

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

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4 IDENTIFICATION OF INTERVENTION OPTIONS

4.1 METHOD OF APPROACH

The analysis of the Key Issues that threaten the sustainability of Ashford's growth provides strong pointers as to the scope of interventions that will be needed to address the current and anticipated future problems. Clearly, physical water-related infrastructure development will be needed to keep pace with development, but a number of the anticipated impacts of development (and of the infrastructure itself) on the water environment will need mitigation for which non-physical measures can be expected to play a significant role.

No one, single, intervention can fully address all the identified constraints: rather, a range of interventions will need to be implemented in order to create a 'water management strategy' that does so. Indeed, a single intervention, may itself comprise a number of components, not all of which necessarily need to be implemented in order to address a Key Issue, if another candidate intervention can be relied upon to do so if implemented.

A suggested definition for an intervention option, which may be used as a test in its identification, is given below:

An intervention option is an action, phased or applied progressively, that together with other interventions if necessary, fully mitigates at least one 'Key Issue' for water management in the provision of 31,000 new homes for Ashford.

In order to manage the complex task of assessment of intervention options, they were initially identified as aiming to address any one of the four principal areas of concern:

- Water supply resources
- Wastewater conveyance and treatment
- Flood risk management
- Biodiversity and the water environment

Initial consideration of potential interventions was targeted at solving the specific issues related to individual water management systems, and identified a range of options which:

- focussed on key areas of concern;
- addressed one or more Key Issue;
- were multi-faceted;
- could be staged in implementation; and
- ideally could address other areas of concern (e.g. biodiversity issues).

Cost was not a consideration at this stage.

In order to draw on the knowledge and experience of key stakeholders, the initial ideas for interventions were presented at so-called 'Blue Sky' workshops, designed to elicit reactions and further ideas. The wide range of suggestions that emanated from this exercise was then reviewed and for each water management system a set of potential intervention options were identified.

Each option was then appraised as to its likely ability to address each of a set of environmental quality objectives, developed and agreed at the commencement of Phase 2 of the Study. This led to the identification of a wide range of interventions, focussed on each of the water management systems, from which system-based 'strategies' could be formulated.

4.2 BLUE SKY WORKSHOPS

Two workshops were held in March 2004 to solicit views and ideas from stakeholders on how to address the Key Issues related to Ashford's growth. 16 people attended the first workshop on 8 March, and 23 attended the second on 10 March.

Each workshop followed a common format: following a brief presentation of the Key Issues identified in the Phase 1 Report, the participants were divided into groups, each to focus initially on 'ideas brainstorming' - generating a range of possible interventions - that might address one of the four main subject heading listed above.

Having developed long lists of possible options, the groups were then asked to classify them into four groups, according to cost and acceptability, as indicated in Figure 4.1

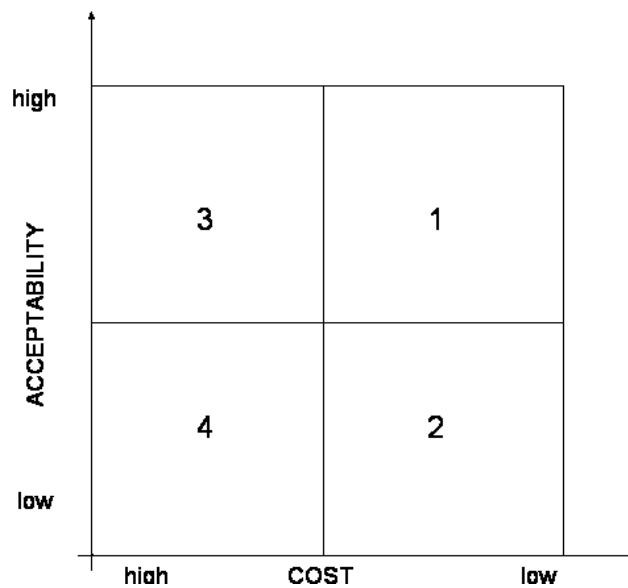


Figure 4.1: Acceptability/Cost Matrix

Of necessity, the assignment to one of the four classifications had to be subjectively agreed: levels of cost and acceptability being what the group as a whole considered to be applicable.

A summary and analysis of the outcomes of the workshops may be found in Appendix 4.1.

4.3 WATER SUPPLY AND RESOURCES

4.3.1 Introduction

The range of solutions to address the shortfall can be categorised under the following three subject areas:

- Availability/development of existing and new water resources
- Technical water demand management
- Regulatory/institutional water demand management

The issues associated with meeting the Ashford area demand cannot be considered in isolation of the wider Kent and South East Regional Water Supply Strategy for meeting demand in the future. It is accepted that a regional solution is needed and a long-term strategy is the only way of optimising resources. Currently there is no single solution which attracts sufficient support to satisfy the supply/demand deficit in the longer term and a combination of options will need to be

considered to meet the immediate and forecast growth in demand. The critical factor with developing any new water resource is the timing. No option can be delivered instantly and many of those being considered need lengthy lead in times for feasibility studies, detailed design and planning approvals. Tied to the timing is the need for a reliable demand forecast, which is itself a function of the projected population growth and per capita demand. The strategy, virtually by definition, has to be continually evolving to absorb any changes in regulation, proposed developments and collective lifestyle. Therefore flexibility and enhanced integration has to be a major consideration in any strategy adopted.

4.3.2 Options to enhance supply

Component interventions that could supplement the existing water resources are summarized in Table 4.1.

Table 4.1: Interventions to increase water resources

Component		Opportunities	Constraints
Wa	Optimise existing resources	<ul style="list-style-type: none"> • Low cost immediate resource increase • Local solution 	<ul style="list-style-type: none"> • Availability of local resources • Sustainable?
Wb	Raise Bewl	<ul style="list-style-type: none"> • Increased resource • Regional solution • Solution near deficit 	<ul style="list-style-type: none"> • Resource shared by other users • Limited additional resource • Time to promote and develop • Bewl outside Ashford area • Transfer pipeline required
Wc	Construct Broad Oak	<ul style="list-style-type: none"> • Increased resource • Regional solution • Resource local to demand • Solution local to deficit 	<ul style="list-style-type: none"> • Time to promote and develop • Broad Oak outside Ashford area • Transfer pipeline required
Wd	Desalination plant on coast (or coal mines)	<ul style="list-style-type: none"> • Unlimited supply • Tariff could reflect cost of production • Solution near deficit 	<ul style="list-style-type: none"> • Transfer pipeline required • High energy and environmental costs • No reuse element
We	Treatment of effluent derived from Ashford to potable water standards	<ul style="list-style-type: none"> • Efficient reuse locally available • Pay the true cost of production and delivery • Low water transfer costs • Solution local to deficit 	<ul style="list-style-type: none"> • Resource limited to available treated sewage effluent • Need for top up water • Loss of discharges to watercourses • High energy and environmental costs • Public perception issues
Wf	Use treated effluent to recharge groundwater	<ul style="list-style-type: none"> • Efficient reuse/recharge • Increased resource in area 	<ul style="list-style-type: none"> • Environmental/Public Health impact on groundwater • Loss of discharges to watercourses (compensated by higher spring flows)
Wg	Water transfers from outside the immediate area	<ul style="list-style-type: none"> • Increased resource • Low impact on local water resources • Transfers from within UK 	<ul style="list-style-type: none"> • Environmental impact • Regional resource constraints • Cost of potable water transfer pipeline, pumps and O & M
Wh	International imports	<ul style="list-style-type: none"> • Pipeline transfer from France • Bag or tanker transfer from Scotland or Norway 	<ul style="list-style-type: none"> • Acceptable? • Technically feasible but high set up and operating costs

4.3.3 Technical water demand management

Component technical interventions that could control or reduce demand for water are summarised in Table 4.2.

Table 4.2: Technical interventions to manage demand

Component	Opportunities	Constraints
Leakage control	<ul style="list-style-type: none"> Proactive control will minimize losses with regard to ELL Short term local solution Leakage would be source of "groundwater recharge" 	<ul style="list-style-type: none"> ELLS reflect WC business ELL may not be optimum. Once at ELL, marginal impact on resources One-off measure
Metering and Tariffs	<ul style="list-style-type: none"> Reduced demand, short and long term! Local solution Consumers responsible for their impact on environment Charge customers real cost of water 	<ul style="list-style-type: none"> Reduced demand, short and long term? Need both, to be effective Real costs versus tariffs Ability and willingness to pay versus imposed Political wrt large, low-income families, debt and disconnections Cost of meter installation and long-term maintenance
Water saving technologies	<ul style="list-style-type: none"> Low water use appliances Point of use treatment Increased resource Resource local to demand Solution local to deficiency 	<ul style="list-style-type: none"> Policing installation and retrofit Does not stop excessive use Time to promote and develop Unlikely to achieve 100% acceptance Increased risk of water quality non-compliance and to public health
Water and wastewater minimisation	<ul style="list-style-type: none"> Reduces demand for water 	<ul style="list-style-type: none"> Unlikely to achieve 100% acceptance
Efficient agricultural and horticultural use	<ul style="list-style-type: none"> Charges to reflect use and environmental impact High technology to reduce demand (hydroponics?) 	<ul style="list-style-type: none"> Policing Limited opportunity to make significant savings Less dilute run-off?
Recycling and reuse	<ul style="list-style-type: none"> Grey water reuse Treatment of effluent for reuse (see Table 4.1) Rainwater storage 	<ul style="list-style-type: none"> Reduces sewer and river flows Increased risk of water quality non-compliance and to public health

4.3.4 Regulatory/institutional water demand management

Component regulatory and institutional demand management interventions that might be considered are summarised in Table 4.3.

The technical water demand management interventions listed in Table 4.2 may each be regarded as a component measure to minimise future demand for the supply of water through physical means. These components may be implemented to a greater or lesser degree, singly or as a package of measures, throughout part or all of Ashford District, with a corresponding level of success in minimising demand.

Table 4.3: Regulatory/institutional interventions to manage demand

Component	Opportunities	Constraints
Maintain existing regulatory Levels of Service (LoS)	<ul style="list-style-type: none"> • Defined national common “design” criteria • Minimum acceptable option 	
Restrict supply and reduce LoS	<ul style="list-style-type: none"> • Impose supply restrictions 	<ul style="list-style-type: none"> • Will not actually reduce demand • Will create water quality problems and health issues • Represents ‘Do Nothing’ option • Political will
Education and awareness	<ul style="list-style-type: none"> • Public and regulators jointly responsible for environment • Ability to understand local issues • Ability to address high non-essential water uses 	<ul style="list-style-type: none"> • Ongoing activity • Need for clarity and honesty with public. • Imposed?
Abstraction incentive charging	<ul style="list-style-type: none"> • Reallocate existing resources • Central control of resources (e.g. the Agency) 	<ul style="list-style-type: none"> • Fairness? • Compensation for loss of licence
Greater flexibility / longer planning horizon allowed for water company business plans	<ul style="list-style-type: none"> • Allow for longer term and more efficient planning • More flexible charging of developers for connection to existing infrastructure 	<ul style="list-style-type: none"> • Uncertainty of size and timing of future developments
Agree target level of demand management and population growth scenario	<ul style="list-style-type: none"> • Allows per capita demand to be forecast with confidence • Provides sound basis for projecting overall water demand 	<ul style="list-style-type: none"> • Requires agreement of many parties on demand management strategy, e.g. water companies, Ofwat, EA, KCC, planning authorities in the region (not just ABC)

The two regulatory/institutional water demand management measures listed in Table 4.3, related to Level of Service, may be regarded as essentially alternative scenarios. Restriction of supply may be viewed as an admission of failure to provide an adequate, sustainable source of water, and is unlikely to be acceptable to any party. It is therefore not considered further. ‘Maintaining existing regulatory Levels of Service’ is therefore not an ‘Option’ but an assumed requirement.

Of the remaining measures listed in Table 4.3, ‘Education and Awareness’ may be considered as an integral part of making the technical interventions listed in Table 4.2 acceptable, or better, *desirable* to consumers. It should therefore be considered as one of the package of water demand management measures.

‘Abstraction incentive charging’ could include the central development and management of resources by an independent body, such as the Environment Agency, which could charge the water supply companies and other abstractors a realistic cost for the water to include environmental costs. This would make consumers in water-scarce areas pay the true cost of the water and, with differential charges, make consumers more conscious of their use of water. It could also remove the financial constraint on long-term planning which the water supply companies have to work within by transferring the responsibility for developing water resources to the independent body. This body would be responsible for ensuring that adequate resources were available when required.

Reassessment of water company funding arrangements, would allow longer term decisions on investment to be taken, but would require central government approval. The issue of alternative funding mechanisms was the subject of a separate study (by others) which it is understood has not been concluded.

The last measure, agreement on demand growth, would increase the level of confidence in planning decisions in the water sector.

Water demand management may therefore be effected by the following additional multi-faceted option:

Intervention	Component
Wi	<ul style="list-style-type: none"> • Various technical demand management measures • Education and awareness • Abstraction incentive charging • Agreed water demand projections

Referring to the Key Issues related to water supply, Table 4.4 indicates where each is addressed, partially or fully, by at least one intervention option identified above.

Table 4.4: Addressing Key Issues for water supply

Option	Wa	Wb	Wc	Wd	We	Wg	Wh	Wi
W1	✓	✓	✓	✓	✓	✓	✓	
W2								✓
W3								✓
W4								✓
W5								✓*

* Partially. Further options were being considered under separate studies by others.

4.4 WASTEWATER MANAGEMENT OPTIONS

4.4.1 Generic options

There will be four principal elements to any wastewater management system to serve the new development in Ashford, viz.

- the generation of flows, encompassing domestic, trade and stormwater flows;
- transportation of the flows from the point of generation to the preferred location for treatment;
- treatment of the wastewater flows to a standard suitable for discharge; and
- discharge of the treated wastewater at a suitable location.

In addition, there are several types of action which can be implemented to mitigate the potentially undesirable effects of wastewater discharges, for example, increasing the river base flows to increase the available dilution at times of low river flow.

There are different options available for each of these principal elements, the major ones of which are shown in Figure 4.2 and are briefly discussed in the following sections.

4.4.2 Flow Generation

There are numerous techniques for influencing and managing the generation of wastewater flows. Wastewater flows themselves must be categorised for this purpose into domestic and industrial

wastewaters and stormwater runoff. Flows in each category will reflect to a greater or lesser extent its level of water consumption. Thus demand reduction measures (Wi) will have a direct bearing on the wastewater flows. It should, however, be noted that equal reductions in wastewater load are not achieved. Wastewater flows will reflect any recycling of consumed water (e.g. grey water reuse, industrial process closed loop/reuse

Sustainable Urban Drainage Systems (SUDS) are the obvious, and now generally the preferred, option for managing stormwater flows. Various SUDS techniques cover the elements of both stormwater flow generation and transportation/conveyance and are discussed later in the report.

4.4.3 Flow Transport/Conveyance

Assuming that a water-borne wastewater system is adopted, some form of pipe system will be required to transport flows from where they are generated to where they may be treated and/or discharged.

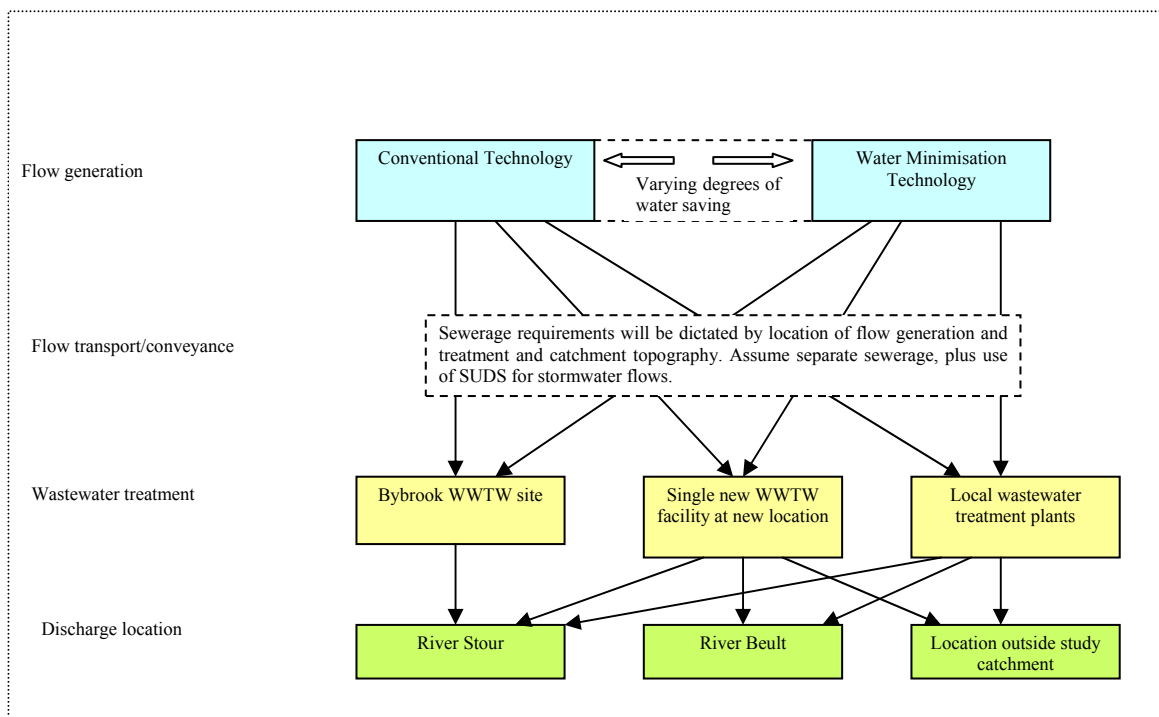


Figure 4.2: Ashford Integrated Water Study – Generic Wastewater Options

It can be assumed that the Ashford development will use a combination of conventional piped sewers for the conveyance of domestic and industrial wastewaters, with the maximum feasible use of SUDS to manage stormwater runoff from building roofs and paved areas. The size, length and route of pipes to carry both domestic/industrial wastewaters and, where necessary, stormwater between SUDS facilities will be dictated by the options selected for the other elements of flow generation and treatment. Where possible, flow will be transported by gravity, with pumping as required. More novel conveyance techniques, such as vacuum sewerage, may be considered if circumstances dictate that they may be applicable.

The carrying capacity of the existing Ashford sewer system is almost completely utilised by existing flows. It is almost certainly possible to increase the capacity of the system to some extent by limited remedial works and improved control technology (Real Time Control). Some capacity may also be 'freed up' by removal of existing stormwater inflows. However, none of these measures is likely to provide sufficient capacity to accommodate all the new flows, and construction of substantial new conveyance capacity is certain to be required.

4.4.4 Treatment location options

A major factor in respect of treating wastewater flows is the location of the treatment works. There are numerous considerations to be taken into account in this decision including:

- availability of suitable land;
- proximity to sensitive housing;
- convenience for conveyance of incoming flows – distance and elevation; and
- availability of suitable receiving water for discharge of treated effluent.

A further factor is the strategic decision either to have a single treatment plant to accommodate all flows from the new development at the one location, or to have more dispersed treatment. The former option could also include some, or all, of the present flows from Ashford which are currently treated at Bybrook WWTW. The site could be at the current Bybrook site, or elsewhere. Alternatively, particularly since the new development will be spread over a substantial area with green “buffer” areas between zones of development, individual zones could be provided with their own individual treatment facilities. The single site option is generally preferable to the wastewater service provider and, probably, to the environmental regulator for reasons of ease of operation, management, monitoring and control.

The ‘dispersed’ option can be applied at several levels. Treatment facilities could be provided for each individual development zone, or clusters of zones. Carried to the extreme, it is technically feasible for every property to have an individual treatment facility. In general terms, it is probably the case that the more ‘dispersed’ the treatment the more scope there is for the use of novel ‘soft’ or ‘green’ technology which minimises the impact on the environment (in terms of the WWTW structure, as opposed to the effluent).

For the larger treatment facilities, the appropriate treatment process will be a function of the nature of the incoming flows, (e.g. ‘normal’ dilute sewage, or more concentrated sewage as a result of water minimisation) and the discharge consent requirements. The terms of the discharge consent will, in turn, be dictated by the assimilative capacity of the receiving water. At this stage it is assumed that a single large plant will employ relatively conventional treatment technology, probably based on the activated sludge process, combined with one or more forms of tertiary treatment to meet the specific demands of the consent (e.g. nutrient removal).

For the purpose of considering potential options at this stage, three alternatives are identified in Figure 4.2. The first assumes that all treatment for both existing and future flows from Ashford continues to be concentrated at the Bybrook site. Within that basic option, there are the alternatives of extending the existing plant to accommodate the additional flows, building a second plant to treat the additional flows, or abandoning the existing plant and building a new facility to treat both existing and proposed flows.

The second option assumes that a new plant is to be constructed at a location other than Bybrook. Clearly, a wide variety of potential sites exist within, and beyond the boundaries of the study area. It is technically feasible to treat wastewater flows almost anywhere. Selection is influenced by planning issues, potential convenience and costs of transporting flows to the site, and the chosen discharge location. As before, the options exist of treating only the new flows at the selected location, whilst retaining Bybrook WWTW for the existing flows. Alternatively, Bybrook WWTW could be closed and all flows taken to the new site for treatment.

The third option is for dispersed treatment with each individual new development zone, or clusters of zones, having their own wastewater treatment facility. In these circumstances it is assumed that the treatment plant will be located adjacent to the zone(s) served, since there would appear to be little point in having a policy of dispersed treatment if the treatment facilities are not close to the point of flow generation. The precise location of the plants will be dictated by the layout of the

development areas and the local topography. It may be that such facilities could be located in, or even be part of, the 'green spaces' within or adjacent development areas.

4.4.5 Effluent disposal options

Treated wastewater from Ashford is currently discharged from Bybrook WWTW into the Stour immediately downstream of the urban area. This is the obvious location for such discharges because the majority of the sewer system operates under gravity and it allows the maximum flow to be delivered to the treatment facility with the minimum of pumping and, hence, energy consumption. It also ensures that effluent enters the river downstream of the conurbation so that any detrimental effects are not experienced through the urban area..

There are several factors to consider in selecting the location(s) for discharge of wastewaters from the new development, *viz*:

- The additional volume of flow provided by the treated effluent may be an asset during times of low river flow, provided it is of appropriate quality.
- Conversely, the volume of wastewater (both effluent and stormwater runoff) will be a liability during time of high river flow, potentially exacerbating river flooding problems.
- Wastewater may be an asset in terms of being a resource for Non-mains water supply, either direct to consumer (after suitable treatment) or abstraction from rivers further downstream.
- The polluting load associated with wastewaters imposes stress on the receiving environment. None of the watercourses in the Ashford area has a large assimilative capacity and, hence, all will require high levels of treatment of the effluent. However, these levels will vary depending on the specific needs of the receiving water, which will have significant cost implications.

There are a great many options potentially available. Ashford is located in the upper reaches of the Stour catchment and parts of the development may extend into the catchment area of the River Beult. In addition, there is the Royal Military Canal to the south and beyond that, at a distance of approximately 15kms. from Ashford town centre, is the sea. All are potential discharge points for wastewater from the new development.

In Figure 4.2, the three most likely options in the light of the above considerations are identified. The first, and most obvious, option is to discharge into the River Stour catchment. Discharges could be directly into the river, or into river gravels. The discharge could be at a single location, or series of locations, in the upper reaches of the Stour or any of its tributaries. Alternatively it could be at Bybrook or some point further downstream. The issues specific to the Stour catchment are as follows:

- The river is not very large at any point in the Study Area. The addition of substantial wastewater flows will be of significant benefit to the river during times of low flow, but will tend to exacerbate flooding problems during times of high river flow.
- The Stour has limited assimilative capacity. While it currently achieves its quality objective over much of the length throughout the study area, it fails its targets in some upstream areas and downstream of Bybrook WWTW and is under stress elsewhere. Hence, any additional wastewaters discharged to the Stour will have to be treated to very high standards.
- The Stour is an important chalk stream fishery. As such, it is particularly sensitive to the relatively high temperatures of normal treated sewage effluent.
- Unless or until the Broad Oak water supply scheme, or other river abstraction scheme is implemented, wastewaters discharged to the Stour will flow via Canterbury to the sea and be lost to the Study Area.

The second option is to discharge wastewaters to the Beult catchment. Some of the development areas may naturally drain to the Beult. Some or all of the others could be made to do so by means of pumping. The pros and cons of discharge to the Beult catchment are identified below:

- Like the Stour, the Beult is a small river in the upper reaches adjacent to the proposed development area and suffers low flow problems during dry periods. Hence, good quality treated wastewater flows will be of benefit to the river during these periods. Conversely, any benefit to the low flows in the Beult would be matched by a similar loss of potential benefit to the Stour.
- The River Beult is a SSSI downstream of Smarden. As such, the quantity and quality of any wastewater discharges to the Beult will have to be carefully controlled so as not to damage the ecology of the SSSI. This would be reflected in any discharge consent.
- Additional flows in the Beult will tend to supplement abstractions for potable water downstream in the Medway catchment at Yalding.

The third option is to export wastewater flows to a location, or locations, outside of the study area. This broad option covers the alternatives of discharge to the Royal Military Canal, to sea or to any other unspecified receiving water. The Key Issue is that both the detriment of the potential environmental impact and the benefit of additional flow in receiving waters are lost to the Study Area. A further consideration is that the selected receiving water will undoubtedly have discharge requirements of its own which may or may not be very demanding (for example, the Royal Military Canal is eutrophic and would require very stringent discharge consent limits). Furthermore, any option for discharge outside of the Study Area will, by definition, require either raw wastewaters or treated effluent to be transported substantial distances with associated high capital and energy costs.

4.4.6 Intervention options for wastewater management

From the foregoing discussions, and by reference to Figure 4.2, seven distinctive generic options may be identified:

- | | |
|----|---|
| Sa | Extending the existing treatment plant to accommodate all flows |
| Sb | Build a new plant to handle, predominantly, only the new flows, leaving the existing plant to treat flows from the existing urban area |
| Sc | Build a completely new treatment plant to handle all flows from both existing and new development areas of Ashford. Abandon the old plant |
| Sd | Construct a new WWTW to handle predominantly all flows from new development areas. Retain Bybrook WWTW to treat existing flows from the current Ashford urban area |
| Se | Accommodate all flows at a new treatment works. Abandon the Bybrook site (which may have potential for brown-field redevelopment) |
| Sf | Expand the Bybrook site to accommodate all flows from both existing and proposed development areas. Discharge of treated effluent could be transferred to another location on the River Stour if this was considered advantageous |
| Sg | The generation of wastewater flows and the management of stormwater runoff are as Options Sd - Sf. Treatment is provided at several facilities close to development areas using 'bio-engineering' treatment technology wherever practical. Effluent discharge is adjacent to treatment plants and, hence, is distributed within and outside of the Stour catchment. Wastewater flows from the Ashford conurbation, and any redevelopment within it, are assumed to continue to be treated at Bybrook WWTW |

Referring to the Key Issues related to wastewater management, Table 4.5 indicates where each is addressed, partially or fully, by at least one intervention option identified above.

Table 4.5: Addressing Key Issues for wastewater management

Option \ Issue	Sa	Sb	Sc	Sd	Se	Sf	Sg
S1		✓	✓	✓	✓		✓
S2	✓	✓	✓	✓	✓	✓	✓
S3	✓*	✓*	✓*	✓*	✓*	✓*	✓*
S4**							

* With level of treatment appropriate for the receiving waters

** Options to address this Key Issue were being considered by others under a separate study.

4.5 FLOOD RISK MANAGEMENT OPTIONS

4.5.1 Flood mitigation measures

Measures to mitigate the risk of flooding may be considered as falling into three categories:

- *Maintenance and management measures.* These are generally non-structural measures, such as maintenance dredging, and operational changes. They may, however, include low-cost structural measures that can be implemented by, say, a term contractor. They can be implemented in the short term.
- *Reactive measures.* These are generally non-structural measures that can be implemented in the short- to mid-term. They may include legislative and institutional changes, flood warning, flood proofing and the like. They generally mitigate rather than eliminate a problem.
- *Proactive measures.* These are long-term structural measures, such as channel improvements that will take a number of years to implement, due to consultation, financing, design, land acquisition, tender processes and construction.

The use of such categories encourages the incremental implementation of options, thereby providing continuous improvement in flood risk mitigation towards a goal. A catchment FRM plan is likely to contain measures from all three categories, unless of course the problems can be solved by a single short-term option. Table 4.6 sets out a range of possible mitigation measures, including, for reference, “doing nothing”. It can be seen that many of the “do something” measures, in particular those involving management and maintenance, are already actively promoted by the Environment Agency.

Table 4.6: Flood Mitigation Measures

<p><i>“Do nothing”</i></p> <ul style="list-style-type: none"> • Do nothing option • Reduce service levels 	<p><i>Reactive</i></p> <ul style="list-style-type: none"> • Flood warning • Flood proofing • Evacuation • Emergency drainage measures
<p><i>Maintenance and management</i></p> <ul style="list-style-type: none"> • Preserve flood plain • Land use designation • Development controls • River maintenance • Catchment runoff modification • Public information and education • Flood relief 	<p><i>Proactive</i></p> <ul style="list-style-type: none"> • River training • Embankments and pumping • Reprovision of floodplain • Improved maintenance • Diversion between catchments • <i>Storage</i>

4.5.2 Selection of potential intervention options

This section briefly considers each measure listed in Table 4.6, eliminates those not appropriate for Ashford, and sets out a range of combinations of measures that may be considered as generic intervention options, for further consideration.

The '*Do nothing*' option forms a base case for flood risk management studies. Similarly, the 'Do minimum' (maintain current defences) option is a base case for modelling, that would result in a '*reduction of service levels*'.

A number of measures are best practice but are currently undertaken to mitigate frequent flooding and to enable people to live with floods. However, they cannot manage extreme floods. These include '*River maintenance*', '*Public information and education*', '*Flood relief (compensation)*', '*Flood warning*', '*Flood proofing*', '*Evacuation*', '*Emergency drainage measures*' and '*Improved maintenance*'. Most are currently undertaken by the Environment Agency and will continue to form a part of the overall flood risk management in the Stour catchment.

'*Land use designation*' and '*Development controls*' form the spatial planning and statutory backgrounds to Ashford's expansion. As such they may be integrated into, say, preservation or expansion of the floodplain, and are therefore critical to the management of flood risk.

The '*Embankments and pumping*' intervention implies provision of levees around flood-prone areas. Such measures are to be avoided whenever possible since embankment failure, overtopping of an embankment by a flood greater than design flood, or failure of the flood pumps, may create an extremely hazardous situation for the local population. Levees may be required locally as a minor contribution to an overall scheme, but should not be considered as an option for overall flood risk management within Ashford.

'*Catchment runoff modification*' is an attractive measure in theory, and land use management of the catchments upstream of Ashford has been promoted throughout the Study as an option for flood risk management. There has been wide-ranging research work indicating that there is some potential for runoff control through measures such as changes from crops to set-aside, directional ploughing on slopes, changes to cropping patterns and afforestation. However, no work has as yet presented a numerical approach robust enough for engineering design. It has been concluded that there is potential in land-use management, but further research is recommended.

In summary, it seems that land use management:

- probably shows good returns for local areas and low return period events; but
- is not proven on a catchment-wide scale and for extreme, design, events.

The consultant has considerable sympathy for the multiple benefits that undoubtedly derive from improved land use management, and it may well become a future option for FRM as on-going research work delivers design information. However, at this juncture it is not prudent to rely on such an un-proven technique for FRM of a major urban area.

The measure will not be considered in options for flood risk management within Ashford. An overview of research on catchment runoff modification, further justifying the above decision, is included in Appendix 4.2.

The remaining interventions fall into two types: storage-based and conveyance (channel improvement)-based. Storage-based measures include '*flood storage*', '*Preservation of flood plain*' and '*Re-provision of floodplain*'. In all these, floodwater will be held in some kind of storage area, be it the floodplain or a flood detention reservoir. Measures that might be considered further include:

- Enlargement of the current Stour floodplain.
- Provision of new floodplain areas to allow development of the floodplain within Ashford.
- New or enlarged flood detention storage upstream of Ashford.
- New flood detention lakes within Ashford (but not in the floodplain) as part of the overall planning concept.

Conveyance measures require engineered (although environmentally acceptable) interventions, changing existing channels, and include '*River training*' and '*Diversion between catchments*'.

Wholesale river training, and the increase of river channel size through Ashford to pass the floods downstream is unlikely to be acceptable in planning and environmental terms, and more fundamentally, may simply pass Ashford's flooding downstream to Canterbury. Nevertheless, elements of river training are likely to be required in any overall flood risk management strategy for Ashford. Its introduction is simple to analyse and may be considered in flood modelling to assess the negative impact of such an approach.

Diversion between catchments would require diversion of flood peaks south-east into the Royal Military Canal or south-west into the BUILT. This can be an attractive option if the adjacent catchments have different flood mechanisms. However, there are problems with such an approach from a number of standpoints:

- From a conceptual point of it may be preferable for each river basin to manage its own flood risk, and not pass flow from one catchment to another.
- From an environmental point of view, there may be objections to the transfer of water between catchments of differing geology and hence water chemistry.
- From a hydrological and practical point of view, diversion of flow into the BUILT may require study of the Medway catchment to establish flooding impacts further downstream.

Nevertheless, flow diversion remains an attractive intervention measure if it is viable.

4.5.3 Summary of options for appraisal

In summary, the following generic intervention options are therefore proposed for consideration:

- Fa 'Do nothing'
- Fb 'Do minimum'

Planning intervention

- Fc Land use designation and development control

Conveyance interventions:

- Fd Channel improvements to the existing rivers
- Fe Diversion of flood flows to adjacent catchments

Storage interventions

- Ff Enlargement or re-provision of the current Stour floodplain
- Fg New or enlarged flood detention storage upstream of Ashford
- Fh New flood detention lakes within Ashford

Combinations of interventions

- Fi One or more conveyance options in combination with one or more storage options

Referring to the Key Issues related to flood risk management, Table 4.7 indicates where each is addressed, partially or fully, by at least one intervention option identified above.

Table 4.7: Addressing Key Issues for flood risk management

Option Issue	Fa	Fb	Fc	Fd	Fe	Ff	Fg	Fh	Fi
F1			✓		✓	✓	✓	✓	✓
F2					✓		✓		
F3					✓	✓	✓	✓	✓

4.6 BIODIVERSITY AND THE WATER ENVIRONMENT

4.6.1 Introduction

The water environment as a receptor, is vulnerable to land use changes in the catchment, and is inextricably linked to the other water-related facets dealt with by this study; namely water supply and demand, wastewater treatment and flood risk management (Figure 1.2).

Key Issues in respect of the water environment may be addressed, essentially, in three ways:

- i. Through interventions identified to address Key Issues related to other facets of the study.
- ii. By implementing planning recommendations or other regulatory controls to achieve habitat and landuse gains, including resolving potential conflicts with recreational and amenity provision. Reference will be made to planning and policy guidance wherever applicable to pursuing 'environmental aspirations'.
- iii. Through interventions identified specifically to address 'biodiversity interests' that do not simply require a change to planning policy..

Each of the six key water environment issues (Key Issues E1- E6) is therefore discussed in turn. Corresponding tabulations highlight firstly how these issues might be addressed by other components of this study. In cases where generic options identified for water supply, wastewater treatment and flood risk management do not fully address environmental Key Issues, but where the application of regulatory or planning control can effect the necessary means to address (the balance of) environmental concerns, such potential controls are identified.

Where neither the previously identified intervention options, nor the application of planning constraints are likely to fully address the environmental Key Issues, additional 'environmental' interventions are identified. These may be viewed as additional measures to supplement potential 'deficiencies' in the previously identified intervention options, or as intervention options in their own right.

4.6.2 Key Issue E1: Further demands for water in the Ashford area will render groundwater more vulnerable to pollution and reduce recharge of surface water springs to the detriment of surface water quality.

Almost 70% of the groundwater abstracted within the study area is used for potable water. Groundwater resources are currently declining in the Ashford area and becoming increasingly vulnerable to pollution due to over-capacity abstractions and prolonged periods of drought. The projected population increase will place additional stress upon resources. Intervention options that could address this issue are summarised in Table 4.8.

Table 4.8: Intervention options identified to address Key Issue E1

i) Intervention options previously identified by other facets of the study that address Key Issue E1	
<i>Provide a new source of water (Wb, Wc, Wd, We)</i>	Provide new source(s) of potable water, sufficient to supply the 31,000 new homes by 2031, thus minimising / reduce the strain upon the already over-abstracted groundwater reserves. The generic options available to address water resources availability are dealt with in Section 4.3
<i>Reduce demand for water through demand management (Wi)</i>	Reduce demand through water-saving technologies and waste minimisation initiatives in new builds to reduce the burden that the development will place upon the area's water resources. A range of measures available that could address water demand management are identified in Section 4.3.
<i>Use of SUDS (Sd, Se, Sf, Ff, Fg, Fh, Fi)</i>	The use of SUDS can help to reduce rates of surface water runoff from urban catchments and under the right conditions may also promote/maintain groundwater recharge.
<i>Recharge groundwater with treated effluent (Wf)</i>	Efficient reuse of effluent discharges would increase the area's water resources.
<i>Reduce dependency on ground waters for abstractions (Wi)</i>	With the provision of additional water sources from outside the Ashford water supply zone and the application of aggressive demand management, it will be possible to re-assess current abstraction patterns north of Ashford and/or introduce of abstraction incentive charging to 'free-up' groundwater reserves for downstream recharge of chalk rivers.
ii) Planning recommendations to address Key Issue E1	
<i>Pa: Alter catchment characteristics to reduce runoff</i>	A number of measures could be adopted at a catchment level to decrease runoff rate and assist infiltration of surface waters into the groundwater, including: <ul style="list-style-type: none"> • Reversion of agricultural land, reinstatement of hedgerows, and field margins through agri-environmental schemes • Imposing riparian buffer strips • Introduction of market gardens, organic farming • Afforestation of the upper catchment
iii) Intervention options identified specifically to address biodiversity interests of Key Issue E1	
<i>Ba: Water re-circulation</i>	Re-circulation of surface water to surface water or groundwater. Groundwater abstractions would only be viable if sufficient new resources are made available to meet needs for potable supplies and a surplus is available for use in environmental schemes.

4.6.3 Key Issue E2: River habitats are vulnerable to additional stress from development due to additional domestic pollution, urban runoff and increased risk of pollution incidents.

The Stour and Beult are, in parts, stressed during summer months due to low flows, effluent discharges, increased sedimentation and pollution. The Great Stour is designated as an SNCI and is an important chalk stream fishery. The projected population increase in and around Ashford would, without suitable mitigation, increase the stress upon river habitats and lead to deterioration in water quality. The current problem here is twofold: firstly, the effluents discharged may not be

of sufficient quality; and secondly, reduced rainfall and summer flows in recent years have reduced the dilution capacity of the river.

The quality of groundwater (which feeds into the chalk rivers downstream of Ashford) and surface waters should be maintained at current levels and wherever possible enhanced in line with requirements of the WFD. Intervention options to improve river water quality are summarised in Table 4.9.

Table 4.9: Intervention options identified to address Key Issue E2

i) Intervention options previously identified by other facets of the study that address Key Issue E2	
Improve treated sewage effluent discharges: (Sb, Sc, Sd, Se), provided treatment is appropriate for the receiving water)	Section 4.4 explores the generic options that can be adopted to deal with increased wastewater flows. It is clear that additional wastewater treatment capacity is required to accommodate all new flows. Water quality effluent performance will need to be increased and improved, both to accommodate the corresponding increases in pollution loads resulting from increased population in and around Ashford, and to mitigate the existing water quality problems. From an environmental perspective, the main factor determining the preferred wastewater treatment infrastructure will be the resulting effluent quality. It is crucial that chalk river characteristics are maintained and to ensure there are no adverse impacts on international designated sites downstream.
Reduce use of CSOs and use of SUDS (Sd, Se, Sf)	Section 4.4 identifies a number of implementation options that could relieve the flows currently contributing to the operation of urban CSOs. Application of SUDS could limit both the high flows and environmental impact of stormwater discharges from new development that might otherwise put strain upon the receiving watercourses.
Strategic location of effluent discharges (Sb, Sc, Sd, Se, Sg)	As highlighted in Section 4.4, there are a number of opportunities to strategically locate wastewater discharges to augment flows in the upper reaches of the Stour thus improving the environmental conditions of the river through Ashford. The main constraints to this option would be establishing a discharge location that is suitable at all times of the year and the need to ensure that water transferred within or between catchments has appropriate chemical characteristics. (Water in the River Stour and the River Beult, for example, have different chemistry due to the contrasting underlying geology of chalk and clay).
Maintain groundwater reserves (Wa–Wi, particularly Wf)	As mentioned in Section 4.3, the protection of groundwater resources would provide more reserves required for downstream recharge of the chalk river.
Reduce volume of effluent discharges (Wi, Sd, Se, Sf, Sg)	Section 4.3 describes demand management measures and interventions that could be implemented to reduce water consumption, and thus volumes of domestic wastewater. However, the reduction in water volumes produced by adopting such measures would effectively increase the pollution load in the remaining flows. This intervention would therefore require combined measures to increase the river base flows (to increase the available dilution at times of low river flow) and/or enhanced level of treatment of the stronger wastewater.
ii) Planning recommendations to address Key Issue E2	
Pb: Enhance level of treatment, compliance	In order to prevent deterioration in river water quality, and in order to meet requirements of the Water Framework Directive it will be necessary to increase the quality of effluent standards. Levels of monitoring to check compliance may also need to be increased.

<i>and enforcement</i>	
iii) Intervention options identified specifically to address biodiversity interests of Key Issue E2.	
<i>Water recirculation (Ba)</i>	<p>Reduced rainfall and low river flows in summer has resulted in reduced dilution capacity for effluent discharges. The projected population increase will place significant additional demand upon local water resources; both on surface and groundwaters, and this will have the potential to exacerbate the problems of low summer flows.</p> <p>Over 18% of groundwater abstracted within the study area is used for a river re-circulation scheme in the upper reaches of the Beult. A similar scheme could be employed during the summer months to augment flows in the River Stour. River re-circulation could source water from groundwater (perhaps by pumping water out of the gravel pits adjacent to the Julie Rose Stadium), surface water or directly from treated sewage effluents.</p> <p>Water re-circulation has already been identified above as an implementation option (Ba) to address Key Issue E1</p>
<i>Bb: Control effluent discharge temperature</i>	<p>The Great Stour is an important salmonid fishery and is therefore sensitive to increased temperature. Consideration could be given in the design of any new or upgraded existing treatment facility to the possible incorporation of effluent detention facilities, such as reedbeds, wet woodland or similar landscape feature to reduce effluent temperature prior to discharge to receiving waters. In addition to cooling the treated effluent, this may also achieve biodiversity gain.</p>
<i>Bc: Measures to decrease pollution</i>	<p>A number of measures could be taken to reduce pollution incidents affecting rivers within the study area:</p> <ul style="list-style-type: none"> • Ensure new developments such as the Junction 10 of the M20 are fitted with filters and run off retention ponds to reduce road runoff entering river channel • Monitor and control development of Brown Field sites to ensure there is no water pollution from contaminated land. • Reduce diffuse pollution through adopting agri-environmental schemes that encourage reduced use / sensitive use of fertilizers and pesticides. (See also intervention option Wb for potential changes to catchment characteristics) • Minimise pollution of surface water due to run-off from new urban areas, through the use of SUDS and effective surface water drainage.
<i>Bd: Measures to reduce siltation</i>	<p>The increased siltation in the Stour noted in recent years contributes to the departure of favourable conditions of the chalk river habitats, and is a factor affecting water quality. The proposed development in and around Ashford will mobilise large quantities of sediment that could, without mitigation, enter the river channel thus significantly worsening the current situation. Interventions available to reduce siltation include:</p> <ul style="list-style-type: none"> • Adopting good practice on construction sites (follow Environment Agency Pollution Prevention Guidelines), • Encouraging landowner participation in agri-environmental schemes (horizontal ploughing, reinstatement of hedgerows, sensitive timing of land management) to reduce sediment inputs to river channels, • Encouraging/imposing reinstatement of riparian buffer strips to minimise runoff from land entering watercourses • Allowing bankside vegetation to encroach upon the river channel, which narrows the channel thus speeding base flow rates through reducing channel capacity, • Fitting control structures to Hothfield and Aldington FAS to permit the release of water at a suitable flow rate to prevent further sedimentation and to flush away existing sediments, • Undertaking gravel cleaning works

	<ul style="list-style-type: none"> Increasing surface water attenuation in upper catchment through afforestation and reinstatement of unimproved meadows and natural grasslands.
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4.6.4 Key Issues E3 and E4: Loss of habitats and species within the study and fragmentation of green spaces area due to direct impacts of development or from reduction in river water quality

The landscape to the south and west of Ashford, where development is planned, is open and typified by small flashy watercourses and dykes. Although not designated, these features are important wildlife corridors and need to be considered in terms of the wider environment and biodiversity interests. The types of habitats and species that may be lost to the Ashford development will be dependent upon the location and size of the new urban areas and the way in which they are connected.

The proposed limited development in the floodplain will not only affect flood storage and flow paths but will also potentially directly constitute environmental damage through direct habitat loss and fragmentation. It will also require more interventionist flood defence management with associated removal of marginal habitat and alteration to channel characteristics. Interventions to avoid and/or minimise impacts upon the biodiversity of the water environment are summarised in Table 4.10.

Table 4.10: Intervention options identified to address Key Issues E3 and E4

i) Intervention option previously identified by other facets of the study	
<i>Increase amount of water in the system (Wa – Wi)</i>	Increasing the total amount of water within the catchment through provision of new potable sources will, by relieving the current stress upon groundwater reserves, indirectly improve river water quality and biodiversity
<i>Maintain / enhance water quality (Sa - Sg), provided treatment is appropriate for receiving waters</i>	Options identified to protect habitats and species from a decline in water quality have been dealt with in Section 4.4.
<i>Use of SUDS (Se – Sf, Fg, Fh, Fi)</i>	The incorporation of SUDS within new urban areas may aid recharge of groundwater resources, thereby benefiting summer river flows, and achieving biodiversity gains within urban areas
ii) Planning recommendations to address Key Issues E3 and E4	
<i>Pc: Design the urban areas with view to enhancing the water environment</i>	<p>There are many opportunities available to create wetland features within the flood plain and/or the green belt. The degree to which this theme is adopted would largely depend upon the extent to which the existing areas are used as development sites or are disturbed during the development process.</p> <p>It may be possible to incorporate a multifunctional water feature (new detention lake, series of lakes, wetland habitat) within Ashford into the design, that offers flood control, recreational opportunities and biodiversity gain</p>
<i>Pd: Policy guidance - no development on sites that have conservation</i>	<p>Selected development sites should avoid current areas / features that are</p> <ul style="list-style-type: none"> designated for conservation value; aquatic features that have significant wildlife interest; or which support protected species (Great Crested Newts, Water Voles and Otters).

<i>interest</i>	Terrestrial habitat may also need protection in the interest of species needs. Although not designated, water features such as ditches, dykes, streams, marshes, mires and river corridors are important wildlife corridors and need to be considered in terms of the wider environment and biodiversity interests.
<i>Pe: Planning guidance - no net loss of water features</i>	Green links into Ashford should be maintained for habitats and biodiversity interests. There should be no net loss of floodplain, other wetlands or green space in general.
<i>Pf: Planning guidance - protect natural river features</i>	The natural character of river banks, bank side vegetation and riverbed are important water features for wildlife interest and should be maintained.
<i>Pg: Planning guidance - no development in the floodplain</i>	PPG25 recommends that development normally avoids the areas of highest risk and that appropriate measures are taken to make development safe where other considerations in favour of the development proceeding outweigh the flooding issues. Development on the floodplain should be avoided.
iii) Intervention options identified specifically to address Key Issues E3 and E4	
<i>Ba: Water-recirculation</i>	Some form of water/river re-circulation may benefit the Stour and the communities that it supports by augmenting low flows in summer. Maintaining flows will be crucial to maintaining populations of priority species and the rivers wildlife potential as a whole. This may be of particular relevance when considering possible implications of climate change.

4.6.5 Key Issue E5: Increased conflict between the use of the floodplain and river corridors for recreation and its requirements for biodiversity

With the projected increase in population in the Ashford area there will be greater need for provision of recreational facilities. Improving access to water for all members of society has been identified as a key action by many organisations; however, this may lead to possible conflict of interests. Measures to address such conflicts are indicated in Table 4.11.

Table 4.11: Intervention options identified to address Key Issue E5

i) Planning recommendations to address Key Issue E5	
<i>Ph: Consider existing policy guidance</i>	<ol style="list-style-type: none"> 1. Application of appropriate Government Planning Policy Guidelines, particularly PPG17, relating to sport and recreation. 2. Consider the Environment Agency's series of model planning policies for local authorities which include policies for water related recreation. 3. Undertake local Agency planning mainly through Catchment Area Management Plans. Individual recreation plans can also be written for a specific river, allowing a greater level of detail.

4.5.5 The effect of climate change on aquatic habitats (Key Issue E6)

In 1999 the Met Office and ADAS produced *Rising to the Challenge*; a report for the new South East Climate Change Partnership (SECCP) that examined the impacts of climate change in the region. The report suggests that the main climate changes for the South East by the 2050s will be:

- Increase in annual average temperature of between 1.0 and 3.0°C
- Increase in winter precipitation by 5 to 35%
- Decrease in summer precipitation by 10 to 35%

Climate change represents serious challenges for the South East; many of the impacts will be pronounced in the region. The impacts will depend on how exactly the climate changes, and on the vulnerability of social, economic and environmental systems to such change and can represent both threats and opportunities.

It is perceived that weather will become more variable (with increased frequency of extreme events such as severe storms and droughts) and in the long term it will become hotter and drier. Reduced summer rainfall and temperature rises will mean drier soils, increased pressure on our water resources, detrimental effects on river quality and wetland ecology and changes in the composition in vegetation communities. Further discussion on the likely impact of Climate Change on the water environment is provided in Appendix 4.3

The stream flow and groundwater recharge regimes in a catchment are the result of a number of natural and human-influenced processes. Each of these may be influenced to a greater or lesser effect by climate change.

A number of measures to deal with, or take into account, the anticipated effects of climate change may be identified (Table 4.12). Measures associated with water demand management will need regional, and in many instances, national support.

Table 4.12: Intervention options identified to address Key Issue E6

i) Intervention options previously identified by other facets of the study to address Key Issue E6	
<i>Additional water demand management measures (Wi)</i>	Drier summers will increase domestic demand for garden watering, which, if unchecked, will negate efforts to reduce per capita consumption. Agricultural demands will similarly increase if crops are not changed to more drought-tolerant species. Domestic demand for garden watering may be controlled if householders can be encouraged to move towards planting 'Mediterranean gardens' through carrot and stick incentives.
<i>Enhanced level of wastewater treatment, compliance and enforcement (Pb)</i>	Consideration should be given to effluent discharge standards under the flow regimes that that would arise from the projected climate change. Higher water quality effluents would be required to mitigate possible reduced summer river flows.
<i>Allow for Climate Change in flood risk management (Fc – Fi)</i>	Defra requires, for approval of funding for any flood mitigation strategy recommended by the Agency, a sensitivity test for climate change predictions, modelling a 20% increase in rainfall in design storm events.
ii) Planning recommendations to address Key Issue E6	
<i>Assess impact on catchment characteristics (Pa)</i>	Assess possible land use changes (changing crop types, timing of crop growth and management, set aside land, agricultural water management, afforestation) that may result from climate change. Model the potential effect of these changes, as changes to catchment runoff characteristics
<i>Facilitate wildlife movement (Pd)</i>	The interconnectivity of habitats and opportunities for movement at a variety of scales is of great ecological importance in coping with climate change. Aquatic features and wildlife corridors should be maintained.

4.7 OPTION APPRAISAL OBJECTIVES

A list of some 16 high-level environmental objectives was identified in order to appraise each the intervention options. The objectives were derived from the following drivers and standards, to ensure that external requirements will be met:

- Water UK – Sustainability Indicators
- ODPM PPG 25 – ‘ Sustainable Flood Risk Management’
- DEFRA FCDPAG3 – Indicative Standards of Defence
- Environmental Drivers for the 2004 Periodic Review (or AMP 4 process)
- Water Framework Directive and other relevant legislation
- Environment Agency Indicators to measure Environmental Change
- Local Environment Agency Plans (LEAP)
- Strategic Environmental Assessment (SEA) for the Ashford area.
- Stour Catchment Abstraction Management Plan
- UK Biodiversity Action Plan

A number of the objectives were taken directly from those included in the Ashford SEA, which had been agreed during stakeholder consultation and were used to appraise the various options of the development frameworks. Their adoption for this Study is therefore desirable for compatibility with those of the SEA.

The LEAP for Kent and more specifically the Kentish Stour are non-statutory plans based on river catchments, which take a long-term view of local environments and set a 5-year plan of action for solving local issues. Issues identified in the LEAPs relating to the water environment have been noted in relevant preceding chapters.

Table 4.13 sets out the 16 objectives and their sources. Indicators and targets are presented later, for more detailed appraisals of potential water management strategies.

Table 4.13: Option Appraisal Objectives

Topic	Objective	Source(s)/Driver(s)
1.0 Water Supply and Resources	<i>1.1</i> To seek to ensure new development does not have a direct impact on the quality and quantity of water available from ground and surface water sources	Ashford SEA
	<i>1.2</i> To ensure a sufficient and sustainable water supply, commensurate with the scale of development proposed, addressing over-abstraction and licensing issues where necessary	Ashford SEA Water UK – Sustainability Indicators Stour CAMS
	<i>1.3</i> To promote sustainable water usage by domestic and non-domestic consumers, with an aim of reducing average household water usage in Ashford by 30% ¹	Ashford's Future
2.0 Water quality	<i>2.1</i> To improve summer water flows in the River Stour in a way which maintains and enhances its nature conservation status as a chalk river	Ashford area SEA AMP3/4 processes
	<i>2.2</i> To prevent any negative impact on water quality in the River Stour and any other receiving water courses arising from surface water run-off from new development	Ashford area SEA
	<i>2.3</i> To maintain and improve groundwater quality ²	Ashford area SEA AMP3 / 4 processes
	<i>2.4</i> To introduce wastewater treatment measures to attain a discharge standard in accordance with directives and standards ³ that ensures receiving water quality and flow are protected and improved.	Ashford area SEA Water UK Sustainability Indicators AMP3/4 processes

Topic	Objective	Source(s)/Driver(s)
	2.5 To ensure that the wastewater infrastructure capacity is commensurate with the rate of growth and location of new development	AMP3 / 4 processes Ofwat targets
	2.6 To meet ecological, chemical and quantitative status objectives assigned for surface waters, ground waters and protected areas. To achieve “good surface water status” and “good ground water status” ⁴ by December 2015.	Water Framework Directive
3.0 Flood Risk Management	3.1 To ensure that new development does not increase flood risk and to protect the capacity and integrity of existing flood storage areas unless acceptable alternative areas are agreed	Ashford area SEA
	3.2 To ensure that the standard of service for flood defence is maintained at a level appropriate for the current and future land use.	FCDPAG 3 indicative standards
	3.3 To limit / reduce run-off effects of development for all zones and control where possible, through the use of sustainable drainage systems	ODPM PPG25 - Development and Flood Risk
	3.4 To provide economically, technically and environmentally sound and sustainable flood defence measures.	DEFRA – Flood Management – High Level Targets
4.0 Biodiversity and the water environment	4.1 To maintain and enhance Ashford's biodiversity interest, particularly where this will help deliver the objectives of the UK and Kent Biodiversity Action Plan ⁵ .	Ashford area SEA Statutory obligations: National and International legislation AMP3/4 processes
	4.2 To maintain and enhance the nature conservation status of the Stour and its tributaries, and promote a healthy fishery and in particular of populations of migration species including salmonids	
	4.3 To maintain and enhance the conservation status of those species and habitats of national or international importance, which are dependent on the water environment ⁶ .	

Notes to Table 4.13

¹ Taken from Ashford's Future Sustainable Growth Options Report. Unlikely to impact on rate and scale of development until 2020. Monitoring should be based on average household water consumption, with the goal of reducing consumption by 30% by 2016.

² Discharges to groundwater require consent under the Water Resources Act 1991. The Groundwater Regulations 1998 prohibit the entry of List I Substances to groundwater and pollution or groundwater by List II Substances. Some currently acceptable discharges to groundwater will have to cease under the WFD.

³ Urban Waste water Treatment Directive (UWWTD), Nitrate Directive, Landfill Directive, Regulations for Pollution Prevention and Control, Requirements from the Environment Quality Standards (like the Freshwater Fish Directive and River Quality Objectives), requirements from the Habitats Directive and other Conservation drivers, and Sludge (Use in Agriculture) Regulations (1989).

⁴ The Water Framework Directive introduces an integrated approach to water management. Surface and groundwater are to be considered together in the Directive – surface waters for its ecological and chemical quality, groundwater for quantity and its chemical quality. Note derogations apply to status objectives. This objective has been selected with a view to the recent implementation of this directive. However, it is not anticipated that the classification standards that relate to “good ecological status” will be defined until 2006, therefore rendering this objective non-quantifiable.

⁵ The Government signing of the Convention on Biological Diversity is being implemented in the UK by the UK Biodiversity Action Plan. Water management has been identified as the third most significant threat facing BAP species and habitats.

⁶ The Habitats Regulations state that every competent authority (which includes Ministers, Ofwat, the Agency and water companies), in the exercise of any of its functions, shall have regard to the requirements of the Habitats Directive, so far as they might be affected by those functions. SSSIs represent the core of protected sites designated on the basis of their national importance for conservation. Part III of the CRoW Act includes new duties on public bodies (including Ofwat, the Agency and water companies) to take reasonable steps to further the conservation and enhancement of SSSIs.

4.7.1 Assessment of options against Objectives

The intervention options were assessed against these Objectives using a 'traffic light' type assessment to indicate how the generic options may be expected to perform against each objective:

Indicated compliance	Indication
Option contravenes objective / targets	
Option partially meets objective / targets	
Option meets objective / targets	
Option has no relevance to objective / targets	

Table 4.14 overleaf sets out the results of this initial appraisal.

4.8 SUMMARY OF RESULTS OF THE APPRAISAL

The appraisal against the objectives indicates that, with the exception of two intervention options (Fa and Fb), none of the options should be discounted on the basis of perceived failing to meet any one of the quality objectives. The two exceptions are the 'Do Nothing' and 'Do Minimum' scenarios for flood risk management, which are conventionally included in any range of options, as baselines for considering other options. These too are therefore carried forward for comparison purposes.

It should be recognised that the predominance of 'amber' assessments in the table is in some instances, a reflection of the lack of specific details of the (generic) options. By focussing the intervention towards an objective, it may be possible to increase the extent to which it could meet the objective – even to the point that it might warrant a 'green' assessment. However, other factors that need to be given higher consideration in order to fully address the Key Issue that the intervention is primarily intended to address, may reduce the extent that the option would meet the objective – which conceivably could result in a 'red' assessment.

Nevertheless, the appraisal matrix (Table 4.14) clearly indicates that a significant number of intervention options identified to address issues in one area of concern, can in fact go some way to meet quality objectives set to ensure performance in another area of concern. Such interventions offer opportunities to realise potentially cost-effective 'win-win' solutions. The appraisal matrix clearly shows that the intervention options identified for water supply and demand, wastewater and biodiversity meet quality objectives across the spectrum, while intervention options identified for flood risk management are far more specific.

In the selection of interventions to create a strategy to meet all the Key Issues in any one of the three areas of concern related to the provision of infrastructure (water supply, wastewater services and flood risk management), it should be remembered that some of the generic infrastructure options are relied upon to deliver some of the measures needed to address environmental Key Issues. Such options should not be discounted without ensuring that the environmental concerns can be fully addressed by at least one remaining combination of intervention options.

Table 4.14: Appraisal of generic options against Objectives

INTERVENTION OPTIONS		WATER RESOURCES			WATER QUALITY / WASTEWATER						FLOOD RISK				BIODIVERSITY			No OF OBJECTIVES MET	
		1.1	1.2	1.3	2.1	2.2	2.3	2.4	2.5	2.6	3.1	3.2	3.3	3.4	4.1	4.2	4.3	Partially	Wholly
WATER SUPPLY AND DEMAND	Wa: Optimise resources	1	8		11										11	11	11	6	0
	Wb: Raise Bewl Water	2	8		11										11	11	11	6	0
	Wc: Construct Broad Oak reservoir	2	8		11										11	11	11	6	0
	Wd: Construct remote desalinisation plant	2	8		11										11	11	11	6	0
	We: Construct local desalinisation plant	2	8		11										11	11	11	6	0
	Wf: Recharge local groundwater with treated effluent	2	9		11		11			11					11	11	11	6	2
	Wg: Transfer surplus of water from outside region.	2	8		11										11	11	11	6	0
	Wh: International import of water	2	8		11										11	11	11	6	0
	Wi: Demand management.	2	10	10	11		11			11					11	11	11	8	1
WASTEWATER	Sa: Conventional wastewater drainage. Extend Bybrook WWTW	3						20	21	20					22	22	22	6	1
	Sb: Conventional drainage. 2 nd WWTW but retain Bybrook for existing flows	3						20	21	20					22	22	22	6	1
	Sc: Conventional wastewater drainage. New WWTW to treat all flows	3						20	21	20					22	22	22	6	1
	Sd: Minimum water usage. New WWTW remote from Bybrook. Retain Bybrook	4		4		13	13	20	21	20			13		22	22	22	8	3
	Se: Minimum water usage. New WWTW on Greenfield site. Abandon Bybrook WWTW.	4		4		13	13	20	21	20			13		22	22	22	8	3
	Sf: Minimum water usage. Expand Bybrook site to accommodate all flows	4		4		13	13	20	21	20			13		22	22	22	8	3
	Sg: Minimum water usage. Local treatment and discharge	5		4		14		20	21	20			13		38	38	38	7	3
FLOOD RISK MANAGEMENT	Fa: Do Nothing										24	24	32	34				0	0
	Fb: Do Minimum										25	25	32	34				0	0
	Fc: Land use designation and development controls										26	24		24	24		24	0	5
	Fd: Channel improvements to existing river									20	23	23		23	22	22		6	0
	Fe: Diversion of flood flows to adjacent catchment										27	31		35				3	0
	Ff: Enlargement / re-provision of current floodplain										28	31		36	39	39	39	6	0
	Fg: New or enlarged flood storage upstream of Ashford										15	31	33	37				3	0
	Fh: New flood detention lakes within Ashford					15					15	31	33	37				4	1
	Fi: Combination of conveyance and storage options					15				24	15	31	33	37				3	3
PLANNING	Pa: Alter catchment characteristics to reduce runoff	6			6	6	6				6		6	6	40	40	40	10	0
	Pb: Enhance level of treatment, compliance and enforcement	7				16				16					16	16	16	6	0
	Pc: Design the urban areas with view to enhancing the water environment					17					18		33	18	18	18	18	8	0
	Pd: Planning guidance - no development on sites that have conservation interest													18	18	18	18	3	1
	Pe: Planning guidance - no net loss of water features													18	18	18	18	3	1
	Pf: Planning guidance - protect natural river features					17					29		29	29	18	18	18	6	1
	Pg: Planning guidance - no development in the floodplain										30	18		18	18	18	18	4	2
BIODIVER SITY	Ba: Water re-circulation				12		12								12	12	12	4	1
	Bb: Control effluent discharge temperature									16					16	16	16	2	2
	Bc: Measures to decrease pollution	7				18				18			18		18	18	18	7	0
	Bd: Measures to reduce siltation	7				19				19	19			19		19	19	7	0

Notes to Table 4.14

1. Optimising existing resources will delay further adverse stress on system.
2. All water supply interventions partially meet objective, either through provision of new resources or by demand management, thus reducing existing stress on system.
3. Effective wastewater treatment will help to ensure that surface water quality is maintained / enhanced.
4. Minimum water usage interventions are preferred (with incorporation of effective water drainage / SUDS in new developments)..
5. Performance and reliability of small-scale works using novel technologies (eg. Living Machines TM) against larger plants currently unknown.
6. Changes to catchment (through agricultural practices, afforestation etc) may decrease runoff and increase filtration to ground waters with potential benefits to summer flows. Imposing buffers trips etc will help to reduce siltation improving water quality. Landuse changes in the catchment may also help to increase filtration thus reducing flood risk.
7. Improving effluent quality and adopting measures to reduce pollution inputs and siltation will improve water quality in river for abstractions downstream.
8. All water supply options will need to be commensurate with scale of the development within the region.
9. Recharge of groundwater may be the most direct measure to address over-abstraction issues.
10. Considered most sustainable water supply / demand measure.
11. All water supply interventions will decrease the current demand on groundwater supplies reducing the need to abstract. This may allow groundwater reserves to build up offering more scope for downstream feed to river and improving summer flows.
12. Water re-circulation (either direct to river or via groundwater and possibly seasonal) has the potential to improve summer flows, and also offers water quality and offer biodiversity gain.
13. Adopting storm water detention interventions (such as the use of SUDs) will reduce the negative impacts associated with runoff from urban areas. It would also make the development more sustainable and benefit groundwater through infiltration.
14. Small-scale treatment works may be able to incorporate reed beds / wetlands. This option is likely to be viable only where urban areas are less dense.
15. Some form of conveyance and/or storage option has the potential to reduce runoff (possibly via wetland habitat) with potential beneficial impact on water quality. It would also reduce pressures on floodplain.
16. New build wastewater infrastructure can incorporate technologies to improve discharge water quality, help to meet the aims of the WFD. The resulting improvement to water quality will have biodiversity gain.
17. Ensuring an effective water drainage system is in place in the urban design and protecting natural river features will help to reduce runoff from the new development.
18. Planning guidelines to protection to existing water features / flood plain or enhancing water features will play a crucial role in flood protection. Adopting this strategy would make the development more sustainable and can also have associated water quality and biodiversity gain.
19. Siltation of the river channel reduces flow rates affecting water quality and channel depth increasing flood risk. This intervention has the potential to offer widespread gain.
20. All water treatment interventions identified have the potential to attain higher discharge consents and improve water quality. However, the degree to which each measure meets the objective with regards to improving water quality and flows will be dependent upon where and how effluents are discharged.
21. All WWTW infrastructures are likely to be modular and installed over time. All measures would need to be commensurate with growth. The favoured location(s) for WWTW(s) will be largely determined by the locations of new development.
22. Opportunities exist through soft engineering / reinstatement of river features to achieve biodiversity gain.

23. It is likely that some improvements will be required to the river channels for flood risk management, at which time there will be opportunities to create sustainable flood defence measures. Significant alterations to channels would not be environmentally sustainable.
24. Do Nothing - Standard of service will not be maintained and will not ensure that new development does not increase flood risk.
25. Do Minimum – Reduction in service level: standard of service unlikely to be adequate for scale of development.
26. Recognising land use designations and development controls will offer protection to current floodplain and biodiversity interests.
27. Water transfer is a viable option although its sustainability across catchments may be an issue.
28. Enlarging / re-provision of the floodplain will be necessary if development is permitted on existing floodplain.
29. Protecting natural river features (on the larger scale) helps to slow flow rates upstream of the urban areas: decreases flood peaks, increases possible filtration, increases evaporation time.
30. If development is not permitted in the floodplain there will be no problem.
31. Any alterations to the character of water channels, flows and discharges within the catchment will be dependent upon location of development sites.
32. Do Nothing / Minimum does not incorporate SUDS.
33. Some form of storage in upper catchment or Ashford area will be favoured due to associated reduction in flow rates and flood risk.
34. Economically unsustainable.
35. Transferring water via channels to other catchments may be technically challenging (depending on topography). Possible cost issues associated with pumping (if needed).
36. Possible option impacts on floodplain should be noted as should the time taken to establish a new floodplain environment.
37. Storage and conveyance options are likely to be required. Scale dependent on development sites.
38. Local treatment may offer added biodiversity gain due to incorporation of reedbeds / wetlands on tributaries.
39. Opportunities exist in the re-provision of the floodplain to create new habitat and achieve biodiversity gain (dependent upon how and where the floodplain is enlarged).
40. Changes to catchment characteristics offer opportunities for increased diversity.