

# The Cam Catchment **ANGLIAN REGION**

## Proposals for Statutory Water Quality Objectives



**NRA**

*National Rivers Authority*

Guardians of  
the Water Environment



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Published by  
National Rivers Authority  
Rivers House  
Waterside Drive  
Aztec West  
Almondsbury  
Bristol BS12 4UD

Tel 01454 624 400

March 1996

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## INTRODUCTION TO THIS CONSULTATION DOCUMENT

This document sets out the proposals of the National Rivers Authority (NRA) and the Environment Agency (the Agency) for Statutory Water Quality Objectives (SWQOs) for stretches of river in the Cam catchment. Its purpose is to provide local organisations and individuals with the opportunity to comment before more formal Government consultations take place. This is the start of a process which may ultimately lead to the setting of SWQOs by the Secretary of State. Our role in this is to advise the Secretary of State on which SWQOs should apply, having heard the views of interested parties and taken into account the environmental, technical and economic implications of their views.

SWQOs define a target level of water quality to be met for a river stretch, together with a target date by which this level must be achieved. SWQOs have a statutory basis and therefore, once set, the NRA or the Agency will be required to ensure, as far as is practicable to do so, that they are achieved. Water quality targets for river stretches have not previously been set in this way in England and Wales, so Government has decided, in consultation with us, to test the operation of SWQOs in a series of "pilot" catchments. The Cam catchment has been selected as a pilot because a Catchment Management Plan (CMP) has already been completed by the NRA. CMPs integrate all of our water management responsibilities by setting out long-term goals for a range of different uses of the water environment.

In developing our proposals for SWQOs, we have identified the investment necessary - by agriculture, by industry and by the Environment Agency - to deliver

the proposed quality targets. We have also taken account, where appropriate, of the levels of investment by the water industry that were agreed by Government for the purpose of setting revised price limits from 1995 onwards. Our existing River Quality Objectives (RQOs) largely reflect our view of, and longer-term agreements on, the needs of river stretches. In general, we have therefore proposed SWQOs that are consistent with RQOs in keeping with our duty to "maintain and improve" water quality. In a limited number of river stretches where, with the agreed programme of water industry investment, improvements to achieve the existing RQO can not be guaranteed, we have proposed an interim SWQO that is less stringent than the existing RQO, and proposed a further longer-term SWQO that is generally consistent with our current planning target. Where two-tier SWQOs are proposed, the steps necessary to deliver them are outlined, and these should therefore be viewed as priorities for future investment by the water industry.

This document provides an overview of the Cam catchment, presents our proposals for SWQOs for each river stretch, assesses the state of current compliance with the SWQOs proposed, and assesses the costs and benefits involved in delivering them.

Comments are invited on these draft proposals for SWQOs for this catchment. They should be sent to the Area Water Quality Manager, National Rivers Authority, Central Area, Bromholme Lane, Brampton, Huntingdon, Cambs, PE18 8NE by 1st July 1996. The fax number is 01480 413381.

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**STATUTORY WATER QUALITY OBJECTIVES**

The purpose of SWQOs is to establish targets, on a statutory basis, that provide an agreed planning framework for regulatory bodies, dischargers, abstractors and river users. SWQOs will secure achievements to date by providing a statutory "backstop" to existing Consents, as well as providing a vehicle for tackling discharges from non-water sectors of industry, agricultural and other diffuse pollution, and the effects of new or revised abstractions. The SWQO scheme is use-related, based upon a range of water quality standards that protect the 'uses' to which waters may be put. There are a number of different potential river uses. River Ecosystem is the only use to date for which standards have been introduced.

**How SWQOs will be Set**

SWQOs, currently based only on the River Ecosystem use, will be set on a stretch-by-stretch basis for the major rivers within the catchment; they will not apply to our smallest rivers. The targets

will comprise two parts: a River Ecosystem class; and a date by which compliance should be achieved. Account will be taken of planned investment to ensure that the targets are achievable and, where appropriate, reflect planned improvements in river quality. Where appropriate, we have proposed two-tier SWQOs to protect water quality. The target date for the longer-term SWQOs has been set at 2006 to enable prioritisation of expenditure in future planning rounds, and to enable the SWQO to be reconsidered at the five-yearly review stage.

Through this consultation, we are seeking the views of those with an interest in this catchment, before submitting our recommendations to Government. Government will then undertake a period of formal consultation. SWQOs will then be set through Notices served by the Secretary of State. Once formally set, the River Ecosystem classes and dates will represent statutory targets. We will then be under a duty to ensure compliance

using the various pollution control powers at our disposal. SWQOs may be reviewed after five years.

Once set, longer-term SWQOs will have a statutory basis, generally protecting the existing planning base currently expressed as RQOs. Therefore, longer-term SWQOs will provide the basis for the Environment Agency's discharge consenting and water quality planning activities.

**Statutory Objectives Introduced by EC Directives**

Designations of river stretches, or points on rivers, are subject to Regulations which enforce standards set by the EC Dangerous Substances Directive (76/464/EEC), and these standards already constitute statutory objectives. The EC Surface Water Abstraction Directive (75/440/EEC) and the EC Freshwater Fisheries Directive (78/659/EEC) also contain mandatory standards. Designations and compliance reports under these three Directives are included in the Catchment Management Plan.

**TABLE 1 STANDARDS FOR RIVER ECOSYSTEM CLASSES**

Class	Dissolved Oxygen % Saturation	BOD (ATU) mg/l	Total Ammonia mg N/l	Un-ionised Ammonia mg N/l	pH lower limit as 5 percentile; upper limit as 95 percentile	Hardness mg/l CaCO <sub>3</sub>	Dissolved Copper µg/l	Total Zinc µg/l
	10 percentile	90 percentile	90 percentile	95 percentile	95 percentile		95 percentile	95 percentile
RE1	80	2.5	0.25	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 > 100	5 22 40 112	30 200 300 500
RE2	70	4.0	0.6	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 > 100	5 22 40 112	30 200 300 500
RE3	60	6.0	1.3	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 > 100	5 22 40 112	300 700 1000 2000
RE4	50	8.0	2.5	-	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 > 100	5 22 40 112	300 700 1000 2000
RE5	20	15.0	9.0	-	-	-	-	-

## OVERVIEW OF THE CAM CATCHMENT

The catchment covers 400 square miles, and is shown on Map 1. Most of the catchment lies in Cambridgeshire, with parts in Bedfordshire, Hertfordshire, Essex and Suffolk. The urban areas include Cambridge (population 103,000), Saffron Walden (population 14,000) and Royston (population 13,000).

Upstream of Cambridge, the River Cam is joined by the River Rhee, the River Granta and the Bourn Brook. The Cam then flows through Cambridge and is joined by the Lodes in its lower stretches. Eventually, at the end of the catchment, it joins the Old West River near Stretham. Forty miles downstream, as the River Great Ouse, water from the Cam discharges to the Wash at King's Lynn. The Cam catchment consists of 110 miles of watercourses, which are routinely monitored at 35 locations.

The catchment is largely of a lowland nature, but has considerable physical and biological diversity. The geology to the west of Cambridge is clay overlying lower greensand and to the south and east, chalk, overlain in parts by boulder clay.

Both the chalk and the lower greensand are valuable aquifers. The chalk aquifer provides the natural flow to the rivers. Boreholes for Public Water Supply are concentrated to the south and east of Cambridge, abstracting water from the Chalk and Greensand. During the drier months, large quantities of water are also abstracted from rivers for spray irrigation. All the water resources of the catchment are now fully committed to the existing licensed abstractions, to protected rights, and to the needs of the environment. In the upper reaches, the rivers are susceptible to drying out. At times of low flow, the NRA augments the flows to wetlands and to some rivers by pumping from boreholes.

In the lower stretches to the north, the geology changes to peat fenland. The watercourses joining the River Cam here are known as the Lodes. These are man made, cut in Roman times, for the purposes of irrigation. Progressive

wasting and shrinkage of the peat has left the Lodes and Cam as embanked watercourses, some 8 feet above the surrounding land.

A quarter of a million people live in the area and pressure for development is intense. Agriculture is the main industry. Other important economic activities include light industry and chemical manufacturing. This is concentrated in Cambridge and the market towns of Royston and Saffron Walden.

Tourism is important, with 3.5 million visitors to Cambridge each year. The Cam is navigable downstream from Cambridge. The waterways are popular for cruisers, sailing and rowing. Punting on the river at Cambridge is world famous.

### Current Water Quality

The General Quality Assessment for 1994 graded most stretches as "fair" (grades C or D). Higher quality water is restricted mostly to sites on the chalk-fed and fast-flowing upper reaches of the Rivers Rhee, Cam, Granta and New River. These stretches showed depressed concentrations of dissolved oxygen during recent droughts, but this appeared not to damage the environment, and recovery has been good following the restoration of river flows.

Generally the current quality is better now than at any time, at least since the early 1980's, and probably before then. This reflects improvements to discharges. The main present cause for concern is the quality of the Cam below the discharge from Cambridge Sewage Treatment Works. Although recent improvements have been carried out, the discharge causes low oxygen in the river which requires that the NRA makes occasional use of artificial re-oxygenation.

### Catchment Management Plan

A CMP Consultation Report was produced in March 1992. This identified the key issues affecting the catchment. Stemming from this Consultation Report, the NRA launched an Action Plan in April 1993. This Action Plan outlined agreed actions to tackle the

issues. The proposals for SWQOs support the Action Plan.

## PROPOSALS FOR STATUTORY WATER QUALITY OBJECTIVES

The Catchment Management Plan (CMP) prepared by the NRA sets out present and planned future uses for river stretches within the catchment. Currently, these uses are defined by non-statutory water quality targets known as River Quality Objectives (RQOs). Generally, RQOs reflect our view of, and long-term agreements on, the needs of river stretches.

Where possible, SWQOs have been proposed at a level consistent with RQOs. Generally, these will be achievable within the 5 to 10 year horizon of investment planning. However, where it has been necessary, owing to restrictions on further investment (discussed previously in this document), to propose an SWQO that is less stringent than the existing RQO, a further longer-term SWQO is proposed. This longer-term SWQO, which has a target date of 2006, is indicated on Map 3. Map 2 is also annotated with the symbol [\*] where an additional longer-term target applies.

In a catchment as crowded as the Cam, issues will continue to shift and to change. We have identified those issues which are most important now and for the next five years. The Consents to Discharge for a number of smaller works allow for an increase in effluent loads. Provided that the loads do not increase substantially, they do not pose risks to the proposed SWQOs.

Low levels of dissolved oxygen, which occur naturally and are not associated with pollution, are a problem in parts of the catchment. For some river stretches, the rules used in developing SWQO proposals may sometimes suggest an SWQO of RE3 or RE4 for dissolved oxygen, whereas all other measures of water quality suggest an SWQO of RE1 or RE2. This complicates setting objectives, because some stretches need an SWQO of RE1 to protect overall quality, and fish stocks do not appear to be harmed by dissolved



oxygen concentrations consistent with RE3 provided that they are not caused by pollution. These factors can lead to the situation, for example, where the RQO is RE1 or RE2, but the current quality, and the proposed SWQO, is RE3 or RE4. In these cases, a longer-term of RE1 or RE2 may be proposed.

The NRA takes account of these details in the decisions it makes to protect water quality. We shall not, for example, allow other aspects of water quality (Appendix 1) to decline to the levels associated with RE3 and RE4. We shall also recognise where there is limited scope to get dissolved oxygen to the level associated with RE1 or RE2.

Further details of the proposed SWQOs for each river stretch are contained in Appendix 1.

#### **Compliance with Proposed SWQOs**

Map 4 compares current water quality with the proposed SWQOs for 35 stretches of river. (Where two-tier SWQOs are proposed, the interim SWQO provides the basis for this assessment.)

The colour scheme used in the map is:

- Blue (compliant) indicates that the river stretch complies with its target (less than or equal to 50% confidence of failure)
- Yellow (marginal) indicates that, although the river stretch complies with its target, there is a risk that it might fail to comply (between 50-95% confidence of failure)
- Red (failure) indicates that the river stretch does not comply with its target, and that this non-compliance is unlikely to be due to statistical chance (greater than 95% confidence of failure)

The small diagrams alongside the failing or marginal stretches depict those aspects of water quality which do not meet the standards. The rules for assessing compliance are set out exactly in *Water Quality Objectives: Procedures Used by the National Rivers Authority for the Purpose of the Surface Waters (River Ecosystem) (Classification) Regulations 1994*. This is available from

the contact given at the foot of the Introduction page.

All the data used for Map 3 are on the Public Registers. The data for Stretch 1 were a combination of those from the old monitoring point, now redundant, and its replacement. For Stretch 32, Reach Lode, data from 1992 and 1993 have been omitted. The data from this period are atypical and influenced by natural conditions beyond the NRA's control.

Where compliance is marginal, or where a failure is noted, the actions available to rectify the problem and deliver the proposed SWQO are set out in Appendix II. In Maps 2, 3 and 4 the stretches are numbered for ease of comparison with Appendix I and Appendix II. The names of the rivers are on Map 1.

## **ASSESSMENT OF THE COSTS AND BENEFITS**

### **Costs**

Several million pounds investment by Anglian Water Services is planned for Cambridge Sewage Treatment Works. The purpose of this is to improve the quality of the discharge to the Cam. This expenditure is committed and has been justified as part of the national negotiations with the Water Industry on future charges for water.

### **Benefits**

The proposed SWQOs aim to maintain water quality or to reflect improvements from the investment at Cambridge Sewage Treatment Works.

In each stretch, one or more of the following uses apply.

- irrigation and livestock watering;
- fisheries;
- the ecology of the river;
- recreation (boating, canoeing, walking, bird watching, etc;)
- amenity; and
- tourism.

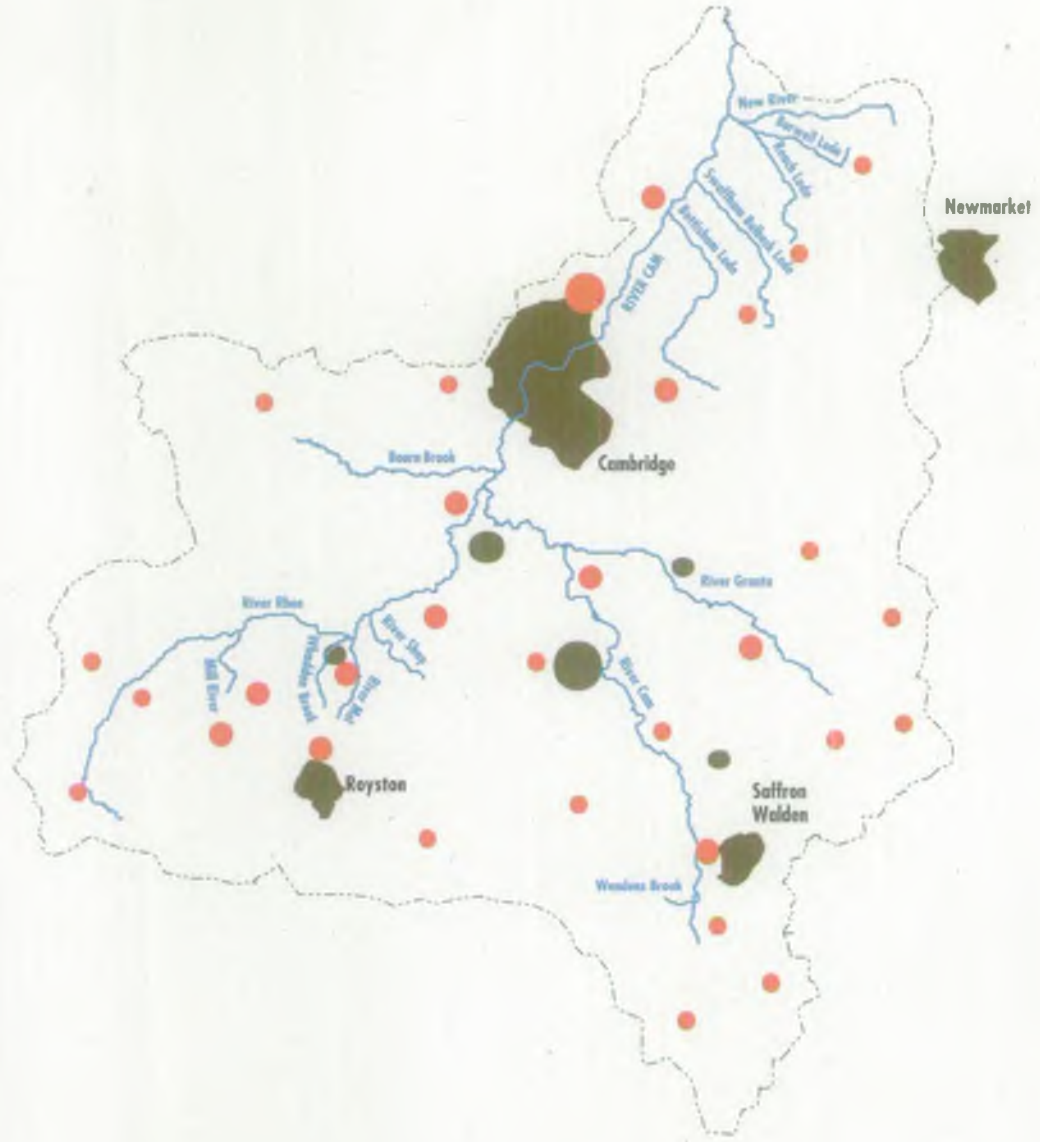
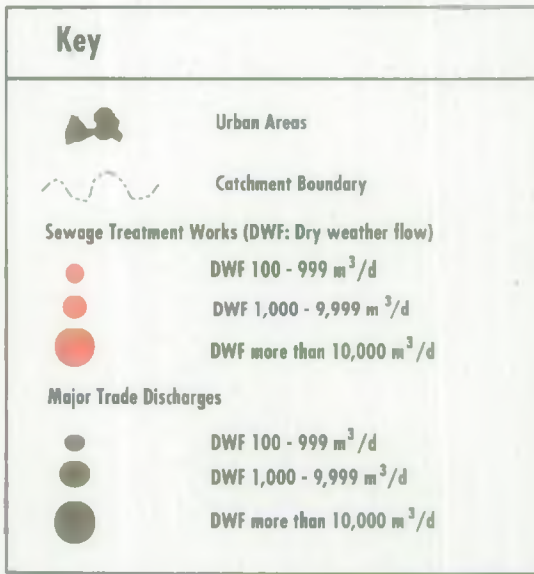
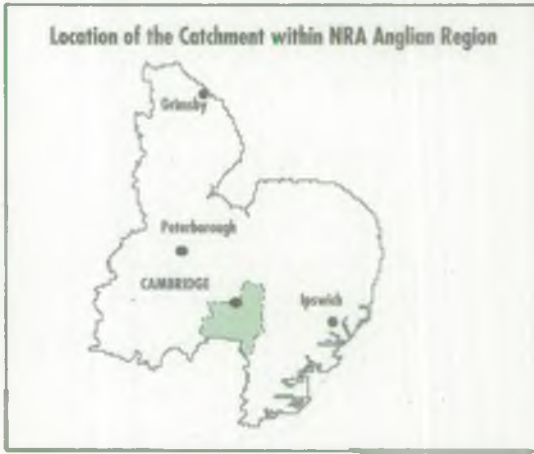
The tables in Appendix II indicate the uses that are protected and the benefits associated with the proposed SWQOs.

### **Comparison of Costs and Benefits**

Given the high recreational use and tourism value of the river, and the provision of good quality angling to a large local population, we believe that these benefits significantly outweigh the costs involved in achieving the necessary level of water quality.







# THE CAM CATCHMENT

MAP 1: OVERVIEW OF THE CATCHMENT



# THE CAM CATCHMENT

## MAP 2: PROPOSED SWQOs

Key	
<b>River Ecosystem Class</b>	
	RE1
	RE2
	RE3
	RE4
	RE5
	<b>Stretch Numbers</b>
	Indicates where a longer-term SWQO is proposed (see Map 3).
<b>Notes:</b>	SWQOs have a target date of 1996 unless otherwise indicated on the map.












# THE CAM CATCHMENT

## MAP 3: LONGER-TERM SWQOs

Key	
River Ecosystem Class	
	RE1
	RE2
	RE3
	RE4
	RE5
	Stretch Numbers
	Indicates a longer-term SWQO
<p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>● Longer-term SWQOs will have a target date of 2006.</li> <li>● A river stretch with no longer-term SWQO is coloured according to its 1996 SWQO (see Map 2).</li> </ul>	



# THE CAM CATCHMENT

## MAP 4: COMPLIANCE WITH SWQOs

Key	
	Compliant
	Marginal
	Failure
	Stretch Numbers
RE	Proposed SWQO
[*]	Indicates where a longer-term SWQO is proposed (see Map 3).
Limiting Determinands	
	Compliant Marginal Failure





## GLOSSARY

**Action Plan**

A document produced by the NRA as a result of a Catchment Management Plan (ibid). It lists the actions required in the next 5 - 10 years.

**Aquifer**

Layers of underground porous rock which contain water and allow water to flow through them.

**ATU**

Allyl Thio-Urea. See Biochemical Oxygen Demand.

**Ammonia (or Total Ammonia)**

A chemical found in water often as the result of pollution by sewage effluent. Ammonia affects fisheries and abstractions for potable water supply.

**AMP2**

An acronym for Asset Management Plan, Number 2. These are the plans of the Water Companies for future investment. This expenditure is committed and has been justified as part of the national negotiations with the Water Industry on future charges for water. See also Statutory Expenditure and Discretionary Expenditure.

**BOD and BOD(ATU)****Biochemical Oxygen Demand**

A measure of the amount of oxygen consumed in water, usually by organic pollution (ibid). Oxygen is vital for life so the measurement of the BOD tests whether pollution could affect aquatic animals. The value can be misleading because much more oxygen is taken up by Ammonia (ibid) in the test than in the natural water. This effect is suppressed by adding a chemical (Allyl Thio-Urea) to the sample of water taken for testing. Hence BOD(ATU).

**Catchment**

The area of land over which rainfall drains to the river.

**Catchment Management Planning**

The consultative process by which the NRA plans to meet all the issues in any catchment, and not just water quality and RQOs. It involves the production of a Consultation Report

and liaison with local people in forming an Action Plan (ibid). One outcome of the process is draft proposals for SWQOs (ibid).

**Classified River or Classified Watercourse**

Rivers big enough to be included in the national quinquennial reports on river water quality. Generally these are rivers whose flow is bigger than about 5 million litres per day, though smaller rivers may be included if they are particularly important. Only classified rivers are being considered for SWQOs (ibid), though all rivers can have RQOs (ibid).

**Combined Sewer Overflows**

Most sewers receive flows of sewage and flows of rainfall that run off our roads and paved areas. After heavy rainfall, the flows in the sewer may exceed the capacity of the sewers or the capacity of sewage treatment works. Combined Sewer Overflows allow the diluted and excess flows to discharge to a receiving water. The conditions under which flows may overflow into receiving waters are specified in the Consent (ibid).

**Compliance Assessment**

A procedure applied to the results of a monitoring programme to determine whether a water has met its Quality Standards (ibid).

**Confidence of Failure**

The outcome from compliance assessment (ibid). This might conclude with the statement, for example, that we are 93% certain of failure - the Confidence of Failure is 93%. We are often less than 100% sure of failure because we cannot monitor continuously everywhere.

**Consent**

A statutory document issued by the NRA which defines the legal limits and conditions on the discharge of an effluent to a water.

**Copper**

See *Dissolved Copper*.

**CSO**

An acronym for Combined Sewer Overflow (ibid).

**Cyprinid Fish**

Coarse fish belonging to the carp family (roach, dace, bream, etc).

**Dangerous Substances Directive**

Substances defined by the European Commission as in need of special control because they are toxic, accumulate in plants or animals and are persistent. Subjects of the Dangerous Substances Directive (76/464/EEC).

**Directive**

A type of legislation issued by the European Community which is binding on Member States in terms of the results to be achieved but which leaves to Member States the choice of methods.

**Discretionary Expenditure**

A special category within AMP2 (ibid) for expenditure over and above Statutory Expenditure (ibid). Discretionary Expenditure is targeted at meeting a specific national set of environmental improvements.

**Dissolved Copper**

A metal, toxic to fish.

**Dissolved Oxygen**

The amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is a test of the health of a river.

**Freshwater Fish Directive**

A Directive (ibid) that sets water quality standards for rivers designated as freshwater fisheries (78/659/EEC).

**Fisheries Directive**

The Freshwater Fish (ibid) Directive (ibid) (78/659/EEC).

**General Quality Assessment (GQA)**

The NRA's way of placing waters in categories according to assessments of water quality based on measurements of BOD, Dissolved Oxygen and Ammonia. Used for the national reporting of trends.

**Hardness**

A measure of the dissolved minerals in water. Important because this affects the toxicity of Copper and Zinc (ibid).

**Invertebrates**

Animals which lack a vertebral column. They include, for example, insects, crustaceans, worms and molluscs.

**MAFF**

Ministry of Agriculture Fisheries and Food.

**mg/l**

Unit of concentration: Milligrammes per litre.

**mg/l CaCO<sub>3</sub>**

Unit of concentration: Milligrammes per litre (expressed as Calcium Carbonate).

**mgN/l**

Unit of concentration: Milligrammes per litre (expressed as nitrogen).

**MI/d**

Unit of river flow, megalitres per day - millions of litres per day.

**Percent Saturation**

**(% saturation)**

Unit of measurement for Dissolved Oxygen. The amount of oxygen expressed as a proportion of the maximum which can be dissolved in pure, sterile, water.

**Percentile**

A level of water quality, usually a concentration, which is exceeded for a set percentage of the time. Hence: 90-percentile (ibid).

**pH**

A measure of the acidity of water.

**90-percentile**

A level of water quality, usually a concentration, which is exceeded for 10-percent of the time. Similarly, 95-percentile and 10-percentile.

**90-percentile Standard**

A level of water quality, usually a concentration, which must be achieved for at least 90-percent of the time. Similarly, 95-percentile and 10-percentile.

**Organic Pollution**

A term used to describe the type of pollution which through the action of bacteria consumes the Dissolved Oxygen (ibid) in rivers. It applies to the effects of sewage, treated sewage

effluent, farm wastes and the waste from many types of industry like dairies, breweries and abattoirs. The effects of organic pollution are described by the levels of BOD, Ammonia and Dissolved Oxygen (ibid).

**River Quality Objective (RQO)**

The category of water quality that a body of water should match, usually in order to be satisfactory for use (ibid) as a fishery or water supply etc. Mostly expressed as the River Ecosystem Class.

**Quality Standard**

A level of a substance or any calculated value of a measure of water quality which must be bettered. The pairing of a specific concentration or level of a substance with a summary statistic like a 90-percentile (ibid).

**Salmonid Fish**

Game fish of the Salmon Family (trout, salmon, etc).

**Sites of Special Scientific Interest**

A legal designation applied by English Nature/Countryside Council for Wales to land of particular importance for nature conservation.

**SSSI**

Acronym for Site of Special Scientific Interest (ibid).

**Statistically significant**

A description of a conclusion which has been reached after making proper allowance for the effects of random chance.

**Statutory Expenditure**

AMP2 (ibid) expenditure which is mainly aimed at meeting legal duties, especially those imposed by European legislation. For sewage treatment, it is dominated by the requirements of the Directive on Urban Waste Water Treatment (ibid).

**Statutory Water Quality Objective (SWQO)**

A Quality Objective given a statutory

basis by Regulations made under the Water Resources Act 1991.

**STW**

Acronym for Sewage Treatment Works.

**Surface Water Abstraction (Directive on)**

A Directive (ibid) that sets water quality standards for surface waters used, after treatment, as a supply of drinking water to the public (75/440/EEC).

**Total Ammonia**

See Ammonia.

**Total Zinc**

A metal, toxic to fish.

**Unionised Ammonia**

A species of Ammonia (ibid). A small component of the amount of Total Ammonia which is particularly toxic to fish and which therefore has its own standard.

**Urban Waste Water Treatment**

**(Directive on)**

A Directive that sets standards for discharges from sewage treatment works and sewerage systems (and similar discharges). The Directive also sets out the dates by which the standards must be achieved.

**Use**

Attributes of a river like a fishery or a water supply.

**Use-related Objective**

An aim to achieve a particular Use (ibid).

**Use-related Standards**

Water quality standards needed to protect a Use (ibid).

**µg/l**

Unit of concentration: Microgrammes per litre - one millionth of a gramme per litre.

**Zinc**

See Total Zinc.

## APPENDIX 1: PROPOSED SWQOs FOR THE CAM CATCHMENT

RIVER STRETCH	NAME OF WATERCOURSE	START OF STRETCH	MAP REFERENCE	END OF STRETCH	MAP REFERENCE	LENGTH OF STRETCH (km)	PROPOSED SWQOs (with date)
1	River Cam	Debden Water	TL5225034500	The Slade, Audley End	TL5220038500	4.3	RE3 (1996); RE2 (2006)
2	River Cam	The Slade, Audley End	TL5220038500	Little Chesterford	TL5140041900	3.8	RE3 (1996); RE2 (2006)
3	River Cam	Little Chesterford	TL5140041900	Duxford	TL4830046300	6.4	RE2 (1996)
4	River Cam	Duxford	TL4830046300	Sawston Paper Mill	TL4700049300	4.3	RE2 (1996)
5	River Cam	Sawston Paper Mill	TL4700049300	River Granta	TL4640051500	3.1	RE4 (1996); RE2 (2006)
6	River Cam	River Granta	TL4640051500	A10 Bridge	TL4315052750	4.3	RE2 (1996)
7	River Cam	A10 Bridge	TL4315052750	River Rhee	TL4285054000	1.5	RE3 (1996)
8	Wendons Brook	M11	TL5085036250	River Cam	TL5195036150	1.3	RE2 (1996)
9	River Granta	Bartlow	TL5835045150	Fish Pond Moat, Little Linton	TL5515047800	4.8	RE2 (1996); RE1 (2006)
10	River Granta	Fish Pond Moat, Little Linton	TL5515047800	A11 Bridge	TL5210049200	4.1	RE2 (1996)
11	River Granta	A11 Bridge	TL5210049200	Bridge, Babraham	TL5110050100	1.5	RE3 (1996); RE2 (2006)
12	River Granta	Road Bridge, Babraham	TL5110050100	River Cam	TL4640051500	5.3	RE4 (1996); RE2 (2006)
13	River Rhee	Ashwell Village	TL2700039800	Hooks Mill	TL2670045400	8.7	RE2 (1996)
14	River Rhee	Hooks Mill	TL2670045400	Mill River	TL3200047800	6.3	RE2 (1996)
15	River Rhee	Mill River Meldreth	TL3200047800	Whaddon Brook	TL3680047650	1.3	RE2 (1996)
16	River Rhee	Whaddon Brook	TL3680047650	Barrington	TL4020049500	4.2	RE3 (1996); RE2 (2006)
17	River Rhee	Barrington	TL4020049500	Cantelupe Farm	TL4285054000	6.5	RE3 (1996); RE2 (2006)
18	Mill River	Litlington	TL3110043200	River Rhee	TL3200047800	4.0	RE3 (1996)
19	Whaddon Brook	Meldreth Road	TL3575045000	River Rhee	TL3700047600	3.8	RE4 (1996)
20	River Mel	Melbourn Road	TL3750044000	Railway Bridge	TL3790045800	2.5	RE2 (1996)
21	River Mel	Railway Bridge	TL3790045800	River Rhee	TL3720047650	2.3	RE2 (1996)
22	River Shep	Black Peak	TL4040044800	River Rhee	TL3965049500	5.1	RE3 (1996); RE2 (2006)
23	Bourn Brook	Wimpole Way	TL3465056100	B1046 Bridge	TL3565055750	1.2	RE4 (1996); RE3 (2006)
24	Bourn Brook	B1046 Bridge	TL3565055750	M11 Bridge	TL4265054750	7.9	RE3 (1996)
25	Bourn Brook	M11 Bridge	TL4265054750	River Cam	TL4355054650	1.2	RE4 (1996); RE3 (2006)
26	River Cam	Cantelupe Farm	TL4285054000	Newnham College	TL4480057450	4.3	RE2 (1996)
27	River Cam	Newnham College	TL4480057450	A45 Bridge	TL4835061600	7.1	RE3 (1996)
28	River Cam	A45 Bridge	TL4835061600	Swaffham Bulbeck Lode	TL5220067200	7.0	RE3 (2000)
29	River Cam	Swaffham Bulbeck Lode	TL5220067200	Old West River	TL5355074600	8.3	RE3 (1996)
30	Bottisham Lode/ Quy Water	Fulbourn Fen, Teversham	TL5110058000	River Cam	TL5100065850	9.6	RE4 (1996); RE3 (2006)
31	Swaffham Bulbeck Lode	Bottisham	TL5515060900	River Cam	TL5220067200	8.2	RE3 (1996)
32	Reach Lode	Swaffham Prior	TL5625064400	Burwell Lode	TL5475069300	5.8	RE4 (1996); RE3 (2006)
33	Burwell Lode	Little Fen	TL5925068850	Priory Farm	TL5635069000	3.7	RE3 (1996)
34	Burwell Lode	Priory Farm	TL5635069000	River Cam	TL5360069950	2.9	RE2 (1996)
35	New River	B1102 Bridge	TL6085069550	Burwell Lode	TL5420069650	7.5	RE2 (1996); RE1 (2006)



**APPENDIX II: SUMMARY OF COSTS, BENEFITS AND ISSUES**

**RIVER STRETCHES 1-8:**

These stretches of the Cam and Wendons Brook run through an area of arable farmland with many riverside villages. The proposed SWQOs with a target date of 1996 are based on maintaining current water quality. Current water quality in stretches 1, 2 and 5 puts at risk the achievement of the proposed SWQOs.

**PROPOSED COSTS:**

No planned investment to meet SWQOs with a target date of 1996.

Investment is required at Sawston Sewage Treatment Works (STW) to minimise the risk that the effluent will cause failure of the proposed longer-term SWQO of RE2 (2006) for stretch 5. Improvements to the works are estimated to cost less than £5 million.

<b>BENEFITS</b>	<b>POTABLE SUPPLIES</b>	<b>AGRICULTURAL &amp; INDUSTRIAL ABSTRACTION</b>	<b>FISHERIES</b>	<b>RIVER ECOSYSTEM</b>	<b>RECREATION</b>	<b>AMENITY &amp; AESTHETICS</b>	<b>TOURISM</b>
	Low	Medium	High	High	High	High	Medium

**SUBSTANTIVE BENEFITS:**

**FISHERIES:**

The habitat in the stretches upstream of Duxford is suitable for brown trout and the river supports a managed trout fishery. The stretches below Duxford support a high quality coarse fishery which is popular with anglers. A deterioration in water quality would threaten the spawning and recruitment of brown trout in the upper reaches and adversely effect the trout fishery. It could also threaten the coarse fishery in the lower stretches.

**RIVER ECOSYSTEM:**

Aquatic plant and animal communities vary between average to high diversity and a deterioration in water quality may have an adverse impact on these and the fisheries which they support.

**AMENITY/AESTHETICS:**

The river has important aesthetic and amenity value where it passes through an impounded section in landscaped gardens at the popular National Trust attraction of Audley End mansion. In other parts of the catchment, there is moderate public access and several lengths of riverside footpaths which are important for recreation and amenity.

**IRRIGATION:**

There is agricultural abstraction for spray irrigation and livestock watering throughout, and there are also abstractions for industry.

**OTHER ISSUES:**

During periods of low flow, some stretches may have low concentrations of dissolved oxygen. This is the result of natural processes and is not indicative of pollution. The stretches which have SWQOs, with 1996 target dates, that are less stringent than existing RQOs have so because of this phenomenon. The longer-term SWQOs will continue as targets for planning purposes and this will serve to protect against planned deteriorations in water quality.

**RIVER STRETCHES 9-12:**

These stretches of the Granta run through a rural area of arable farmland. Proposed SWQOs with a target date of 1996 are based on maintaining current water quality. Current water quality in stretches 9, 11 and 12 puts at risk the achievement of the proposed longer-term SWQOs.

**PROPOSED COSTS:**

No planned investment to deliver compliance with proposed SWQOs with a target date of 1996.

<b>BENEFITS</b>	<b>POTABLE SUPPLIES</b>	<b>AGRICULTURAL &amp; INDUSTRIAL ABSTRACTION</b>	<b>FISHERIES</b>	<b>RIVER ECOSYSTEM</b>	<b>RECREATION</b>	<b>AMENITY &amp; AESTHETICS</b>	<b>TOURISM</b>
	Low	Medium	Medium	High	Medium	Medium	Low

**SUBSTANTIVE BENEFITS:****RIVER ECOSYSTEM/FISHERIES:**

The Granta has a high aquatic diversity and the headwaters support rare invertebrate species. The river is not used as a fishery, but supports small breeding populations of brown trout in the upper stretches and tributaries. Maintenance of water quality is essential to conserve the aquatic plants and invertebrates and to ensure continued spawning and maintenance of fish stocks.

**AMENITY/AESTHETICS:**

The river flows through the villages of Linton and Hildersham and has public access and footpaths along much of its length. A deterioration in water quality could adversely effect the aesthetic and amenity value of the river.

**IRRIGATION:**

Water is abstracted for agricultural uses including spray irrigation and livestock watering.

**OTHER ISSUES:**

Stretch 10 currently meets the proposed SWQO of RE2. There is a risk that the proposed SWQO will not be achieved if the current quality of Linton Sewage Treatment Works effluent deteriorates to the legally consented limits. The risk of this situation arising is considered low provided current levels of operational maintenance are continued and only modest population growth occurs in Linton and other villages served by Linton Sewage Treatment Works. The South Cambridgeshire District Council Local Plan identifies only limited rural growth for this locality.

During periods of low flow some stretches may have low concentrations of dissolved oxygen. This is the result of natural processes and is not indicative of pollution. The stretches which have proposed SWQOs, with 1996 target dates, that are less stringent than their existing RQOs have so because of this phenomenon. Longer-term SWQOs will continue to be used by the Environment Agency as the basis for consenting and other water quality planning activities.

**RIVER STRETCHES 13-22:**

These stretches of the River Rhee and its tributaries flow through the intensive cereal growing areas of the chalk land between Royston and Cambridge. Proposed SWQOs with 1996 target dates are based on maintaining current water quality. Where longer-term SWQOs are proposed (stretches 16, 17 and 22), these are generally consistent with existing RQOs

**PROPOSED COSTS:**

No planned investment.

<b>BENEFITS</b>	<b>POTABLE SUPPLIES</b>	<b>AGRICULTURAL &amp; INDUSTRIAL ABSTRACTION</b>	<b>FISHERIES</b>	<b>RIVER ECOSYSTEM</b>	<b>RECREATION</b>	<b>AMENITY &amp; AESTHETICS</b>	<b>TOURISM</b>
	Low	Medium	High	High	Medium	High	Low

**SUBSTANTIVE BENEFITS:**

**RIVER ECOSYSTEM/FISHERIES:**

The chalk spring source of the River Rhee in the village of Ashwell is a designated SSSI. Another important water-dependent SSSI is the Fowlmere site at the head of the River Shep. Brown trout have been recorded in the upper Rhee, Mill River, River Mel and River Shep. Lower stretches of the Rhee hold excellent stocks of coarse fish.

**AMENITY/AESTHETICS:**

The springs and headwater are also an important aesthetic feature in Ashwell, which is a popular conservation village.

**IRRIGATION:**

Throughout most parts of the Rhee system, water is abstracted for spray irrigation and also used for livestock watering. Water from the River Shep supports a trout farm.

**OTHER ISSUES:**

Stretch 18, Mill River, currently complies with the proposed SWQO of RE3 (1996). There is a risk that the proposed SWQO will not be met if the current effluent quality of Litlington Sewage Treatment Works deteriorates to the legally consented limits. The risk of this situation arising is low provided current levels of operational maintenance are continued and spare capacity exists following the removal of a major trade effluent discharge. Only minimal population growth from infill settlement is identified in the South Cambridgeshire District Council Local Plan.

Stretch 19, Whaddon Brook, currently complies with the proposed SWQO of RE4 (1996). There is a risk that the proposed SWQO will not be met if the current effluent quality of Royston deteriorates to the legally consented limits. The risk of this situation arising is considered low provided that current levels of operational maintenance are continued. Only modest population growth is identified for Royston in the North Hertfordshire District Local Plan.

Stretch 21, River Mel, currently complies with the proposed SWQO of RE2 (1996). There is a risk that the proposed SWQO will not be met if the current effluent quality of Melbourn Sewage Treatment Works deteriorates to the legally consented limits. The risk of this situation arising is considered low provided that current levels of operational maintenance are continued. The South Cambridgeshire District Council Local Plan identifies only limited rural growth.

During periods of low flow, some stretches may have low concentrations of dissolved oxygen. This is the result of natural processes and is not indicative of pollution. The stretches which have proposed SWQOs, with 1996 target dates, that are less stringent than their existing RQOs have so because of this phenomenon. Longer-term SWQOs will continue to be used by the Environment Agency as the basis for consenting and other water quality planning activities.



**RIVER STRETCHES 23-25:**

These stretches of Bourn Brook flow through a rural area of clay land used for arable farming and with some intensive livestock farms.

Proposed SWQOs with target dates of 1996 are based on maintaining current water quality. Current water quality in stretches 23 and 25 puts at risk the achievement of the proposed longer-term SWQOs of RE3.

**PROPOSED COSTS:**

No planned investment to meet SWQOs with 1996 target dates.

Investment is required at Bourn Sewage Treatment Works (STW) to minimise the risk that the effluent will cause failure of the proposed longer-term SWQO for stretch 23. Improvements to the works are estimated to cost up to £1 million.

BENEFITS	POTABLE SUPPLIES	AGRICULTURAL & INDUSTRIAL ABSTRACTION	FISHERIES	RIVER ECOSYSTEM	RECREATION	AMENITY & AESTHETICS	TOURISM
	Low	Medium	Medium	High	Low	Medium	Low

**SUBSTANTIVE BENEFITS:****FISHERIES:**

The brook supports a moderate coarse fish population and is used for angling in the wider lower stretches near the confluence with the river Cam.

**RIVER ECOSYSTEM:**

Plant and animal diversity in the river itself and the associated river corridor are average. Habitat enhancements have been carried out to encourage otters which are beginning to establish populations in the catchment. Maintenance of water quality is necessary to protect the existing plant and animal communities.

**AMENITY/AESTHETICS:**

The brook has moderate public access near roads and footpath crossings. Any deterioration in water quality may have an adverse impact on amenity and aesthetic value.

**IRRIGATION:**

Water is abstracted for spray irrigation and also used for livestock watering.

**OTHER ISSUES:**

Stretch 23 currently meets the proposed SWQO of RE4 and falls short of the long term SWQO of RE3. The proposed SWQO of RE4 may not be achieved if the current effluent load from Bourn Sewage Treatment Works increases to the legal consent limits. The risk of not meeting this is low provided current operational practice continues and only modest population growth occurs at Bourn and other villages served by Bourn Sewage Treatment Works. The South Cambridgeshire District Council Local Plan identifies only group and infill development in Bourn.

Most years, during periods of low flow some stretches have low dissolved oxygen concentrations. This effect is the result of natural processes in the watercourse and is not indicative of pollution. The stretches, which have proposed SWQOs that are less stringent than the existing RQOs, are affected by this phenomenon. The long-term SWQOs are targets for planning purposes and in all cases are only non-compliant for dissolved oxygen. Hence, they will serve to protect against deteriorations in water quality.

**RIVER STRETCHES 26 & 27:**

These stretches of the river Cam run through Grantchester and the city of Cambridge. The proposed SWQOs are based on maintaining current water quality.

**PROPOSED COSTS:**

No planned investment.

<b>BENEFITS</b>	<b>POTABLE SUPPLIES</b>	<b>AGRICULTURAL &amp; INDUSTRIAL ABSTRACTION</b>	<b>FISHERIES</b>	<b>RIVER ECOSYSTEM</b>	<b>RECREATION</b>	<b>AMENITY &amp; AESTHETICS</b>	<b>TOURISM</b>
	Low	Low	High	High	High	High	High

**SUBSTANTIVE BENEFITS:**

**AMENITY/AESTHETICS:**

The city of Cambridge is internationally known for its university and attracts around 3.5 million tourists annually from all over the world. The river provides an important amenity through Grantchester Meadows and the centre of the city of Cambridge.

The aesthetic and amenity value of the river are particularly important to tourism and recreation.

**TOURISM/RECREATION:**

Punting is a popular leisure activity for tourists, students and the local population. The lower stretch is navigable to pleasure craft and is important for the many rowing clubs which use it for training and competition. The River Cam is an important feature of the city and a major asset as a tourist attraction. A deterioration in water quality would adversely effect the aesthetic and amenity value of the river and reduce the suitability of the river for recreational use.

**RIVER ECOSYSTEM/FISHERIES:**

The river supports an excellent coarse fishery and is important for recreation as it provides free fishing in parts of the city.

Maintenance of current water quality is essential to protect the fishery and the aquatic plant and animal community which support it.

**IRRIGATION:**

There are minor abstractions for spray irrigation and the river is used for livestock watering.

**RIVER STRETCH 28:**

This stretch of the Cam flows from the outskirts of the City of Cambridge towards Waterbeach. Currently water quality marginally fails to meet the proposed SWQO of RE3 (2000).

**PROPOSED COSTS:**

Eight million pounds committed as an outcome of the recent national negotiations on charges for water.

<b>BENEFITS</b>	<b>POTABLE SUPPLIES</b>	<b>AGRICULTURAL &amp; INDUSTRIAL ABSTRACTION</b>	<b>FISHERIES</b>	<b>RIVER ECOSYSTEM</b>	<b>RECREATION</b>	<b>AMENITY &amp; AESTHETICS</b>	<b>TOURISM</b>
	Low	Low	High	High	High	High	Medium

**SUBSTANTIVE BENEFITS:****FISHERIES:**

The River Cam downstream of Cambridge is an important coarse fishery for roach, bream and pike. It supports an excellent stock of these species and is an important match angling venue. Currently the water quality is adversely affected by the impact of effluent from Cambridge Sewage Treatment Works and the fish populations are at risk. To prevent fish mortalities, fixed aerators are intermittently used to re-oxygenate the river. Improvement in water quality is essential to minimise the risk of fish mortalities and will eliminate the need for the aerators, and associated maintenance and operating costs.

**RIVER ECOSYSTEM:**

The aquatic animal community in this stretch is currently less diverse than would be typical for this type of the river. An improvement in water quality will protect and enhance the existing aquatic diversity.

**RECREATION:**

This stretch of the Cam is extensively used by pleasure craft and there are several moorings in the area. Part of the stretch is used for rowing and there are proposals to develop a rowing lake adjacent to this stretch of the river.

**AMENITY/AESTHETICS:**

There is good public access to the river via footpaths along this stretch. These provide a link to the City Centre and are extensively used by walkers and cyclists. The amenity and aesthetic value of the river is high and an improvement in water quality will ensure it is protected.

**TOURISM:**

The City of Cambridge attracts about 3.5 million tourists annually who contribute substantially to the local economy. Some of these visitors use the river for recreation, in particular boating and for riverside walks. An improvement in water quality will ensure and enhance the attractiveness of the river for tourists.

**RIVER STRETCH 29:**

This stretch of the River Cam flows through low lying fenland used for intensive arable farming. The proposed SWQO is based on maintaining current water quality.

**PROPOSED COSTS:**

No planned investment.

<b>BENEFITS</b>	<b>POTABLE SUPPLIES</b>	<b>AGRICULTURAL &amp; INDUSTRIAL ABSTRACTION</b>	<b>FISHERIES</b>	<b>RIVER ECOSYSTEM</b>	<b>RECREATION</b>	<b>AMENITY &amp; AESTHETICS</b>	<b>TOURISM</b>
	Low	High	High	High	High	High	Medium

**SUBSTANTIVE BENEFITS:**

**RIVER ECOSYSTEM/FISHERIES:**

The river supports a high diversity of plants and an excellent coarse fishery. It is popular for angling, especially match angling and in 1994 was one of the venues for the National Championships.

**IRRIGATION:**

The river provides water for spray irrigation of the surrounding intensively farmed fenland and is also used for livestock watering.

**RECREATION:**

Boating is a popular recreational activity on this stretch, which is extensively used by pleasure craft travelling between the cities of Ely and Cambridge, and two marinas are located on this stretch of the river.

**AMENITY/AESTHETICS:**

There is good public access via riverside footpaths.



**RIVER STRETCHES 30-35:**

These stretches are known as the Lodes. They rise from chalk springs and drain land on the edge of the Cambridgeshire Fens that is used for intensive arable farming.

Proposed SWQOs with 1996 target dates are based on maintaining current water quality.

Current water quality in stretches 30, 32 and 35 puts at risk the achievement of the proposed longer-term SWQOs.

**PROPOSED COSTS:**

No planned investment.

<b>BENEFITS</b>	<b>POTABLE SUPPLIES</b>	<b>AGRICULTURAL &amp; INDUSTRIAL ABSTRACTION</b>	<b>FISHERIES</b>	<b>RIVER ECOSYSTEM</b>	<b>RECREATION</b>	<b>AMENITY &amp; AESTHETICS</b>	<b>TOURISM</b>
	Low	Medium	High	High	High	Medium	Low

**SUBSTANTIVE BENEFITS:**

**FISHERIES:**

Burwell and Reach Lode support good quality coarse fish stocks. Burwell and Reach Lode are popular venues for pleasure and match fishing.

**RIVER ECOSYSTEM:**

New River supports a high diversity of aquatic plants and invertebrates. Water from the New River and Burwell Lode system is used to support the important Wicken Fen National Nature Reserve (NNR). This site relies on high quality water and supports a large number of rare plant and animal species. Wicken Fen is a unique site and a deterioration in water quality would have an adverse impact on the plant and animal communities it supports.

**AMENITY/AESTHETICS:**

Footpaths run alongside almost the entire length of the Lode system and provide excellent public access into a unique countryside area.

**IRRIGATION:**

In addition to the recreational activities of fishing and walking, Burwell Lode is navigable and is used by pleasure boats. Water from the Lodes is used for irrigation of intensively farmed fenland.

**OTHER ISSUES:**

During periods of low flow, some stretches may have low concentrations of dissolved oxygen. This is the result of natural processes and is not indicative of pollution. The stretches which have proposed SWQOs with 1996 target dates, that are less stringent than their existing RQOs, have so because of this phenomenon. Longer-term SWQOs will continue to be used by the Environment Agency as the basis for consenting and other water quality planning activities.



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