

**ASHFORD'S FUTURE: IWMS
FINAL REPORT**

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9 THE PREFERRED ASHFORD INTEGRATED WATER MANAGEMENT STRATEGY

9.1 OVERVIEW

The integrated water management strategy that has emerged out of the Study has been robustly tested against a range of performance and quality criteria and found to be technically sound, economically preferred and environmentally acceptable. The multi-faceted strategy comprises a wide range of interventions, both physical and non-physical, that will need to be implemented to a timely programme if it is to maintain or enhance the local environment.

The Study has also identified a number of areas where further studies and investigations are needed in order to identify specific constraints and opportunities, design parameters, performance criteria, etc., necessary to focus the implementation of the strategy.

To be successful, the strategy will need the full support, without exception, of every stakeholder. The list of principal participants is long (Table 9.1) and their role(s) in the strategy is crucial.

Table 9.1: Role of Stakeholders in relation to the strategy

Stakeholder	Role(s) and responsibilities
Central Government	Central planning policy. Initial funding. Legislative support
Kent County Council	Updating Structure Plan. Issue of Design Guides
Ashford Borough Council	Development of LDF policies. Planning and building control. Co-ordination of provision of SUDS. Provision and maintenance of sub-catchment SUDS.
<i>Ashford's Future</i>	Promotion and co-ordination of development within Ashford. Introduction of flagship applications of green roofs, grey water recycling
Environment Agency	Protection of water resources (through abstraction licensing, discharge consents) and management of flood risk (provision, O&M of FRM infrastructure and as statutory consultee on development proposals)
Ofwat	Regulation of water companies (approving capital spend and tariff levels)
Mid Kent Water	Providing adequate supply of potable water to Ashford and other areas. Support for water demand management.
Southern Water Services	Providing adequate infrastructure for the collection and treatment of wastewaters generated within the Study Area. Management of Bewl Reservoir. O&M of storm drainage within Ashford
Folkstone & Dover Water	Minor cross-boundary import and export of potable water with Mid Kent Water
Defra	Setting of policy on rural affairs, and providing guidance to various government bodies (EN, CA and EA)
EN / CA	Administering changes in countryside policy, as set by Defra. Provision of guidance regarding the conservation of wildlife habitats and protection of wildlife features, landuse, access and recreation
KWT/other NGOs	Provision of knowledge and advice regarding management of local wildlife sites and conservation of species and habitats
Stour IDB	The relevant operating authority for ordinary watercourses within its district.
Developers	Provision of SUDS, water conservation measures/initiatives
Industry	Responsible use/disposal of water
Farmers	Responsible use of water. Control of diffuse pollution
Residents/general public	Responsible use of water, enjoyment of the water environment

The southeast is one of the driest regions in the country. Water resources within the region are limited, and if the planned development of the region, including Ashford, is to be sustained then significantly greater efforts need to be made by stakeholders to manage the consumption of Mains and Non-mains Water. The recently formed Kent Water Demand Management Group, comprising representatives from the water companies, Kent County Council, the EA, Ashford's Future Delivery Team, Kent Thames-side Delivery team and Water Voice have pooled their initiatives in this area and are committed to achieving significant improvements in water demand management through physical and non-physical measures. The preferred integrated water management strategy is founded on the measures being promulgated by this group, which are outlined within the discussion below.

9.2 PROPOSED PHYSICAL INTERVENTIONS

9.2.1 Water demand management

Physical interventions to manage water demand that should be implemented, cover the broad areas of:

- water efficiency devices, which may either be:
 - installed by developers; or
 - purchased by householders; and
- water re-use measures.

The recommendations of the Demand Management Group will be fed into the Kent Design Guide for different types of developments. Although not currently mandatory, this will give KCC, and through the planning system, planning authorities such as Ashford BC significant leverage in getting water efficiency measures included by developers.

Individual sheets have been drafted (see Appendix 9.1) which recommend water efficient specifications for:

- Showers;
- Indoor taps;
- Outdoor water use;
- Toilets;
- White goods (washing machines and dishwashers); and
- Rainwater and greywater use.

The aim of these measures is to introduce water efficiency without impacting on customer lifestyles.

A typical example is the restricting of flow to outside taps to 10 l/minute would reduce water use whilst still leaving householders enough water to water their gardens. This can be achieved by installing flow regulators, which maintain a constant flow irrespective of pressure, or more simple flow restrictors whose performance is affected by pressure. Limiting water flow to outside taps can provide beneficial water savings, especially at the hottest and driest periods of the year.

Similarly, showers that use more than 12 l/min would require consent from the local water company under the Water Supply (Water Fittings) Regulations. Initiatives are underway to reduce sales of high-use shower heads by reducing this threshold limit to 10 l/min.

In the future, once more information and results of studies is available, the most effective practices should be incorporated into tougher building regulations to enforce the inclusion of appropriate measures. This has to be promoted at all levels, particularly by central government, through the building regulations and effective education.

9.2.2 Water supply resources

The Study has identified that the currently agreed regional strategy for water resource management, with its reliance on maximum groundwater abstraction from aquifers in the Stour catchment, will contravene the provisions of the Water Framework Directive until Broad Oak reservoir or some other major new source can be brought into operation.

The preferred strategy arising from this Study is therefore to follow the general provisions of the regional water resource strategy in bringing into use the currently planned regional resources, but to reduce groundwater abstractions in the upper Stour catchment. The shortfall in deployable output would be re-provided from a new river abstraction/water treatment plant facility of capacity at least equal to the reduction in groundwater abstraction. The new Works would be located upstream of Wye, drawing water from the Great Stour, whose flows will be enhanced by the increase in treated wastewater effluent resulting from the growth in Ashford's population. The output of the Works should not reduce the summer low flow in the Great Stour downstream to below the levels currently experienced.

Some flexibility may be exercised in the sizing and operation of the new Works. Higher rates of river abstraction may be possible at times of higher flows in the Great Stour, allowing groundwater abstractions to be further reduced to allow greater recovery of groundwater reserves. Greater use of the new works at such times might also enhance the rate of replenishment of Bewl storage reservoir in the spring, through reduction of demand for water from Bewl, should a dry winter fail to restore water levels sufficiently. This would allow full use of Bewl reservoir at times of low flows in the Great Stour, perhaps allowing a lower rate of river abstraction. When Broad Oak reservoir (or similar major new source) is in operation, it will be possible to cease operation of the Works upstream of Wye for a period of years, as the headroom provided by Broad Oak in the early years of its operation will allow significant further reduction of groundwater abstraction from the Stour catchment.

9.2.3 Wastewater infrastructure

Substantial provision of additional wastewater conveyance and treatment capacity will be required to support the planned expansion of Ashford. Conveyance systems (trunk sewers, major sewage pumping stations and rising mains) will need to be provided to cope with the full planned development.

There is an indicated economic preference for expanding the existing WWTW at Bybrook and providing conveyance systems to deliver wastewater to this works. The capital works would comprise expansion of system capacity, beyond that currently planned under AMP4.

A tentative programme for the implementation of the preferred strategy for the provision of WWTW capacity is discussed later in Section 9.6. Trunk sewers, pumping stations and rising mains would need to be planned to service the new development areas, and the most cost-effective route(s) identified to transport these additional flows from south of Ashford to the inlet works of the (expanded) WWTW at Bybrook.

Consideration needs to be given, at the time of planning the major new extensions to the infrastructure, as to how the system might be further expanded to serve any further development beyond the 31,000 new homes, and if so indicated, the planning authority approached to modify the Local Development Framework to reserve land for a second, southern WWTW.

The study has also demonstrated, through the use of SIMCAT modelling, that the expansion of Bybrook WWTW is preferred on environmental grounds (inter alia because receiving waters are less sensitive relative to the upstream head waters). The modelling work has highlighted areas where the additional effluent flows would result in failures against river quality targets, and provided a means by which to set tightened treatment standards to maintain river water quality meeting existing RE classes.

It is recognised that the currently modelled strategy (with tightened standards) suggests a slight deterioration in water quality downstream of Bybrook, and it is acknowledged that this may be perceived as a failure to meeting the Agency's 'no deterioration policy'. However, the level of water quality impact is negligible and it is expected that further modelling work will be required beyond this study to identify treatment standards that will be further tightened to ensure that the planned development does not cause deterioration in river quality.

It is likely that these higher standards could not be achieved with sufficient confidence using a conventional activated sludge (AS) process as assumed in the Study to date. A higher performing process, such as the Membrane Batch Reactor (MBR) might be more appropriate. The MBR process is a high intensity activated sludge process incorporating micro-filtration for the separation of the final effluent from the mixed liquor instead of providing separate final settling tanks. It is more compact than conventional AS, but more expensive. Such a change of process would not affect the choice of preferred strategy: the cost differential between WW1 and WW7 would remain in favour of WW1, and the 'natural technology' process would not be able to achieve the higher standard of effluent that the further modelling is likely to indicate, and so WW4 would not qualify for further consideration.

A further positive attribute of the MBR process is that the resulting effluent is disinfected, having a bacterial quality which is normally better than that achieved with ultra violet disinfection, making it suitable for non-potable re- use, including irrigation and the feeding of wetlands created for public access.

In addition to this, it is expected that more generalised improvements in river water quality will be achieved during the study period through implementation of wider impacting Ecological Water strategies, outlined below, including the implementation of reedbeds to polish effluents downstream of local WWTW and agri-environmental schemes targeting reductions in diffuse pollution and sedimentation impacts.

9.2.4 FRM infrastructure

Physical measures to manage flood risk resulting from the development of Ashford principally comprise, in decreasing order of effectiveness to control general flood risk:

- Large-scale incorporation of SUDS throughout new development areas
- SUDS's incorporated to the greatest extent possible in redevelopment
- Construction of off-line storage; and, to a limited extent
- Provision of some flood walls to protect properties otherwise at risk.

Some local channel improvements will also be necessary.

The opportunity to provide infiltration-based SUDS in most of the new development areas is denied, due to the underlying geology. Strict limits on runoff from developments, to less than that which currently occurs on these sites, need to be enforced if flood risk is to be adequately managed. Centralised detention ponds in each sub-catchment need to be provided in order to achieve this goal.

Potential offline storage areas associated with Whitewater Dyke and Ruckinge Dyke have been identified. A third area, identified at Cheeseman's Green to provide compensation storage for limited encroachment into the floodplain of the so-called Canal District, may not be available. No suitable alternative site has been identified, and it has been demonstrated through modelling that without this compensation, design flood water levels in the vicinity may be expected to rise of the order of 100mm. From an FRM perspective, the Canal District is in Ashford's primary flood plain

area and if flood compensation cannot be found, its construction would go against planning guidance, and cannot be justified from the point of view of drainage and sustainability.

Despite the implementation of above measures, some minor increase in design flood water levels may be expected, particularly if the anticipated effect of climate change are realised. As a result, some limited provision of low flood walls or embankments to protect properties will be needed, for instance in the vicinity of Park Farm.

9.2.5 Ecological water infrastructure

The Study has identified eight 'physical' strategies specifically aimed to address concerns regarding the impact of Ashford's proposed development upon water quality and features of biodiversity interest. These are not alternatives, but a suite of interventions to be implemented in a co-ordinated way to support and enhance the contributions that the other physical and non-physical interventions make to delivering sustainability of the water environment.

The creation of wetland sites through the implementation of SUDS and offline storage or the construction of tertiary treatment reedbeds has the potential to address both urban diffuse pollution and point source domestic pollution. While these features will have primary functions of flood management control and effluent polishing, they will offer secondary benefits as wildlife habitats. The 'value' of these habitats to wildlife and biodiversity interests will be dependent upon a coordinated approach being adopted between spatial planners, the Environment Agency, water companies and local conservation groups involved in the enhancement of green spaces and habitat creation. This will require good communication and teamwork. In particular, agreement must be reached to fund 'higher quality' designs that will ensure that the 'needs' of the ecological water environment are appropriately addressed.

The implementation of land management change is a theme that has been promoted in work produced by the GADF, and which offers significant potential to improve water quality in the Stour catchment by addressing rural diffuse pollution and improving the management of the riparian habitat. The importance of this strategy cannot be overstated given the requirements to meet objectives driven by the Water Framework Directive in 2015. Current reforms in land use policy and the development of new environmental schemes are seen as the key delivery vehicles for achieving change, and it is recommended that a 'Land Use Change Group' be formed to develop and agree a targeted approach for strategy implementation.

Considerable work has been undertaken during the development of the IWMS to investigate the impacts of effluent discharges on water quality with regards to temperature. While the Study has not arrived at a preferred strategy to reduce the temperature of discharges, it has identified the relative impacts attributable to the discharges and a range of measures that could be adopted that might address the problem. This is one of several areas where further investigation is required.

Green roof technology and combined grey water systems with SUDS has been proposed, although for limited application, for inclusion into the design and 'environmental specification' of Ashford growth. Both strategies are relatively new and therefore poorly understood in this country. However, they have reputation for delivering multiple environmental benefits. While, on the scale proposed, they will have only a limited positive impact, their adoption would demonstrate innovative and forward thinking and would represent Ashford's aim to be a sustainable development. The extent to which these technologies feature in Ashford's planned development will depend upon the political will and the voice of the local authorities.

The implementation of in-stream river modifications is proposed with a view to enhancing localised stretches of river for fisheries interest. This work falls within the Environment Agency's remit, and initial input from internal specialists points towards implementing measures downstream of Wye, where trout populations are most established and therefore fisheries interests are greatest. It is recommended that the Agency liaises closely with local fisheries groups and early

consideration is given to the benefits that might be gained by altering the control structure at Wye, as part of the proposed water re-use strategy.

The appraisal of integrated strategies against the quality objectives and targets (provided in Appendix 7.5 and summarised in Table 7.16) has highlighted that some of the targets set to maintain and enhance Ashford's biodiversity and water environment are not being achieved by the suite of physical interventions comprising the IWMS. Indeed, while some of the physical strategies have the potential to create new habitats, it is apparent, in many instances, that they are unable on their own to enhance existing biodiversity features. This issue is considered to result largely from the fact that the mitigation of environmental impacts cannot be addressed by any physical water management strategies, and because many of the targets that have been set are akin to planning statements. In recognition of this, it is proposed that maintenance and enhancement of Ashford's biodiversity features will need to be addressed through development control, and a suite of 'policy statements' have been drafted for inclusion in the LDF.

9.3 PROPOSED NON-PHYSICAL INTERVENTIONS

9.3.1 Policies relating to the conservation of Mains Water

The public perception of water must be totally changed if there is to be any progress in water demand management. Currently the problem is that Mains Water is perceived by the public as a statutory right, and any suggestion that its use should in any way be limited is likely to be fiercely opposed, even if much of the use could not be reasonably justified.

A simple example is the proliferation of the power washer. Should people use potable water – often a scarce resource, treated to a high standard at considerable expense – for washing moss off footpaths? The answer has to be, only if they, as individuals, are prepared to pay the true cost – which has to include the cost of developing new resources and the full environment impact costs of higher energy, including dealing with the climate change issues.

At some point there must be a national debate to determine the level of Government / regulatory intervention in personal water use, to conserve resources and the environment (in terms of stewardship for future generations) versus supporting individual rights to use what they like. Everybody has a right to expect a wholesome supply of water for basic needs – drinking, washing, sanitation – but beyond that, water should be considered a luxury commodity which has to be paid for, as any other commodity. Any new regulations required to conserve water would need to be backed by legislation and so the lead needs to come from central government, but there appears to be a reluctance to engage in such a debate. Possibly this is because the problem isn't seen as a sufficiently imminent but by ignoring water scarcity, particularly when considering regional housing development, the problem is just being compounded. At the very least, the Building Regulations need to be revised to ensure best practice is being enforced in all new developments

The present system for water charging does not, for the majority of users, reinforce any sense of responsibility in its use – and has been described in a recent publication¹ as “the most socially unjust of any country in the developed world with the exception of Mexico”. The review of water charging, promised in December 2004 by DEFRA, should be used as an opportunity to introduce not just a fairer method of charging but a means of promoting the responsible use of water. The debate will have to consider how far the inevitable redistribution of costs will be allowed and how to protect larger, vulnerable families.

There are currently varying views on how water should be charged for. The consumer group Water Voice consider that payment by volume is the fairest way of charging for domestic water supply with safeguards provided through the social security system. Research by the Joseph Rowntree

¹ Utility Week 29 July 2005

Foundation came to the conclusion that the fairest system would be for every household to receive a free allowance to meet basic needs and further consumption charged on metered volume adjusted by council tax banding. Others promote the use of variable tariffs which do not penalise the average user, but target the excessive user. However, until funding is provided for installing smart meters, the current “dumb” technology can only support block tariffs. The common component with all these schemes is that they require the volumes used to be measured, and therefore all properties need to be metered – and there does not appear to be any urgency at present to achieve this.

Whatever charging system is adopted it can not address the underlying problem of what happens if people are still prepared to pay for as much water as they want. Do you physically restrict their consumption or do you just keep developing new, increasingly less sustainable resources?

The most effective approach to achieving water efficiency and conservation in the long term must be to instil a responsible attitude in the general public. A proactive national campaign with a meaningful message is needed to educate the public in the consequence of wasting water. Perhaps items like power showers and power washers could be registered with water companies when they are purchased, as televisions are with the licensing authority, and carry “health warnings” similar to the energy efficiency classifications applied to white goods. Any introduction of an environmental tax on commodities such as power washers, power showers and swimming pools would be viewed with considerable suspicion by the public unless its use was ring-fenced for environmental projects. Power showers over 12 l/min already need consent from the water company: but how many people know that, and comply? The problem is always how it is policed. Some water companies used to make a charge if you had a hosepipe but they relied on the honesty of their customers. A similar issue would arise with registering other devices.

The planning process should fully consider any major development on the implication to regional water resources before approvals are granted, plus consideration given to timing and the ability to provide new resources. Contemporary lack of a sustainable water supply should be sufficient reason to turn down planning applications.

Water audits are already carried out by some water companies for their largest consumers. There is an argument to make these audits compulsory on all larger commercial and institutional users (including reviewing discharge consents to encourage reduced usage/reuse). This could be made a mandatory requirement for all consumers over some agreed threshold, and be paid for either by the consumer or offered by the water companies.

Wastewater management

The primary area of policy relating to the provision of wastewater services identified as arising from the integrated water management strategy is in the area of funding the provision of infrastructure capacity beyond that which is needed within the Ofwat determination periods. This aspect is discussed in greater detail in Section 9.5.

9.3.2 Policies related to the use of Non-mains Water

The lack of reliable data on actual Non-mains Water abstractions and discharges is woeful. Procedures to regularly and accurately monitor abstractions need to be put in place by the EA so the true level of abstractions is known. The monitoring must allow the EA to know how much is being used, where, and when, and the impact of its return to the water environment as a wastewater discharge. The level of monitoring would have to complement the abstraction and the frequency of reporting should match the volumes being abstracted. The fundamental point is that without complete and accurate records you can't have the complete picture with which to manage the resources. Any farmer, say pumping significant quantities of water out of a river for irrigation, should have a meter as part of their equipment in the same way that water tankers are required to have permanent meters onboard for when they are filling from hydrants.

As part of the licence conditions the EA should be supplied will records of the type and output rates of all pumping/abstraction plant, meters should be required as permanent fixtures and, on larger fixed installations, automatic records of pump hours run should be kept. The recorded flows could be supplied to the EA on a daily, weekly or yearly basis as appropriate, and check readings could be made by the EA at intervals to ensure that the information being supplied was accurate. Bypassing or tampering with meters would be an offence as with any other utility meter.

More abstraction licences are becoming time-limited, and future application for new or extended licenses should be assessed on the appropriate usage, processes used, technology employed and implementation of water efficient systems. It should be possible to withdraw licences if the usage is considered to be wasteful or inappropriate (such as for heavily water-dependant crops in a water scarce area)

9.3.3 Policies related to FRM

The flood risk management strategy, especially components such as SUDS that operate at a development level, will be implemented through planning policy and documents, viz:

- An overview is given by the Greater Ashford Development Framework.
- Local Development Frameworks will direct the development of neighbourhood areas.
- Planning conditions will define allowable runoff from individual development plots.

It will be important for common planning conditions to be established at an early stage, which can be applied universally across Ashford. It will be equally as important to ensure continued maintenance of any SUDS infrastructure provided. There are a number of mechanisms proposed in PPG25. The most effective control is likely to be through a planning obligation under Section 106 of the TCPA 1990. This would allow the planning authority to ensure that:

- SUDS is properly designed and maintenance issues have been considered;
- Long-term maintenance is planned for; and
- Revenue can be raised to support long-term maintenance.

Three options for SUDS maintenance exist:

- SUDS maintained by Local Authority;
- SUDS vested in Local Authority; and
- SUDS maintained by a third party.

Further, it is hoped that these planning documents will include a rigorous application of PPG25. This guidance document is currently being revised. Much of Ashford's development will take place under the new guidance and its successors, that are expected to remove many of the planning loopholes as to floodplain development found in the original document.

All these activities will take place under the overview of the Environment Agency, as a statutory consultee for planning. The Agency's approach has recently changed from one of defending to managing floods. This means reducing both the likelihood and the impact of flooding when it occurs. Such an approach recognises the fact that flooding is a natural hazard and society must accept that flood risk cannot be eliminated: only reduced.

This policy also recognises that climate change may play an increasing role in the level and location of floods, and that a longer term view may be needed before planning and building flood defences. The Agency has stated that it will look at the changing use of land and object to new developments which are likely to be at high risk of flooding. The development of Ashford must take this policy into account.

9.3.4 Policies related to ecological water and biodiversity

Reference has been made to a series of 'design codes' or 'planning recommendations' in Section 4 and Section 6.8.3 that are intended to assist in the implementation of the preferred Integrated Water Management Strategy. These have been developed further following appraisal of the shortlisted strategies against the Study's Quality Objectives and Key Issues and now provide a basis for development of a series of 'policy statements' for incorporation in the LDF (Table 9.2).

Table 9.2 Indicative policy statements to meet Study aspirations

Target	Aim	Indicative policy statement
1.1 (b) & 2.6 (c)	Water resource balance and meet WFD objectives	Development should not oppose progressive targeted reductions in groundwater and surface water abstractions in the upper Stour GWMUs.
2.3 (a)	Groundwater protection	Development should comply with "Policy and Practice for the Protection of Groundwater" by respecting locations of GPZs and SPZs.
2.6 (a/c)	Increase RQOs and meet WFD objectives	Land management changes that control runoff to watercourses should be supported at catchment scale through agri-environmental schemes
3.1 (a)	Maintain integrity of floodplain	Design policy to follow ABC policy on development in the floodplain and PPG25.
4.1 (a)	No loss of BAP habitats	Impacts of development should be assessed on a case-by-case basis under standard EIA
		An appropriate assessment of the potential impact on the natural environment should be carried out for all developments. Impacts upon BAP priority habitats, or other nationally or locally important habitats, should be avoided wherever possible. Where such impacts cannot be avoided, then lost habitat should be replaced by creating equivalent habitat of twice the area lost
4.1 (b)	Conserve and enhance existing wildlife habitats	Development should seek to protect and enhance existing wildlife habitats, and enhance existing green spaces and corridors. The design and implementation of development should protect and enhance the water environment, and planning of green space should draw on local community input
4.1 (e)	Maintain / enhance aquatic features	Rivers and riverside habitat should be managed sympathetically in line with Green Corridor Action Plan.
4.1 (f)	Maintain / enhance wildlife corridors	All linear wildlife features should be conserved and enhanced as part of the design of the new urban environment. Any loss should be more than offset by creation of new features. Land use changes to be supported at catchment scale through agri-environmental schemes
4.2 (b)	Healthy fisheries	Flood defence measures should be sympathetic to fisheries issues and advice should be sought from Environment Agency fisheries department on all projects impacting upon the river channel.
4.3 (b/c)	Maintain / enhance	All development should protect and enhance populations of

Target	Aim	Indicative policy statement
	conservation features	rare, scarce, locally important or legally protected species. Where development is likely to impact upon such species, appropriate action must be taken to maintain and enhance the abundance and distribution of the species.

9.4 FURTHER INVESTIGATIONS

9.4.1 Immediate action

The Study has identified the need (some urgent) for a wide range of studies and investigations to be undertaken to provide information on which to base decisions related to the implementation of numerous aspects of the strategy. The list below is intended to cover the work that needs to be done in the next few years to provide a sound basis for taking decisions related to the strategy components.

- *Improvement performance of local STW* - There are no AMP4 Agency Environment Programme schemes for local STW that will benefit the Stour but it has been recognised that significant improvements water quality in the Stour could be achieved. Further work is recommended following the completion of the IWMS to gain support for improvement schemes as a way of partially offsetting the potentially increased Phosphorus load from Ashford. The feasibility of introduction of constructed reedbeds at each site, to polish treated effluent should be investigated.
- *Data gathering on abstractions* – The Environment Agency urgently needs to understand the extent to which Non-mains water abstractions are affecting the availability of surface and groundwater resources, particularly seasonally.
- *Condition of groundwater resources* – M
- Modelling of the chalk block is urgently required to confirm statements made within the CAMS regarding over-abstractions. This information is also required to inform and target areas during the process of reducing groundwater abstractions.
- *Low flow measurements* - Target 2.1 (a) looks to establish an environmentally acceptable low flow regime for the G Stour south of Bybrook and Target 2.1 (b) seeks no depletion in long-term average base flows in the upper Stour. Attempts have been made during the Study to identify changes in river base flows over time and establish whether a low flow alleviation programme is required. However, a lack of historic river flow data has meant that no conclusions could be drawn regarding either target. Further work is needed to establish baseline flow conditions for a number of purposes, including preparation of river basin management plan (RBMP). A study is proposed under AMP4 to identify historical base flows and establish an aspirational environmentally acceptable flow regime in the river Stour.
- *Low flow studies* - should include an assessment of how changes in river management through implementing in-stream modifications (including reed planting) may affect flows. The aim of this study would be to identify the most natural means by which to optimise on flows locally for general water quality and fisheries interests.
- *Investigation of the performance of the hydrobrakes* – for improvement of FRM modelling (additional flow gauge needed at Aldington, existing level gauges need investigation)
- *Temperature data* – a better understanding of the impact of wastewater effluent on river temperature is needed. Flow monitoring in the vicinity of the outfall from Bybrook WWTW will be needed, together with daily measurement of water temperature upstream and downstream of the outfall (and of the effluent itself) over a twelve month period.
- *EU Life project* – assuming a site for the pilot trial is confirmed within economic distance from Bybrook WWTW, then the (seasonal) demand for treated effluent needs to be identified
- *Innovative development* - Identification of potential flagship developments for green roofs/grey water recycling/water harvesting demonstrations
- *SUDS study* – more detailed outline designs should be drawn up for a number of pilot developments, to show in detail the application of SUDS within Ashford.
- *Sub-catchment detention ponds* - suitable areas need to be identified for contribution to runoff control from development areas, and mechanisms for their funding, construction and maintenance investigated
- *Planning conditions for drainage* - common planning conditions should be established that can be applied universally across Ashford.

- *Review of flood model/revised FEH* – the new release of the FEH data set and the new rainfall-runoff method may further improve the Upper Stour model. This needs to be done when the FEH upgrades are released.
- *Update S105 mapping* – when the above studies are completed, it may be necessary to upgrade the Section 105 flood mapping.
- *Hothfield & Aldington performance* – there remain uncertainties with the performance of the two flood detention reservoirs. The up and downstream gauging stations should be reviewed and rated to increase the quality of level and flow data.
- *Additional flow gauges* – a number of temporary gauges have been established on ungauged catchments such as Whitewater and Ruckinge Dyke. Data from these gauges should be used to re-assess the hydrology of these catchments.
- *Changes in agricultural land management* - has been identified as means by which runoff can be controlled and diffuse pollution addressed. Further studies will be required to
 - establish / agree priority areas for land use change – a rationale being to focus on sections of the Stour most adversely impacted by sedimentation and nutrient inputs;
 - develop a strategic approach;
 - agree targets for number of scheme implemented or the area of land affected by schemes; and
 - develop the proposed concept of a Land Use Change Group.
- *Investigations for wetlands* – Studies should be commissioned to confirm the role that effluent-fed wetlands may play in mitigating water quality impacts and reducing the temperature of effluent discharges.
- *Management and maintenance of wetland sites* - The responsibility for routine care and maintenance of wetland sites (reedbed and SUDS systems) is an important issue – either the developer has to agree to take responsibility or the management of the sites is adopted by the local water companies and sewerage undertakers. This needs to be discussed in the earliest next stages of master planning.
- *Amenity use of wetland systems fed by treated effluent* - The potential benefits of the reedbed strategy in terms of its amenity and recreational value need to be investigated in collaboration with the Environment Agency.

9.4.2 Monitoring requirements

There will be a need for significant extensions to the range of environmental monitoring presently undertaken by the Environment Agency within the Study Area and downstream, both to provide data to enable strategy components to be appropriately designed, and to monitor the performance and effectiveness of interventions as they are implemented. These would include the following:

- *Rainfall/Flow variations* – additional hydrometric stations needed within the catchment to improve understanding of river hydrology
- *Groundwater levels/pumping records* – needed to establish effects of changes in abstractions and to calibrate chalk block model
- *Air/water/effluent temperature variations* – Short-term to provide data for studies, long-term for monitoring performance of any measure to reduce impact on river water temperature
- *Other abstraction/discharge records* – needed for resource management
- *River quality* – needed to develop a database on ecological quality, to confirm/develop measures to meet requirements of the WFD
- *Riparian area surveys* - to establish baseline data to prioritise/focus land management schemes

9.5 FUNDING AND RESPONSIBILITY FOR IMPLEMENTATION OF THE PREFERRED STRATEGY

The Ofwat periodic review process looks at detailed programmes of work over the next five-year period and broad figures for the following five years. Within the process there are opportunities to review some aspects of longer term plans and strategies, for example infrastructure charges for up to 20 years. As it stands, Ofwat determinations are based on the audited data provided by each water company and detailed obligations and future proposed regulation. Ofwat does not, nor should have direct control of a number of the issues impacting a company's 5, 10 and 20-year strategy; specifically:

- Long term resource planning
- Infrastructure funding beyond the Economical Level of Leakage
- The conflict between designated Water Scarce Areas and local or national political planning "directives".
- The planning cycle itself

Long term resource planning

Water resource planning involves submissions to and discussions with the EA. Ofwat is not directly involved in producing the 20 to 25-year plans. Furthermore the plans address availability, licences and headroom only, not the more complex issues surrounding solutions to shortfalls. The EA can and does critically review a utility's resource plan and may comment (adversely) on solution options, but the EA does not approve a company's water resource plan. The company can therefore be criticised for a plan, but not supported in solutions. Clearly defined short-term solutions will be funded by Ofwat; longer term studies to develop solutions or promote a large long-term scheme may get partial funding for "more studies" in the five-year determination.

The EA should provide a positive and constructive lead at a national level in water resource planning. The EA will need to be impartial and be prepared to address contentious issues (some of which may then need legislation to implement) such as:

- compulsory metering (and how to fund it)
- prohibition of new development in water resource-scarce and constrained areas (override national and regional planning organisations where proposals conflict with environment or social expediencies)
- limiting or terminating agriculture, horticulture and industry in water-scarce and constrained areas to restore and safeguard the water balance between all legitimate users, not just the non-mains water users and the environment (where are humans, reducing energy and other natural resources consumption, agricultural over production covered in the EA's definition of "sustainability"?)

With the EA leading the long term planning process, clear long term direction and thereby funding requirement, the company will be funded by Ofwat. The customer will thereby be paying an economic price for a long term sustainable supply.

Infrastructure funding beyond the Economical Level of Leakage

Where a long term cost of water can be established that incorporates *all* relevant cost elements, including developing new resource, leakage can be managed within a comprehensive ELL calculation. Ofwat audits the figures as presented against an agreed methodology for calculating ELLs. Changes in the methodology could evolve through improved water resource planning processes and through due consideration being given to a wider-reaching and inclusive set of parameters that reflect the environment as a whole, and not just potable water-related ones.

The second strand of this argument is whether to fund underground asset improvements beyond the ELL and in so doing reduce leakage further. The question of who funds the additional costs will need to relate to who benefits from reduced abstraction. At present the domestic consumer is a soft target. In the longer term the benefit of additional leakage reduction will be derived by the non-domestic and non-Mains Water users. Therefore all users should contribute to the additional rehabilitation costs through increased tariffs. This could be independent of universal metering, but the inter-user arguments would be reduced where there was full metering coverage). The EA would need to lead this initiative, being the only organization that is involved with all water users.

The conflict between designated Water Scarce Areas and local or national political planning "directives"

Promoting large scale development in water-scarce and resource-stretched areas is unsustainable unless the plan is managed by a single organisation that can manage the diverse issues and fund realistic solutions. This is not Ofwat's role. A new development needs to be self-funding, but individual regulators are not appropriate scheme promoters because of their conflicting responsibilities and sometimes preconceived views and solutions. Prior to getting individual investors involved (who are out to make a profit), an independent and unbiased organisation needs to manage the process to ensure that all stakeholders are equally represented, and that a sustainable and fundable plan is produced. This service could be provided through a organisation (Inspectorate?) derived from the Public Enquiry Secretariat: to convene a team of experts with the diverse skills necessary for resolving the often conflicting issues; to review proposals; and to develop a sustainable plan (or reject the proposal!). Once the plan is produced, the developers would take on the project and fund all the facilities and utility extensions. The developers would however still need to comply with detailed planning requirements and regulations.

The planning cycle itself

There have been numerous discussions on appropriate duration for the Ofwat determination cycle. It is unquestionably more appropriate for water companies to be given longer term plan periods within which to operate, specifically for resource development and infrastructure planning that is related to long term development programmes. However an effective plan must be realistic and long-sighted with long term sustainable solutions both for the environment; the planned development; and for the utility providing the service. While the three stakeholders are "regulated" by different organisations with diverse agendas, it will be difficult if not impossible to achieve realistic agreement and hence long term investment planning.

The regulators, the EA, Ofwat, planning authorities and government are servants of the people and not the environment. These various organisations have a responsibility to manage and protect the public and the environment. However, it is the consumer that pays for the service, whatever is being provided: whether the income to support the service is derived through tariffs, licence fees or taxes. It is therefore important that politicians and regulators maintain a perspective that safeguards the aspirations and rights of the individuals and does not prejudice one to the benefit of others while clearly being unsustainable.

9.6 PROGRAMME FOR IMPLEMENTATION

9.6.1 Programme for FRM interventions

FRM interventions will generally be carried out at the start, or in parallel with development in each area. Expected timings are therefore:

- SUDS – design integral with development plot design (any sub-catchment detention area needs to be designed and in place in advance of the first development it serves).
- Central Town Centre (TC) development areas – design of compensation areas integral with development plot design – 2011.

- TC development areas TC2 and TC3 - compensated for by a new floodplain/wetlands area in the Discovery Park on Whitewater Dyke – 2016
- Remaining Canal District – 2016-2021 Effective compensation at Cheesemans Green or elsewhere will be required in advance if any development is to be permitted in the flood plain
- Climate Change interventions – as required when climate change parameters are confirmed.

9.6.2 Programme for Mains Water interventions

Water demand management

It may be argued that there is no defensible basis on which to set a firm programme for implementing demand management measures, though it is clear that the longer the delay in implementation, the more difficult it will be to reduce demands to target levels by the target date. Some discipline must therefore be introduced if the task is to be achieved without the need to resort to extreme actions as the target date approaches.

National initiatives (determining the level of intervention into personal water use, support to the application of differential tariffs, public awareness campaigns) need to be instigated as soon as possible.

The Kent Water Demand Group should set itself a deadline (if it has not already done so) to agree on a realistic programme and target for demand management, and in combination with a regional growth forecast, to develop a demand forecast. This should be achievable by the end of 2006. This will provide a sound basis for programming the bringing into operation additional resource capacity, and provide a basis on which SWS can forecast the growth and spatial distribution of wastewater flows.

A policy of metering all new properties is assumed. A realistic programme needs to be established for enabling the retrofitting of meters in existing housing stock, and undertaking the work itself. This is likely to be a protracted exercise, and may not be fully implemented until around 2020.

Water supply resources

Programmes have been approved for the transfer of water from Bewl into the Ashford WIS zone (2008), and the raising of Bewl reservoir to increase its PDO (by 2014). The regional resource strategy includes an outline programme for the development of a reservoir at Broad Oak by 2019.

The timing of the establishment of a 'compensation' source upstream of Wye will be driven by the timetable for meeting the requirements of the WFD on the one hand, and the availability of additional flows in the Stour (from increases in volumes of treated effluent created by Ashford's growth) on the other. The latter needs to be firmed up following:

- the agreement on water demand projections;
- considerations of the potential for phased introduction of compensation PDO (and corresponding partial reduction of groundwater abstractions); and
- consideration of the use of available headroom/flexible operation of the expanded resource base.

An appropriate target date for operation of the compensation works might be around 2014.

Wastewater infrastructure

The programme for implementing the preferred wastewater strategy is critically dictated by the growth of wastewater flows and the ability of SWS to maintain infrastructure capacity

(conveyance to, and treatment at Bybrook WWTW). The critical deadline can only be determined by SWS, from its current asset development programme and a detailed appreciation of Ashford's development programme.

Future reviews of the LDF may need to address pressures for development beyond 31,000 new homes. At such time, a second AIWMS should reassess the assimilative capacity of the Stour (and other catchments) to accept further effluent flows. The need to reserve land for a possible second (southern) WWTW, in the general locations of the sites considered for WW4/WW7, should be addressed at this time.

9.6.3 Programme for ecological water interventions

Physical interventions

The most significant physical intervention proposed for the enhancement of Ecological Water and biodiversity is the development of effluent-fed wetlands in close association with each WWTW in the Study Area. A feasibility study will be required, which should be initiated in the near future, to identify potential sites and establish outline proposals and costs for wetlands downstream of each existing WWTW.

The source of funding should be identified and confirmed, and the detailed designs and budgets prepared for approval. Given early agreement by all parties concerned, a wetland site fed by effluent from Bybrook WWTW could be operational by 2010. Smaller wetlands associated with the local WWTW may be programmed to suit local needs.

Other physical interventions would be implemented with associated development, though feasibility studies will be needed to identify appropriate application areas. These studies should be initiated in 2006, to ensure that opportunities are identified sufficiently early to influence detailed planning activities.

Non-physical interventions

There are numerous information gaps relating to Ecological Water that warrant further investigation and studies, as itemised in Section 9.4. These should be put in hand before the end of 2006 in order to inform future actions. Studies into seasonal behaviours should be given priority, as monitoring over a twelve month period may be necessary.

Suggested policy statements, aimed to control the impact of development on the (water) environment, need to be firmed up and incorporated in the LDF.

9.7 CASH FLOW FORECAST

9.7.1 Scope of cost estimation

Broad brush cost estimates have been developed for the significant components of the strategy, primarily in order to compare differences between Mains Water system-based strategies, as part of the characteristics appraisal process. A number of simplifying assumptions were made (see Section 7.7.5). Indicative costs for key physical interventions for FRM and Ecological Water management systems have also been assessed.

There are however, a number of elements of the preferred strategy where no attempt has been made to estimate costs, either because the activity/intervention is common to all candidate strategy elements, or where the elements are too diverse in their application to cost. Thus costs associated with the following elements are not presented:

- All planning recommendations, and the costs (to developers) of compliance
- SUDS (local and sub-catchment) and compensation areas provided by developers
- Central government public awareness campaigns
- Agricultural Land Management Schemes
- Water demand management measures (such as consumer metering, water efficiency devices, property-level water reuse measures)
- Local sewerage, including small pumping stations
- O&M of existing works at Bybrook WWTW
- Upgrading of the existing works at Bybrook to meet enhanced discharge standards identified by SIMCAT modelling in this study
- Currently committed extensions to sewerage network
- Water distribution network
- Further studies and investigations

9.7.2 Optimism Bias

Costs have been derived from a number of sources. Most are of recent origin and no allowance for inflation has been applied. Costs presented earlier in this report, whether externally generated or derived by the consultant are assumed or have been developed on a 'best estimate' basis. These are therefore raw estimates, with no contingency allowance included.

Recognising the fact that at this level of knowledge, assumptions have had to be made on a wide range of matters that have a cost implication, it is wise to include a cost risk element in any forecast of future expenditure. Defra, in determining its approval of strategies, such as those promoted by the Environment Agency, requires an 'Optimism Bias' to be applied. The recommended default value (to be applied in the absence of any known factors that would suggest otherwise) of this optimism bias is 60%. Estimates of costs presented below are therefore inclusive of a 60% optimism bias.

9.7.3 Cash Flow Forecast

Estimated capital expenditure on the principal physical elements of the preferred strategy is presented in Table 9.3. These costs, which are inclusive of a 60% optimism bias, have been temporally distributed among quinquennial periods, to reflect the anticipated ability to phase the implementation of the associated works.

Table 9.3 Forecast of capital expenditure on principal elements of the preferred strategy (£M) including Optimism Bias

Element	Total cost	2006-2011	2011-2016	2016-2021	2021-2026	2026-2031
Water supply - resources						
Bewl Transfer	28.8	28.8				
Bewl raising (Ashford's share)	6.2		6.2			
'Broad Oak' (Ashford's 'share')	21.8			21.8		
5 Ml/d works upstream of Wye	19.2		19.2			
Wastewater Management						
Expansions at Bybrook WWTW	16.0		10.7	5.3		
Conveyance system expansions	18.1		17.2		0.9	
Flood risk Management						
Bank raising and other flood defences	16.0		3.2	3.2	6.4	3.2
Ecological Water Management						
Construction of reedbeds at WWTW	4.0	1.4	2.6			
TOTAL	130.1	30.2	59.1	30.3	7.3	3.2