO, pH, Phosphate	Fish	Poor	Good	No
River Lugg Norton Bk to R Arrow	GB109055042030	Poor	DO, pH, Arsenic, Copper, Iron, Zinc, Ammonia, Phosphate	Phytobenthos	Poor	Good	540
Cheaton Brook Source to R Lugg	GB109055041950	Poor	Zinc, Ammonia, Copper, DO, Ammonia, Invertebrates, pH	Phytobenthos, Fish	Poor	Good	0
R Arrow Gladestry Bk to Gilwern Bk	GB109055036620	Poor	DO, Ammonia, Zinc, Cypermethrin, Copper, pH, Invertebrates, Phosphate	Fish, Diazinon	Moderate	Good	60
River Arrow Gilwern Bk to R Lugg	GB109055041840	Poor	Ammonia, Zinc, Iron, Copper, pH, DO, Arsenic, Phosphate, Invertebrates	Fish (Moderate) Phytobenthos (Poor)	Poor Moderate	Good	1970
Humber Brook Source to Holly Brook	GB109055041920	Bad	Ammonia, Dissolved Oxygen, pH, Phosphate	Fish	Bad	Good	0
Letton Lake Brook Source to R Wye	GB109055037120	Poor	Copper, Zinc, pH, Ammonia,	Invertebrates (Poor) DO (Poor), Phosphate (Moderate)	Poor Poor,Good	Good	50
River Frome Source to Tedstone Bk	GB109055041850	Bad	Ammonia, Zinc, Dissolved Oxygen, , Phosphate, Invertebrates, pH, Copper	Fish	Bad	Good	460
Garren Brook Source to Gamber Bk	GB109055029710	Poor	Ammonia, Zinc, Copper, DO, Invertebrates, pH, Phosphate	Phytobenthos	Poor	2027	20
River Wye Walford Bk to Bigsweir Br	GB109055037111	Poor	Phosphate, pH, DO, Ammonia, Invertebrates, Copper	Phytobenthos	Poor	Good	560
Afon Honddu Source to R Monnow	GB109055036830	Poor	DO, pH, Copper, Cypermethrin, Diazinon, Zinc, Ammonia, Phosphate	Fish (Poor) Invertebrates (Poor)	Poor Poor	Good	20
River Leadon Source to Preston Brook	GB109054039640	Poor	Diazinon, Mecoprop, Zinc, Linuron, pH, Ammonia, Copper	Fish (Poor), Invertebrates, (Moderate), DO (Moderate), Phosphate (Moderate)	Poor, Moderate, Mod, High	Good	890
Preston Brook Source to Kempley Bk	GB109054039590	Poor	Copper, Zinc, pH, Ammonia, Invertebrates, Ammonia	DO (Bad), Fish (Poor), Phosphate (Poor)	Bad, Poor, Moderate	Good	30
Glynch Brook Source to R Leadon	GB109054039620	Poor	Zinc, Ammonia, Ammonia, pH, Copper, DO, Invertebrates	Phosphate (Poor) Fish (Poor)	Poor Poor	Good	20

Notes: Housing Pressure is the indicative number of housing units in the respective topographic catchment from emerging spatial strategy Scenario 1 (May 2009).

8. CATCHMENT SCALE FLOOD RISK MANAGEMENT

8.1 The Herefordshire Strategic Flood Risk Assessment (SFRA)

It is a recommendation of the Environment Agency guidance that Water Cycle Studies should explicitly address flooding issues through a Strategic Flood Risk Assessment

The SFRA component of a Water Cycle Study should therefore provide the evidence base, maps, methodologies and tools to enable these objectives.

A comprehensive SFRA for Herefordshire was completed in April 2008, with a final 3rd Edition issued on DVD in April 2009. This was a large and complex study, designed to be read and used as a stand-alone document with a supporting Geographical Information System (GIS) evidence base. It should be regarded as a sister document to this Water Cycle Study.

Consequently, this Water Cycle Study document does not repeat the issues and outputs of the SFRA, although cross-references are made where appropriate and necessary, particularly with regard to Surface Water Management Plans where there is a high degree of inter-linkage between surface water drainage and flood risk.

The SFRA makes comprehensive reference to important associated regulatory and/or strategic plans, notably:

- The Wye and Usk Catchment Flood Management Plan
- The Severn Catchment Flood Management Plan
- The Pitt Review of the 2007 Summer Floods
- The Environment Agency Review of the 2007 Summer Floods

8.2 Geology, Soils and Precipitation

Precipitation, topography and soil type (derived from underlying geology) are the three predominant influences on flood hydrology. An understanding of the interactions of these basic physical drivers of flooding is essential in managing flood risk from 'first principles'. Many SFRAs and CFMPs neglect to analyse the simple principal mechanisms of runoff generation. An appreciation of elementary catchment 'hydrodynamics' can provide many robust strategic level solutions to flood risk.

The Old Red Sandstone geology which predominates over most of Herefordshire has low permeability, allowing limited drainage. However, there

are significant local variations influenced by a range of soil types. The gravel aquifers around Hereford may provide a sub-surface route for flood waters.

Moving southwards along the Wye from Hereford, the soils become increasingly permeable due to the influence of sandstone or limestone geology. The limestone geology in particular allows water to drain through the rocks, reducing surface run-off and the catchment's response to rainfall.

Soils in the Middle and Lower Wye are dominated by deep, well-drained and fertile Brown Soils, with scatterings of Surface Water Gleys and Groundwater Gleys. Brown soils occur in different forms from slowly permeable soils to less permeable loams and clayey soils. The sub-surface layers are highly valued for agricultural purposes. However the low permeability of the underlying geology means that in times of heavy rainfall the soil will become saturated quickly. The reduced capacity of the soil will lead to increased surface run-off and a reduction in catchment response to rainfall. Pockets of shallow free draining soils are concentrated in the east of the catchment overlying the Limestone geology of the Forest of Dean.

Higher precipitation naturally tends to produce higher quantities of runoff. Equally important, high precipitation catchments tend to have wetter antecedent conditions, which means they tend to have less available storage and runoff responds more rapidly and more frequently. Across the Herefordshire SFRA area precipitation is highest in the north-western and south-western areas (Red Brook above Knighton, 996 mm/a), (Honddu above Monmouth, 1206 mm/a). There is a rapid decline in rainfall gradients across Herefordshire moving west to east, such that in the Upper Frome above Bromyard, annual precipitation is 727 mm/a, and in the Leadon above Ledbury, it is only 694 mm/a.

Steeper or less permeable catchments will tend to have proportionately higher peaks and more rapid response than shallower well drained catchments. Steep catchments that are also less permeable are particularly flood prone, and have the added disadvantage that the time of the flood peak will be relatively rapid.

These characteristics influence the timing and magnitude of fluvial flooding, but also play a significant part in general surface flooding.

8.3 Identifying the Key Flood Risk Areas

Risk driven plans and strategies such as SFRAs and CFMPs should target policy and resources at the highest risk areas. It is requirement of these plans that the Environment Agency and LPA should engage and agree which areas within the catchment are the highest at risk and what polices should be adopted to control this risk.

Within the SFRA framework, the highest risk areas that are identified for urgent active policy consideration are based on the following objective measures:

- The five highest ranking catchments in terms of fluvial flood risk i.e. existing flood-risk defined by property counts within the 1% AEP floodplain

- The five highest ranking catchments in terms of generalised flood hazard as defined by the Catchment Flood Hazard Index of the SFRA study

- The five highest ranking catchments in terms of number of reported flood incidents.

- Specific settlements where there has been repeated severe flooding and where strategic options may be necessary in the future.

Where catchments fall into more than one of these categories, these can be considered to be even higher priority candidates for active policy intervention.

Development pressure is ignored in these criteria, precisely because through the Sequential Test, the LPA will have to demonstrate that it has sought to locate developments in alternative areas. Hence, development allocation is an output from the risk assessment, not an input.

8.3.1 Five Highest Risk Catchments by Fluvial Flood Risk

Table 8-1 summarises the highest fluvial flood risk areas as defined by the FFR Index.

Table 8-1 – Five Highest Fluvial Flood Risk Catchments

Catchment	Localities affected	Watercourses	Risk Measure
Lower Wye	Hereford	Wye, Red Brook, Withy Brook,	Rank =1 under FFR Index
Yazor Brook	Hereford	Yazor Brook, Widemarsh Brook	Rank = 2 under FFR Index
Pinsley Brook	Leominster	Pinsley Brook, Lugg	Rank = 3 under FFR Index
Lower Lugg	S. Leominster, Bodenham, Hope-under-Dinmore, Hampton Bishop, Mordiford	Lugg, Cherry Brook, Pentaloe Brook	Rank = 4 under FFR Index
Upper Middle Wye	Eardisley, Winforton, Whitney-on-Wye	Wye	Rank =5 under FFR Index

8.3.2 Five Highest Risk Catchments by Flood Hazard

Catchment Flood Hazard is defined as the average of the rank of each catchment with respect to long-term percentage runoff, soil moisture deficit, time to peak and number of flood reports. This is a general indicator of potential surface water flooding, and as expected there is no overlap with the FFR Index as these are measuring quite different flood impacts (one flood hazard, the other fluvial risk). The five highest ranking catchments are summarised in Table 8-2.

Table 8-2 – Five Highest General Flood Hazard Catchments

Catchment	Localities affected	Watercourses	Risk Measure
Dore	Dorstone, Peterchurch	Dore	Rank =1 under CFH Index
Upper Arrow	Kington	Arrow	Rank = 2 under CFH Index
Upper Monnow	Michaelchurch Escley, Clodock, Longtown	Escley Brook, Olchon Brook,	Rank = 3 under FFR Index
Ell Brook	Aston Ingham	Ell Brook	Rank = 4 under FFR Index
Back Brook	Kington	Back Brook	Rank =5 under FFR Index

8.3.3 Five Highest Risk Catchments by Flood Reports

Irrespective of the theoretical indicators, account should also be taken of where actual flooding has been record in the past. Historical flooding can be a useful pointer to future flood risk, because the causes of the flooding are likely to persist. It is possible to query the database directly to ascertain the total number of flood reports by catchment, and this output leads to Table 8-3.

Table 8-3 - Five Highest Catchments by Flood Reports

Catchment	Localities affected	Watercourses	Risk Measure
Lower Wye	Hereford, Lower Bullingham, Hampton Bishop	Wye, Red Brook, Yazor Brook	Rank =1 under Reports Index
Mid Teme	Leintwardine, Orleton, Brimfield	Teme, Brimfield Brook, Little Hereford	Rank = 2 under Reports Index
Lower Lugg	S. Leominster, Stoke Prior, Hope-u-Dinmore, Bodenham, Marden, Sutton St Nicholas, Withington Marsh, Hampton Bishop, Mordiford	Lugg, Cherry Brook, Pentaloe Brook	Rank = 3 under Reports Index
Lower Arrow	Barons Cross, Ivington, Knapton Green	Arrow, Honeylake Brook,	Rank = 4 under Reports Index
Middle Frome	Bromyard, Bishops Frome, Five Bridges, Stretton Grandison	Frome	Rank =5 under Reports Index

8.3.4 Summary Flood Risk Map

The overall flood hazard, flood risk and flood report indicators discussed above are represented as the following GIS layers, in each case copied from the Herefordshire SFRA:

- HWCS Main Flood Spots
- HWCS Flood Hazard (b)
- HWCS Flood Risks (b)
- HWCS All Catchments

Together they produce **Evidence Map 8-1.** This map effectively summarises how emerging spatial strategies relate to existing flood risks. Where a development 'hot-spot' lies directly within or adjacent to a historical flooding reports 'hot-spot', then clearly local drainage and surface water issues will require careful examination.

Sub-catchments with red striping are those High Flood Hazard catchments identified from the Strategic Flood Risk Assessment. These are catchments that potentially have high rates of surface water runoff, and by virtue of the basic physical characteristics are likely to be most susceptible to climate change.

Sub-catchments with blue striping are those most heavily associated with fluvial flooding adjacent to the main rivers. Future development in these areas will have to have specific regard to the proximity of the fluvial floodplain, and issues of emergency access and egress, including safe development. PPS 25 will particularly apply to these growth areas.

There is a reasonable association between theoretical Category 1 Flood Hazard catchments and observed flood reports, suggesting that the Index is useful in identifying potential flood hazards, for example in the Dore catchment (Ewyas Harold), Back Brook and Upper Arrow (Kington), and in the Ell Brook (Aston Ingham).

The Flood Risk Map basically confirms that the greatest fluvial risks to existing property lie along the main corridors of the Lugg and the Wye, where there is the greatest concentration of property. Development in these areas must be located outside the zone 3 and 2 floodplains otherwise this will place an increased burden on emergency services and civil contingency planning.

There are a significant number of observed flooding hot-spots. The most persistent include Kington, Leominster and Hereford in the main towns, and Leintwardine, Eardisland, Orleton, Ivington, Bodenham, Stretton Grandison, Sutton St Nicholas, Bosbury, Hampton Bishop and Ewyas Harold among the villages. Strategic solutions may be needed for these places in future.

8.4 Catchment Sensitive Farming Initiative

In many cases the land use/management approaches necessary to combat diffuse agricultural pollution (DAP) can also assist water infiltration and attenuation to serve flood risk abatement. Through a nationally funded DEFRA initiative for diffuse agricultural pollution through the England Catchment Sensitive Farming Delivery Initiative, there is diffuse pollution abatement in place for the whole of Herefordshire.

Natural England has expressed the view that identified flood risk areas require a holistic and integrated approach to sustainable flood risk management that minimises and slows urban and rural runoff and promotes sound floodwater storage options.

As the EA are developing a program of flood risk strategies for specific catchments following on from their CFMPs, and the SFRMP has also identified significant detailed alleviation measures, these should be supplemented by and closely integrated with the ongoing DAP mitigation initiative in these same areas.

8.5 Climate Change Impact Appraisal

8.5.1 Precautionary versus Adaptive Approach

DEFRA suggests two principal approaches for taking climate change into consideration in the design of flood risk management measures:

- **The Precautionary Approach**: This involves inclusion of a specific quantified allowance for changes in climatic variables based on the best scientific evidence currently available. This is most appropriate for setting design criteria which would be prohibitively expensive to alter in the future, such as finished floor levels or bridge dimensions.

- **The Managed Adaptive Approach**: This involves identifying the sensitivity of results based on existing climatic conditions to potential changes that could occur as a result of climate change impacts, in order to allow designers and decision-makers to identify an appropriate, location specific response. This approach is the more flexible and risk orientated approach, whereby increasing flood risk can be 'tracked', and site or infrastructure design can adapted accordingly. This is most appropriate for strategic flood management infrastructure such as flood meadows, flood reservoirs and diversionary channels, but it is essential that the full 'worst case' extent of the infrastructure is identified and reserved at the outset.

The Herefordshire SFRA has addressed climate change by provision of two objective tools:

- Specially commissioned output of the EA Generalised Flood Model increasing river flows by 20%, to provide a GIS based 1% AEP flood outline + climate change effects (**HSFRA Climate Change Outline**)

- Establishment of the **Catchment Flood Hazard Index**. This Index indicates the probable level of sensitivity of the overall catchment to future climate change. The derivation of the Index itself could be modified in future if more reliable and deterministic data become available.

Both of these assist in applying the managed adaptive approach as recommended by DEFRA.

8.6 Summary of Main Issues

8.6.1 Herefordshire SFRA

A comprehensive SFRA for Herefordshire was completed in April 2008, with a final 3rd Edition issued on DVD in April 2009. This was a large and complex study, designed to be read and used as a stand-alone document with a supporting Geographical Information System (GIS) evidence base. It should be regarded as a sister document to this Water Cycle Study.

Consequently, this Water Cycle Study document does not repeat the issues and outputs of the SFRA, although cross-references are made where appropriate and necessary, particularly with regard to Surface Water Management Plans where there is a high degree of inter-linkage between surface water drainage and flood risk.

8.6.2 Key Flood Risk Areas

Risk driven plans and strategies such as SFRAs and CFMPs should target policy and resources at the highest risk areas. It is requirement of these plans that the Environment Agency and LPA should engage and agree which areas within the catchment are the highest at risk and what polices should be adopted to control this risk.

Within the SFRA framework, the highest risk areas that are identified for urgent active policy consideration are based on the following objective measures:

- The five highest ranking catchments in terms of fluvial flood risk i.e. existing flood-risk defined by property counts within the 1% AEP floodplain
- The five highest ranking catchments in terms of generalised flood hazard as defined by the Catchment Flood Hazard Index of the SFRA study
- The five highest ranking catchments in terms of number of reported flood incidents.
- Specific settlements where there has been repeated severe flooding and where strategic options may be necessary in the future.

8.6.3 Catchment Sensitive Farming

In many cases the land use/management approaches necessary to combat diffuse agricultural pollution (DAP) can also assist water infiltration and attenuation to serve flood risk abatement. Through a nationally funded DEFRA initiative for diffuse agricultural pollution through the England Catchment

Sensitive Farming Delivery Initiative, there is diffuse pollution abatement in place for the whole of Herefordshire.

As the EA are developing a program of flood risk strategies for specific catchments following on from their CFMPs, and the SFRMP has also identified significant detailed alleviation measures, these should be supplemented by and close integrated with the ongoing DAP mitigation initiative in these same areas.

It would be a recommendation for Herefordshire that it perhaps collates the various strategies and ongoing actions under these separate plans to ensure a collective and integrated approach.

8.6.4 Climate Change

The Herefordshire SFRA has addressed climate change by provision of two objective tools:

- Specially commissioned output of the EA Generalised Flood Model increasing river flows by 20%, to provide a GIS based 1% AEP flood outline + climate change effects (**HSFRA Climate Change Outline**)

- Establishment of the **Catchment Flood Hazard Index**. This Index indicates the probable level of sensitivity of the overall catchment to future climate change. The derivation of the Index itself could be modified in future if more reliable and deterministic data become available.

Both of these assist in applying the managed adaptive approach as recommended by DEFRA.

8.7 Issues for Action – Catchment Scale Flood Risk Management

Table 8-4 - Issues for Action – Catchment Scale Flood Risk Management

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions
8a	Flood Risk management at catchment scale reviewed in Herefordshire SFRA, accompanying report. Do other appropriate stakeholders have electronic copy of this report?	Herefordshire	SFRA available from Herefordshire
8b	Significant historical flooding throughout Herefordshire, evident from GIS database. Significant proportion (50%) is due to surface water flooding, susceptible to climate change.	Herefordshire	Herefordshire needs to ensure strategic sites are minimally susceptible to surface water flooding.
8c	Floodplain zone extents shown NOT to be overly sensitive to climate change, but Level 3 FRAs may be required in some major strategic sites	Herefordshire	As required when Strategic Sites are defined and assessed as being at risk.
8d	Lower Wye, Yazor Brook, Pinsley Brook, Lower Lugg and upper Middle Wye are sub-catchments most susceptible to fluvial flooding.	Herefordshire	Require holistic integrated approach to flood risk management. Requires coordination of SFRA, CFMP and CSFI proposals
8e	SFRA raised several issues regarding effective long-term flood management strategies. What is the EA response with regard to specific sub-catchments where development pressure may be high?	EA Herefordshire	Some measures identified by EA through CFMP? SFRA proposals also important, but no feed-back to Herefordshire
8f	Dore, upper Arrow, upper Monnow, Ell Brook and Back Brook identified as highest potential risks for surface water flooding and susceptibility to climate change	Herefordshire	Some measures identified by EA through CFMP? SFRA proposals also important, but no feed-back to Herefordshire
8g	Lower Wye, mid-Teme, lower Lugg, lower Arrow and Middle Frome identified as highest potential risks from repeated historical flooding. These areas may require SWMPs or mini-SWMPs to mitigate housing.		SWMPs probably required in Leominster/Hereford
8h	Strategies identified under Wye-Usk Catchment Flood Management Plan and Herefordshire Strategic Flood Risk Assessment must be viewed in conjunction with DEFRA Catchment Sensitive Farming initiatives	Herefordshire NE/CCW	Herefordshire recommended to review main actions under CFMP, SFRA and CSFDI to provide coherence and integration.
8i			

9. INTEGRATED DRAINAGE AND SURFACE WATER MANAGEMENT

This Chapter summarises the prospective regulatory framework for integrated surface water management and reviews the necessary approaches and supportive best practices in sustainable drainage systems (SUDS) that should be applied. Probable locations within Herefordshire where SWMPs may be required are identified.

9.1.1 Definitions

Surface water flooding describes flooding from sewers, drains, small water courses and ditches that occurs during heavy rainfall in urban areas. It includes:

- Pluvial flooding; flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface (surface runoff) before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity.
- Sewer flooding; flooding which occurs when the capacity of underground systems is exceeded, resulting in flooding inside and outside of buildings. Normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters.
- Flooding from small open-channel and culverted urban watercourses which receive most of their flow from inside the urban area
- Overland flows from the urban/rural fringe entering the built-up area, including overland flows from groundwater springs.

9.1.2 Local Development Framework Role

Projections of future climate change indicate that more frequent short-duration high intensity rainfall and more frequent periods of long-duration rainfall of the type for the widespread floods of 2000 can be expected. Herefordshire was heavily affected by surface water flooding in 1998, 2000 and 2007.

Consequently, the future Local Development Framework must promote policies that recognise that:

- existing property and infrastructure may be subjected to increased frequency and/or depth of flooding in the future
- future development should lessen the hydraulic loading on underground and above ground surface water systems to minimise downstream risks
- future development should incorporate improved resilience to flood inundation where it is not feasible to locate it outside the floodplain

9.2 DEFRA Consultation – Improving Surface Water Drainage

9.2.1 Increased Risks from Surface Water

Surface water flooding occurs where high rainfall events exceed the drainage capacity in an area. Such events can also lead to serious flooding of property and possessions where surface water flows and collects. DEFRA invited views from stakeholders on a consultation on improving surface water drainage. In line with Sir Michael Pitt's recommendations, the consultation put forward detailed proposals to improve the way that surface water is currently managed. The consultation closed on 30 April 2008. A summary of the responses received was published on 17 September 2008.

To support the Government's new Water Strategy, Future Water, the DEFRA consultation sets out policies to improve the way that surface water drainage is managed. The floods last summer showed the real damage that surface water flooding can cause. The Environment Agency estimates that two-thirds of the 57,000 homes affected were flooded from surface water runoff overloading drainage systems. Combined damage from the June and July floods is estimated to be around £3 billion.

The Pitt Review on lessons learned has urged early action to improve the way that surface water is managed, particularly in high risk areas. Improving surface water drainage is a key part of the Government's new Water Strategy.

9.2.2 Government New Water Strategy

The Water Strategy puts forward three policy proposals on surface water management and the DEFRA consultation sets out the details.

1) **Establishing Surface Water Management Plans** as a way of improving co-ordination of activities between stakeholders involved in surface water drainage. This part of the consultation addresses the long-recognised fragmented responsibilities for managing surface water drainage.

   Surface Water Management Plans could provide a much-needed co-ordinating mechanism. Stakeholders were asked for their views on whether preparation of the plans should remain voluntary or become required in high risk areas, and what roles each of the key stakeholders should play.

2) **Clarifying responsibilities for adoption and management of sustainable drainage systems (SUDS).** This part of the consultation asks stakeholders for their views on options for encouraging SUDS as a viable alternative to connecting surface water into sewers. It puts forward specific proposals in relation to responsibilities, policies and processes to increase uptake of SUDS.

3) **Reviewing automatic right to connect (Section 106 of the Water Industry Act 1991).** This part of the consultation reviews the existing and

longstanding ability for new development to connect surface water drains or sewers to the public sewerage system, which could act as a potential barrier to the use of SUDS. The right to connect foul drains and sewers to the public sewerage system will remain.

Traditional piped drainage has delivered many benefits and will continue to have a role to play as part of surface water drainage. But to prepare for climate change and continuing development pressures, we should ensure that a much fuller range of drainage approaches is considered when surface water drainage systems are designed, constructed and improved in the future.

9.3 Intra-urban Flash Flooding

Besides flooding from rivers and coasts, towns and cities will be increasingly subject to localised flooding caused by the sewer and drainage systems being overwhelmed by sudden localised downpours. Flash flooding occurs when the ground becomes saturated with water that has fallen too quickly to be absorbed.

The runoff rapidly flows downhill and collects in low-lying areas. This is particularly of concern in towns and cities where, because of the built environment, the ground has little capacity to absorb rainfall. In a flash flood drainage and sewerage systems, at best designed to take a 30 year storm, are overwhelmed causing flooding in vulnerable areas.

According to the **Foresight Future Flooding** report the potential damages could be huge, but more work needs to be done to quantify the potential problem of intra-urban flooding.

In the absence of reliable surface sewer models and urban flooding reports from Welsh Water generally, the Herefordshire SFRA notes the increasing relevance and impact on urban housing and infrastructure of this phenomenon of flash flooding. Herefordshire seems particularly susceptible to this hazard, as it has a preponderance of hilly upland catchments, and relatively impermeable sub-soils at shallow depth. Approximately 50% of the reported flooding incidents in Herefordshire are from sources other than fluvial flooding.

The Consulting firm JBA Ltd. has pioneered the modelling approach to flash flooding using similar Digital Terrain Models (DTMs) and methodologies as used for the EA generalised flood outline modelling. The assessments can be County wide, and are not excessively expensive.

It is therefore recommended that a strategic assessment be carried out into locations within Herefordshire most likely to be subjected to flash flooding. The outputs can be used to further inform the appropriateness of new development in certain locations, and identify appropriate mitigation measures.

9.4 Surface Water Management Plans

9.4.1 Policy Framework

The Government's view is that the key to the consistent and successful implementation of SUDS for all development sites is inclusion of a sustainable drainage policy within regional and local development documents. This should be implemented with the collaboration of the Environment Agency and the sewerage undertaker (Welsh Water). In areas of intense development or locally complex drainage issues, it may be necessary to formulate a **Surface Water Management Plan** that has multi-agency engagement and support.

Allocating new development sites to areas of least fluvial risk is only 50% of the sustainability test. New developments well outside the floodplain and not therefore themselves at risk of flooding may place significantly increased loading on receiving sewers and watercourses, sometimes many kilometres downstream of their location. Flood risk to downstream third-parties is thereby increased.

This is a particularly significant risk associated with large sites draining to relatively small watercourses, which is a characteristic of a number of potential development sites within Herefordshire. Hence appropriate and sustainable surface water drainage from new sites has a critical role to play in local flood risk management.

Urban drainage management is delivered by a number of organisations with varying powers and responsibilities.

Arrangements for managing surface water drainage are split between the Environment Agency, local authorities, water companies, and other agencies, with no one organisation having overarching responsibility. As a result, decisions about new drainage or development investments are usually taken without a complete understanding of surface water risks and the most effective solutions.

There is increasing momentum at Government level for increased coordination of drainage and flood management strategies, and it is clear that LPAs will have an increasingly responsible role in coordinating effective drainage strategies through the planning process.

In critical drainage areas, where the risk from surface water drainage is significant, the local authority should prepare a **Surface Water Management Plan**. This would be an action plan, agreed by all local stakeholders with drainage responsibilities, to clarify responsibilities and manage these risks. Given the potential risks posed by surface water flooding around the country, the Government is now consulting separately on how to give Surface Water Management Plans a stronger role in coordinating development and investment planning.

It sees local authorities in a central leadership role, with the Environment Agency advising on and potentially quality-assuring the plans. In particular

LPAs and water companies should work together in preparing such plans and using them to guide investment decisions on solving local drainage, including options for above-ground storage and routing.

9.4.2 Technical Framework

Establishing Surface Water Management Plans (SWMPs) as a mechanism to improve coordination should ensure that:

- new development is located in areas of lower flood risk where possible
- each element of the drainage system operates in a known and planned way to minimise flood risk
- emergency planning for surface water flooding can be targeted to areas of greatest risk.

The SWMP plan will set out the most cost-beneficial policy options for managing surface water drainage in a local area and clarify the responsibilities of each stakeholder.

In essence, Surface Water Management Plans should:

- map and quantify surface flows and drainage with sufficient detail to enable local as well as strategic flooding problems to be tackled
- produce a delivery plan that clarifies responsibilities and then directs resources at tackling surface water, prioritising areas at greatest risk first
- influence local planning policy such that new development occurs primarily in areas of low surface water flood risk or where flood risk can be managed effectively, making use of sustainable drainage solutions where appropriate
- be periodically reviewed, possibly including independent scrutiny of planning and resource decisions to gauge progress in tackling the most serious problems.

9.4.3 Anticipated Benefits

Assuming that the process directly influences planning and investment decisions, the resulting SWMP should deliver:

- Investment strategies in drainage that are the most cost-beneficial, namely that produce greater reductions in flood risk for every pound spent, for example by providing upstream storage to increase river capacity downstream to accommodate drainage and eliminating the need for end-of pipe solutions in the urban area
- Clarity on roles and responsibilities, and reduced duplication of effort across the different stakeholders
- Greater use of sustainable drainage systems (SUDS) which depend on a more integrated approach to drainage planning
- Land allocations that minimise surface water impacts on new and existing development (all other considerations being equal)

These benefits would have two major outcomes:

1) Fewer serious flood events, relative to the projected increase with climate change, as surface water is more effectively managed and directed away from property, with the result that the costs of flood insurance decrease and customers face lower insurance premiums

2) Improved water quality as there is less surface water runoff contaminated with diffuse urban pollution, and fewer incidences of Combined Sewer Overflows, when untreated sewage enters watercourses

9.4.4 Where SWMPs should be Implemented

SWMPs will be used to understand and resolve complex and high risk surface water flooding problems in urban areas. It is not possible to be overly prescriptive as to when and where a SWMP will need to be undertaken, as this is largely dependant on local needs. However there are some common criteria which may help to identify the need for a SWMP:

- Identification of critical drainage areas – Level 2 SFRAs should identify critical drainage areas, and hence the need for a SWMP.
- Future urbanisation/redevelopment – new home building in urban extensions or as part of regeneration presents a challenge to existing drainage systems but can also become an opportunity to address long-standing problems.
- Evidence of surface water flooding history – this is one of the most reliable indicators of high risk for future flooding. Information on previous flooding is often collated in a SFRA or CFMP, but is also available from local authorities, water companies, the Environment Agency and the community.
- Known degree of drainage system interaction – where the operation of local drainage system is known to be complicated by interactions between systems, solutions have to involve a partnering approach.

9.5 Implementation Difficulties with SUDS

9.5.1 Conflicting Agency Requirements

Arrangements for managing surface water drainage are currently split between the Environment Agency, local authorities, water companies, and other agencies, with no one organisation having overarching responsibility. As a result, decisions about new drainage or development investments are often taken without a complete understanding of surface water risks and the most effective solutions, or optimum solutions are not implemented because the controlling Agency refuses to adopt the proposed structures.

The nature of SUDS means that their implementation and management does not readily sit within established water industry structures. The major obstacles

to their wider uptake and implementation have to do with ownership, maintenance and funding arrangements. The Government is now consulting separately on options for resolving these barriers to take up, including options for ownership and adoption of SUDS across the main agencies involved in urban and land drainage.

Whilst the industry vision of reducing runoff to green field rates or better is desirable it may not be widely accepted by all of the industry and typically it is driven by the Environment Agency, and resisted by the water companies. It is understood that Severn Trent Water is supportive of green-field runoff policy, however currently the implementation of SUDS is not a statutory requirement.

However, under Planning Policy Statement (PPS) 1 - Delivering Sustainable Development, it is a requirement that regional planning bodies and local authorities should promote the use of SUDS for the management of run-off. LPAs should ensure that their policies and decisions on applications support and complement Building Regulations on sustainable rainwater drainage. These give priority to the use of infiltration drainage systems over first watercourses and then sewers.

Some LPAs have statements within Local Development Frameworks and have complementary Supplementary Planning Documents to support the implementation of SUDS. However, this may be difficult to enforce where connection to the surface water system is easier and cheaper.

The lack of policy or legislation supporting the long term ownership and maintenance responsibility for SUDS hinders the implementation of SUDS. DEFRA as part of the process to implement the WFD is currently looking at options to allocate the maintenance of SUDS and support implementation and it is possible that supporting legislation will be available in advance of 2015 [3].

9.5.2 Adoption of SUDS

To help overcome the specific problems of SUDS adoption, and as an interim measure, the National SUDS Working Group (NSWG) has developed an Interim Code of Practice for SUDS (NSWG, 2004). This code of practice is complemented by CIRIA publication C625 Model Agreements for SUDS, which provides a set of planning model agreements for use between those public organisations with statutory or regulatory responsibilities relating to SUDS.

The Model Agreements are based on current legislation and the current planning system. The aim of the Model Agreements is to facilitate uptake of SUDS by providing a mechanism for maintenance. The model agreements developed for use with the Interim Code of Practice achieve this through the planning process, either as a planning obligation under Section 106 of the Town and Country Planning Act 1990, or as a condition attached to planning permission.

Oxfordshire County Council and Oxfordshire Borough Council have nevertheless demonstrated that it is possible to implement and adopt widespread use of SUDS in their Local Development Framework without excessive difficulty.

9.6 Sustainable Drainage Systems Defined

9.6.1 SUDS Management Train

Sustainable Drainage Systems aim to mimic natural drainage processes and remove pollutants from urban run-off at source. SUDS comprise a wide range of techniques, including green roofs, permeable paving, rainwater harvesting, swales, detention basins, ponds and wetlands. To realise the greatest improvement in water quality and flood risk management these components should be used in combination, often referred to as the SUDS Management Train.

SUDS objectives are to minimise the development impacts of quality as well as quantity on the receiving drainage system, and to maximise amenity and biodiversity opportunities.

There are a wide range of structures and techniques for surface water drainage, which are considered more sustainable than conventional piped systems, because they can offer improvements in environmental water quality, reduced flood risk and amenity benefits. Carbon savings could also be significant, as it is estimated that around 6% of the energy consumed by water companies is used to pump and treat surface water.

These measures seek to mimic natural drainage processes and reduce the impacts of urbanisation on downstream watercourses. These can operate at the level of individual properties (green roofs, water butts, soakaways in garden areas and porous paving of driveways), within neighbourhoods (swales, detention basins and porous paving of highways and large car-parks and at the strategic level through features such as large balancing ponds.

To mimic the natural runoff process as closely as possible, the hierarchy of techniques that should be considered in developing the management train is as follows:

1. **Prevention** – the use of good site design and housekeeping to minimise runoff and source pollution (rainwater harvesting, clean parking areas). Prevention policies should be included in the site management plan.

2. **Source Control** – control of runoff at or very near its source (e.g. green roofs, soakaways, filter strips, and pervious pavements)

3. **Site Control** – de-centralised management of water in a local area or site (e.g. runoff from large roofs and car-parks directed to infiltration zones, landscape ponds or detention basins)

4. **Regional Control** - strategic management of surface runoff with one or several sites contributing to a larger, centralised attenuation reservoir or wetland area.

9.6.2 Designing for Exceedance

All sewers that will subsequently be adopted by the sewerage undertaker must be designed and built in accordance with the requirements of Sewers for Adoption, 6th Edition. This document provides guidance on suitable return periods for use in the design of sewerage systems for various development types. In general terms, sewers should be designed to ensure that no flooding occurs above ground level for events with a return-period in the range of 30 to 50 years, depending on the development type.

A significant issue is that rainfall events that cause an exceedence of the adopted sewerage system are beyond the statutory responsibilities of the sewerage undertaker. This has been a major problem in the past, whereby EA development control Officers have requested that site runoff up to and including the 1% AEP event should not exceed green-field rates, but this is well beyond the capacity of most sewerage systems.

For events with a return-period in excess of 30 to 50 years i.e. beyond the stipulations of Sewers for Adoption, Ed. 6, the solution inevitably lies with SUDS type drainage control, requiring especially consideration of the site drainage design in the very earliest stages.

Surface flooding of open spaces such as landscaped areas or car parks is acceptable for short periods, but the layout and landscaping of the site should aim to route water away from any vulnerable property. No flooding of property should occur as a result of a 1% AEP storm event (including an appropriate allowance for climate change).

In principle, a well-designed surface water drainage system should ensure that there is little or no residual risk of property flooding occurring during events well in excess of the return-period for which the sewer system itself is designed. This is called designing for event exceedence. Further guidance on this and designing safe and sustainable flood is provided in Designing for Exceedance in Urban Drainage – good practice.

9.6.3 Charging, Adoption and Maintenance

Local Authorities, sewerage undertakers nor developers (via management companies) currently find the prospect of adopting SUDS attractive. Each fears the adoption of unfunded liabilities, principally because funding and costs are not tied together linked under the present funding arrangements.

There is no overt link between the public sewage infrastructure expenditure caused by, and downstream of, the connection to public sewer of a new development and the charges paid by the developer. Generally, reinforcement is funded by sewerage customers at large and the infrastructure charge on developers is a fixed, uniform amount. Neither are the environmental costs of flood risk and pollution reflected in any transactions. This is an issue that Government is actively seeking to address [2, 3, 10].

It is likely that SUDS have a higher ongoing maintenance liability than conventional sewerage systems. The satisfactory performance of SUDS

depends not only on good design but also adequate maintenance, and provision for this must be made from the outset. Planned maintenance operations are likely to be more intensive during the early establishment of balance ponds, and may include an initial de-silting on completion of construction (sand, silt and other construction waste may enter the SUDS whilst site construction is ongoing). Vegetated SUDS will require routine maintenance to control growth, ranging from regular grass cutting (swales and filter strips), to annual 'meadow' grass cutting (for basins) or longer term management of the vegetation in ponds.

De-silting and disposal of sediment will be required at some stage to maintain storm water capacity (this may require consents from the Environment Agency and or the LPA). The developer and the LPA will need to agree who will be responsible for the on-going maintenance as a condition of planning consent.

Responsibility for this may rest with the freeholder or a management company. The LPA are more likely to adopt SUDS assets if they are located within an open space where the public has access. A Section 106 Agreement will be required for the transfer of the SUDS asset to the Council, along with a management plan and an appropriate payment for future maintenance and management responsibilities.

9.6.4 Climate Change Considerations

In making an assessment of the impacts of climate change on flooding from the land, rivers and sea as part of a flood risk assessment, the sensitivity ranges in Table 9-1 (extracted from PPS25 table B.2) may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities, river flow, wave height and wind speed.

Sensitivity testing of the Flood Map produced by the Environment Agency, using the 20 per cent from 2025 to 2115 allowance for peak flows, suggests that changes in the extent of inundation are negligible in well-defined floodplains, but can be dramatic in very flat areas.

However, changes in the depth of flooding under the same allowance will increase the probability (reduce the return period) of a given flood. This means that a site currently located within a lower risk zone (e.g. Zone 2 in PPS 25, Table D.1, Annex D) could in future be re-classified as lying within a higher risk zone (e.g. Zone 3). This in turn could have implications for the type of development that is appropriate according to its vulnerability to flooding. It will therefore be important that developers, their advisors and local authorities refer to the current Flood Map and the SFRA when preparing and considering proposals.

Table 9-1 – Precautionary Sensitivity Ranges for Climate Change Effects

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

Notes:

1. Refer to *Defra FCDPAG3 Economic Appraisal Supplementary Note to Operating Authorities – Climate Change Impacts, October 2006*, for details of the derivation of this table.
2. For deriving peak rainfall, for example, between 2025-2055 multiply the rainfall measurement (in mm/hour) by 10 per cent and between 2055-2085 multiply the rainfall measurement by 20 per cent. So, if there is a 10mm/hour event, for the 2025-2055 period this would equate to 11mm/hour; and for the 2055/2085 period, this would equate to 12mm/hour. Other parameters in Table B.2 are treated similarly.

Source: DCLG, PPS 25, Table B.2

Developers should note that an appropriate precautionary response for new development runoff is to attenuate the peak flow derived from the peak rainfall intensity + 20% for commercial uses, and + 30% for residential uses.

9.7 Sustainable Drainage Best Practice

The single most authoritative source for SUDS design and implementation which should be cited in LDF policies is **The SUDS Manual – 2007, CIRIA C697** which provides comprehensive guidance on every aspect of SUDS [5].

A new Local Authority Network on Drainage and Flood Risk Management (Landform) has been established by CIRIA with support from the Environment Agency (http://www.ciria.org/landform) [6].

The Environment Agency has also provided an outline guide for developers which recommends that SUDS should be cost-effectively designed to work with retained natural features such as ditches or ponds, and to form an integral part of hard and soft landscaped areas [7]. In this way, they can contribute towards an attractive scheme that enhances the nature conservation and amenity value of the development, while also recycling the valuable water resource.

Environment Agency (Wales) also hosts a comprehensive on-line guide to SUDS implementation and best practice in its region [8].

9.7.1 Appropriate Systems

The choice of SUDS system will depend on a number of factors such as:

- the pollutants present in run-off
- the size of and drainage strategy for the catchment area
- the hydrology of the area and infiltration rate of the soil
- Groundwater Source Protection Zones or contaminated land.

Large-scale ponds and wetlands are generally more appropriate for sites larger than 5ha. Infiltration trenches, swales, filter strips and porous pavements are suitable for both large and small sites. The best drainage solution for a site will often incorporate a mix of mechanisms.

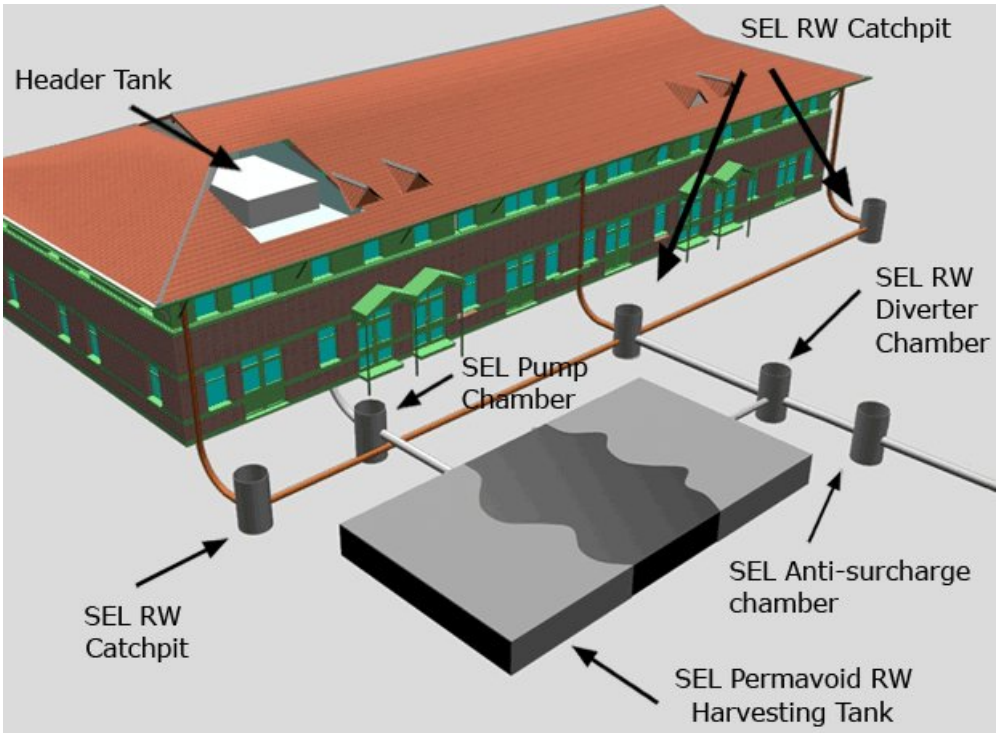
Soil permeability can have a significant effect on selecting SUDS mechanisms. Infiltration techniques may not be effective if the infiltration rate is below 10mm/hr for the upper soil layers. Swales and ponds, working by a combination of filtration and infiltration, are more tolerant of poor soils. In highly permeable soils, wet ponds need to be lined. SUDS must be designed to avoid discharge to old mine workings where they exist.

It is important for developers to establish the soil conditions and hydrology of their site at an early stage in the planning process. The results of such investigations should be provided to the planning authority with the proposals for a drainage system included with the planning application.

On brown-field sites where there is a risk of environmental damage from land contamination, the use of infiltration-based solutions requires careful consideration. The focus must be to avoid mobilisation of contaminants.

In these instances it may be more appropriate to utilise a contained form of rainwater attenuation and storage.

9.7.2 Example – Large scale rainwater harvesting



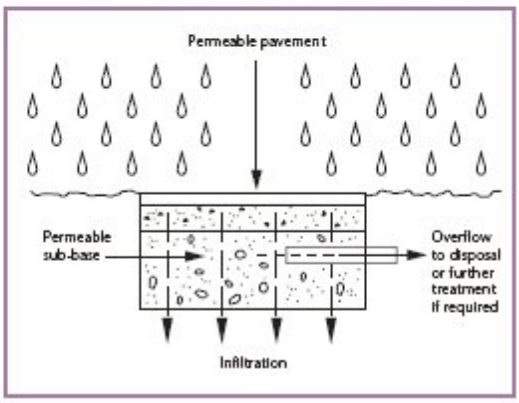
Source: © www.althon.co.uk/products

Typically water stored within the rainwater harvesting tank is pumped back into a building from a simple and shallow pump chamber, to a header tank normally situated within the roof space. The water can then be fed by gravity to supply any required facilities i.e. toilets, irrigation for landscaping etc. Providing there is sufficient annual rainfall, reusing water for flushing toilets and landscape watering could account for up to 50% of total water consumption.

9.7.3 Example – Permeable Pavements and Surfaces

Permeable pavements

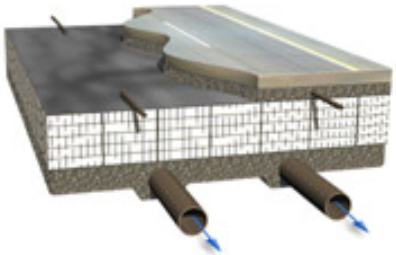
The need for surface water drains and off-site sewers can be reduced or eliminated where run-off is encouraged to permeate through a porous pavement, such as permeable concrete blocks, crushed stone and porous asphalt. Depending on the ground conditions, the water may infiltrate directly into the subsoil or be stored in an underground reservoir (for example, a crushed stone layer) before slowly soaking into the ground. If infiltration is not possible or appropriate (for example, because of ground contamination), an impermeable membrane can be used with an overflow to keep the pavement free from water in all conditions. Pollutant removal occurs either within the surfacing or sub-base material itself, or by the filtering action of the reservoir or subsoil.



Source: Environment Agency – SUDS A Guide for Developers, 2003
And The Concrete Centre, www.concretecentre.com

Figure 9-1 – Underground block systems

Underground cellular block type structure used predominantly for providing below ground surface water infiltration and soakaway systems.

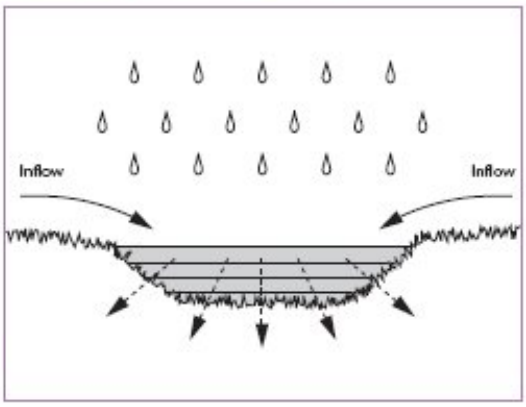


Source: © Hydro International, Stormcell system

9.7.4 Example – Swales and Basins

Swales and basins

These can be created as features within the landscaped areas of the site, or they can be incorporated into ornamental, amenity and screen-planted areas where they would be looked after as part of the normal maintenance contract. They provide temporary storage for storm water, reduce peak flows to receiving waters, facilitate the filtration of pollutants (deposited and incorporated into the substrate) and encourage microbial decomposition, as well as allowing water infiltration directly into the ground. Swales and basins are often installed as part of a drainage network connecting to a pond or wetland, prior to discharge to a natural watercourse. They may be installed alongside roads to replace conventional kerbs, therefore saving construction and maintenance costs.

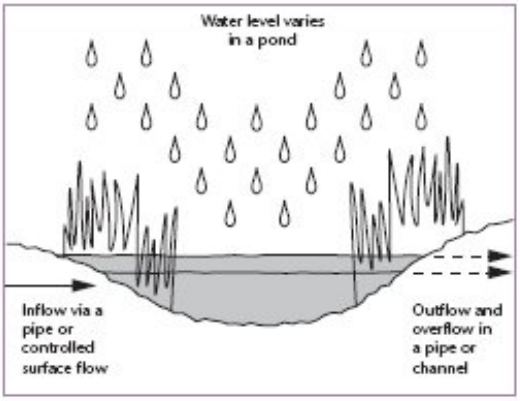


Source: Environment Agency – SUDS A Guide for Developers, 2003

9.7.5 Example – Pond and wetlands

Ponds and wetlands

Although these can be designed as wet or dry ponds, or wetlands, they are most likely to contribute to visual amenity and biodiversity where they include a permanent water body. Ponds or wetlands can be designed to accommodate considerable variations in water levels during storms, thereby enhancing flood-storage capacity. By allowing adequate detention time, the level of solids removal can be significant. The algae and plants of wetlands provide a particularly good level of filtering and nutrient removal, as well as being able to recycle grey water. Ponds and wetlands can be fed by swales, filter drains or piped systems, and the use of silt traps is recommended to reduce sedimentation.



Source: Environment Agency – SUDS A Guide for Developers, 2003
Source: Environment Agency (Wales)

Figure 9-2 – Localised attenuation pond for new development

9.8 Herefordshire Locations Requiring SWMPs

In the complete absence of surface water system flooding and hydraulic performance information from DCWW, this study has resorted to the established Herefordshire Council database of historical flooding reports, which in fact provide a valuable general overview of where both fluvial and/or surface water flooding has been reported in the past.

The appropriate GIS layer is:

- **HOWCS Main Flood Spots**

These 'hot-spot' areas are clearly priorities for investigation.

9.9 Summary of Main Issues

9.9.1 Surface Water Management Plans

The Government's view is that the key to the consistent and successful implementation of SUDS for all development sites is inclusion of a sustainable drainage policy within regional and local development documents. This should be implemented with the collaboration of the Environment Agency and the sewerage undertaker (Welsh Water). In areas of intense development or locally complex drainage issues, it may be necessary to formulate a **Surface Water Management Plan** that has multi-agency engagement and support.

In view of the intense housing pressures forthcoming in and around Leominster and Hereford, and the extensive historical flood risk in these areas also, we are of the view that Surface Water Management Plans are urgently required for:

- **Hereford (north-west)**
- **Hereford (south-east)**
- **Leominster**

A working group comprised of representatives from Herefordshire Council, DCWW and EA should be established to from the Terms of Reference, data needs, and outcomes.

The River Lugg Internal Drainage Board (IDB) may have a useful role to play in the formulation of these Plans, and in promoting SUDS in less urban areas.

9.9.2 Adoption and Operational Issues of SUDS

Legislative impacts on roles and responsibilities of forthcoming Floods and Water Management Bill should be reviewed jointly by Herefordshire Council and DCWW.

There is potential for significant overlap of roles, with possibly conflicting outcomes. A Policy Statement may be required, and precise roles and

responsibilities clarified in the LDF. A Memorandum of Understanding may be required between DCWW and Herefordshire Council.

9.9.3 Habitats Regulations

CCW has commented that SWMPs and SUDS developed in the vicinity of European sites are likely to require consideration under the Habitats Regulations.

9.10 Issues for Action – Integrated Drainage and Surface Water

Table 9-2 – Issues for Action – Integrated Drainage and Surface Water Management

Issue	Water cycle issue, deficiency or impact requiring solution	Principal actors	Ongoing actions
9a	Working Group urgently needed to define ToR for SWMPs in identified critical areas of Leominster and Hereford	Herefordshire DCWW	Awaiting inputs
9b	Roles and responsibilities for SUDS implementation, adoption and maintenance under new Water Bill 2009 are required by key stakeholders	Herefordshire DCWW EA	Awaiting inputs

10. TECHNICAL APPENDICES

10.1 References

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10.2 Water Infrastructure Constraints

This Section summarises the submission of DCWW with regard to potential general infrastructure constraints of:

- Sewerage
- Sewage Treatment
- Water Supply

Site References (by Market Town) relate to the Herefordshire Council SHLAA study, which is GIS mapped as:

- **HWCS Development Sites 081127**

Table 10-1 - Water Services Infrastructure Constraints – Hereford Area

Site Ref	Water Services Infrastructure Comments HEREFORD Area
BAPX	**Sewerage:** No problems are envisaged with the public sewerage system for domestic foul discharge from this development. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
FRP6	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/112/001	**Sewerage:** No problems are envisaged with the public sewage system for domestic foul discharge from this development. **Sewerage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development.
HLAA/114/001	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/116/001	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers
HLAA/283/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are

	required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers
HLAA/011/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/019/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/032/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/038/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/048/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/048/003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/048/004	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage Treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water

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HLAA/048/005	Sewerage: Parts of the public sewerage system suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advanced of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/050/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/052/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
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HLAA/057/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/058/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits

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HLAA/058/002	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
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HLAA/071/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/075/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/076/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The

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HLAA/087/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/087/ 002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/090/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of our Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/096/ 001	**Sewerage:** No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/103/ 001	Sewerage: Parts of the public sewerage system suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advanced of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-

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HLAA/104/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/108/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/110/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/120/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/134/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/134/003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would

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HLAA/134/003a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/164/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/173/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/174/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/175/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

HLAA/187/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/196/ 002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/197/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/197/ 002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allcoations proposed for this area would overload the deisgn capacity of our Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The area suffers from low water pressure and additional new development would merely exacerbate service levels.
HLAA/197/ 002a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/197/ 003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allcoations proposed for this area would overload the deisgn capacity of our Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply:

	The area suffers from low water pressure and additional new development would merely exacerbate service levels.
HLAA/197/ 003a	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/197/ 004	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/197/ 004a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/197/ 004b	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/203/ 001a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allcoations proposed for this area would overload the deisgn capacity of our Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The area suffers from low water pressure and additional new development would merely exacerbate service levels.
HLAA/203/ 001b	Sewerage: Parts of the public sewerage system suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermain are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

HLAA/210/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/215/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/215/002	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/215/003	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/215/004	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/215/005	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/215/006	Sewerage: No problems are envisaged with the public sewage system for domestic foul discharge from this development. Sewerage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plan post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, then developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/215/007	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year

	2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/215/008	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/219/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/221/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/248/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/255/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/298/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/304/	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current

001	5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/308/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/308/ 002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/309/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/309/ 002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/310/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/311/	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current

001	5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
HLAA/317/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
M9BK	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
MKC7	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plan post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, then developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
NAPY	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
NSPX	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current

	5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/006	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/007	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/011	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/014	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works.

	Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/015	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/024	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/025	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/026	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/027	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential

	improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/028	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/029	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planner under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements developers may be required to fund the essential improvements. Sewage treatment: Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to carry out essential improvements. Should any development occur in advance of the Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/030	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of our Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan period to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Her/031	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
O/Her/032	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
O/Her/034	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current

	5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.
O/Her/035	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this developmen. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Her/036	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Her/037	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Her/039	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Her/041	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage development: No problems are envisaged at the receiving Welsh Water Treatment Works to accommodate domestic foul flows from this development. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
P258	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plan post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, then developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
P692_P1102	Sewerage: Parts of the public sewerage system suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advanced of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
YEBU	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current

	5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund essential improvements. Water supply: This area suffers from low water pressure and additional new development would merely exacerbate service levels. The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the cost of which would be borne by potential developers.

Table 10-2 – Water Services Infrastructure Constraints – Bromyard Area

Site Ref	Water Services Infrastructure Comments BROMYARD Area
By/10	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment**: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site water-mains may be required which can be assessed during the planning application stage.
By/12	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site water-mains may be required which can be assessed during the planning application stage.
By/18	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under DCWW's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. DCWW awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site water-mains may be required which can be assessed during the planning application stage.
By/21	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.
By/24	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.

By/36	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.
By/42	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.
By/44	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.
By/48	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.
By/49	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.
By/54	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public

	waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required which can be assessed during the planning application stage.
HLAA/115/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/125/001	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/154/001	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment**: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/154/002	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/321/001	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains

	are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
O/By/001	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. **Water supply:** The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/By/002	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. **Sewage treatment:** Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. **Water supply:** The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/By/003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
O/By/004	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/By/005	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/By/006	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers

	may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
O/By/007	**Sewerage:** Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/By/007a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/By/008	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/By/009	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/By/010	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development

	of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P1061	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P1087	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P520/1	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P520/2	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Captial Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

Table 10-3 – Water Services Infrastructure Constraints – Leominster Area

Site Ref	Water Services Infrastructure Comments BROMYARD Area
HLAA/014/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/021/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/027/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/027/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/027/003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be

	provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/027/004	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/043/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/044/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/046/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/046/001a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's

	Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/106/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/123/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/123/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/153/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/196/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design

	capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan proces to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/205/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/243/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
HLAA/264/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
Leo/1	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/10	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential

	improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/18	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/19	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/2	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/20	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/21	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/23	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.

Leo/25	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/26	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/27	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/28	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/29	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off
Leo/3	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/31	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should

	any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/32	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/33	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/34	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/35	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/36	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/37	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be

	required and these can be assessed during the planning application stage.
Leo/38	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/39	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/41	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/44	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/45	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/47	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/48	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The

	total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/50	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/52	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/53	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/55	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/56	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/57	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of

	the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/58	Sewerage: No problems are envisaged with the pubic sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/6	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/61	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/7	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/8	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Leo/9	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh

	Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/001	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/002	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/003	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/004	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/005	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.

O/Leo/007	Sewerage: Parts of the sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/008	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/009	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/010	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/011	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/012	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any develoment occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/013	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The

	total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/014	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/015	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/017	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/018	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/019	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/020	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru

	Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/021	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/022	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/023	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/024	Sewerage: No problems are envisaged with the pubic sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/025	Sewerage: No problems are envisaged with the pubic sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should

	any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/026	Sewerage: No problems are envisaged with the pubic sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/027	Sewerage: No problems are envisaged with the pubic sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/028	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by developers.
O/Leo/029	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/030	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/031	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan

	process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/032	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/032a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/033	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/034	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/034a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may

	be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/035	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/036	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/036a	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/037	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

O/Leo/038	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/039	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Leo/041	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage
O/Leo/042	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/043	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/044	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential

	improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/045	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Leo/046	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan proces to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P223	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P527	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
P692	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

Table 10-4 – Water Services Infrastructure Constraints – Ross-on-Wye Area

Site Ref	Water Services Infrastructure Comments Ross-on-Wye Area
4ZPP	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.
C2BC	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/199/002	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/199/003	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/018/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.
HLAA/018/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.

HLAA/018/003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.
HLAA/107/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan proces to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/176/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/177/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/191/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the publich waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.
HLAA/192/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are

	required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/199/004	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/260/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/265/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.
O/Ross/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Ross/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.
O/Ross/004	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan proces to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water

	supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/005	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/006	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/007	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/008	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/009	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/010	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water

	supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/011	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/012	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Ross/014	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan proces to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Ross/015	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan proces to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Ross/016	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan proces to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
P1022	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: Development of this site may be constrained by the capacity of the publich waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a cost requisition scheme, the costs of which would be borne by potential developers.
P1046	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the publich waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply

	for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
P331	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the publich waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
P862	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
Ross/11	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/12	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/13	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/15	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/16	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Cymru Welsh Water awaits approval for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/17	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a

	water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/19	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/21	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/5	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/7	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/8	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Ross/9	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: Development of this site may be constrained by the capacity of the public waste water treatment works for which no regulatory improvements are planned under Welsh Water's current Capital Investment Programme. Dwr Welsh Water awaits approval of future funding for its plans post year 2010. Should this site be developed in advance of Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
W461	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

Table 10-5 – Water Services Infrastructure Constraints – Ledbury Area

Site Ref	Water Services Infrastructure Comments Ledbury Area
GUG7	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/015/001	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/029/002	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/062/001	Water supply: The development of this site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/065/001	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/067/003	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/078/001	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/121/001	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/121/001a	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/198/002	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/198/004	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/198/004a	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers
HLAA/267/001	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers

HLAA/288/001	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers
HLAA/288/002	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers
HLAA/288/003	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers
Led/10	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/11	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/15	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/18	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/2	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/4	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/6	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/7	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
Led/9	Water supply: No problems are envisaged with the provision of a water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/Led/001	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/002	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/003	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/004	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/005	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

O/Led/006	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/006a	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/006b	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/007	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/009	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/010	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/011	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/Led/012	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P744	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P746/2	Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
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Table 10-6 – Water Services Infrastructure Constraints – Kington Area

Site Ref	Water Services Infrastructure Comments Kington Area
HLAA/008/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/009/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/016/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/017/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/017/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/045/001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/045/	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current

002	5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/045/ 003	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
HLAA/045/ 004	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/155/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/261/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
HLAA/263/ 001	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
K/1	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru

	Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/12	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/13	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/15	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/2	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/3	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/4	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/5	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/7	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.

K/8	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
K/9	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
NKA8	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/K/001	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/002	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/K/003	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/K/004	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/005	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations

	proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/006	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/007	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/008	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/009	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/010	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/011	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/012	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/013	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru

	Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/014	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/015	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/016	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/017	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/018	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/K/019	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/K/020	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/021	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations

	proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off-site watermains may be required and these can be assessed during the planning application stage.
O/K/023	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/024	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/025	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/027	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/028	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/029	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/030	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/030	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru

	Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: No problems are envisaged with the provision of water supply for this development. Off
O/K/031	Sewerage: No problems are envisaged with the public sewerage system for domestic foul discharge from this development. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
O/K/032	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P122	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P535/1	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.
P535/2	Sewerage: Parts of the public sewerage network suffer from hydraulic overloading. No regulatory improvements are planned under Dwr Cymru Welsh Water's current 5 year Capital Investment Programme. Should this site be developed in advance of any regulatory improvements, developers may be required to fund the essential improvements. Sewage treatment: The total allocations proposed for this area would overload the design capacity of the Waste Water Treatment Works. Dwr Cymru Welsh Water would require the Council to release the allocations at a later stage in the plan process to allow sufficient time to undertake essential improvements. Should any development occur in advance of Dwr Cymru Welsh Water's Capital Investment, developers may be required to fund the essential improvements. Water supply: The development of this proposed site would require off-site mainlaying from a point of adequacy on larger diameter/pressure watermains. Where off-site watermains are required, these can be provided under a water requisition scheme, the costs of which would be borne by potential developers.

10.3 List of A2 Evidence Maps

Not issued as part of this Report, but available in hard-copy or PDF on request to authorised personnel only.

1. Evidence Map A1 – Environment Baseline and RoC
   Contains most details relating to Ecological Status of waterbodies and Consents failing to demonstrate 'No Adverse effect'

2. Evidence Map A2 – Water Supply Infrastructure
   Contains outline details of DCWW water supply infrastructure superimposed with Housing Pressure quantities (strategic sites)

3. Evidence Map A3 – Water Services Infrastructure
   Contains outline details of Water Treatment Plants, Sewage Treatment Plants and DCWW Water Resource Zone boundaries, superimposed with Housing Pressure quantities (strategic sites).

10.4 List of Databases and GIS Layers Prepared

Theme	Description	Version
Base Mapping		
HWCS Herefordshire	County boundary	
HWCS All Catchments	Sub-boundaries of all watercourses + additional catchment specific data	
HWCS Market Towns	Principal urban areas in Herefordshire	
HWCS Wye Rivers	Map of all Wye system rivers	
HWCS Villages	All rural villages in Herefordshire	
HWCS Parish population	Thematic map of population by Parish boundary	
HWCS Spatial Strategies	Thematic map of new housing density based on draft assessment March 2009	
HWCS Development Sites	All considered development sites from the SHLAA study by Herefordshire Council	081127
Environmental		
HWCS SAC	SACs in Herefordshire	
HWCS SSSI	SSSIs in Herefordshire	
HWCS Flood Hazard	Catchments in Herefordshire with high surface water flood risk	
HWCS Flood Risks	Catchments in Herefordshire with high fluvial flood risk	
HWCS Flood Reports	Major database of all historic flood locations	
HWCS Main Flood Spots	Summarised database of frequent flood locations	
HWCS Assessment Points	Location of EA CAMS assessment points for flow and quality monitoring	
HWCS EA WRMUs	Boundaries of EA Water Resource Management Units	
HWCS Discharges Wye	Database of all Discharge Consents in Herefordshire	
HWCS Discharges Wye All	Database of all Discharge Consents in River Wye catchment	
HWCS Discharge Consents Teme	Database of all Discharge Consents in River Teme/Leadon catchments	
HWCS EA Ecostatus 2010 Wye	Ecological status of all waterbodies in Wye system (2009 draft assessment)	
HWCS EA Ecostatus 2010 Teme	Ecological status of all waterbodies in Teme system (2009 draft assessment)	
HWCS Ecostatus Bad Wye	Extract of above showing only Bad Eco-status	
HWCS Ecostatus Bad Teme	Extract of above showing only Bad Eco-status	
HWCS Eutrophic Sensitive Waters	Rivers identified as sensitive under UWWTD	
HWCS RoC Sites	Habitats RoC finalised sites under EA Stage 4 Site Action Plan	
Abstraction Data		
HWCS Abstractions Wye SWA	All surface water abstraction licences in Wye within Herefordshire	
HWCS Abstractions Wye GWU	Unconfined ground water abstraction licences in Herefordshire	
HWCS Abstractions Teme SWA	All surface water abstraction licences in Teme within Herefordshire	
HWCS Abstractions Teme GWA	All ground water abstraction licences in Herefordshire	

HWCS Abstractions Wye AAGR	All surface water agricultural abstractions from Wye system within Herefordshire	
HWCS Abstractions Wye AAGR GW	All groundwater agricultural abstractions from Wye system within Herefordshire	
HWCS Abstractions Teme SWA	All surface water agricultural abstractions from Teme system within Herefordshire	
HWCS Abstractions Teme GWA	All groundwater agricultural abstractions from Wye system within Herefordshire	
HWCS Abstractions Teme AAGR	All surface water agricultural abstractions from Teme system within Herefordshire	
HWCS AAGR400 Spray Irrigation	All agricultural abstractions in Herefordshire for direct spray irrigation	
HWCS AAGR420 Spray Irrigation	All agricultural abstractions in Herefordshire for indirect spray irrigation i.e. via storage	
Water Services Infrastructure		
HOWCS WW WRZ 8101	Boundary map of WRZ Ross	
HOWCS WW WRZ 8103	Boundary map of WRZ Hereford CU	
HOWCS WW WRZ 8105	Boundary map of WRZ Llyswen	
HOWCS WW WRZ 8107	Boundary map of WRZ Pilleth	
HOWCS WW WRZ 8110	Boundary map of WRZ Vowchurch	
HOWCS WW WRZ 8111	Boundary map of WRZ Whitbourne	
HWCS STWs All	All identified STWs in Herefordshire	
HWCS Sewage Treatment Works Teme	STWs in Teme/Leadon within Herefordshire	

10.5 Consultation Responses

1. Dŵr Cymru – Welsh Water
2. Environment Agency
3. Natural England
4. Countryside Council for Wales