

# local environment agency plan

## RIVER DART CONSULTATION REPORT JUNE 1997



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## Foreword

The River Dart Local Environment Agency Plan (LEAP) aims to promote integrated environmental management of this important area of Devon. It seeks to develop partnerships with a wide range of organisations and individuals who have a role to play in the management of the River Dart.

This plan embodies the Agency's commitment to realise improvements to the environment.

An important stage in the production of the plans is a period of public consultation. This Consultation Report is being circulated widely both within and outside of the catchment and we are keen to draw on the expertise and interests of the local communities involved.

Please comment - your views are important, even if it is to say that you think particular issues are necessary or that you support the plan.

Following on from the Consultation Report an Action Plan will be produced with an agreed programme for the future protection and enhancement of this much loved area. We will use these Plans to ensure that improvements in the local environment are achieved.

*Geoff Bateman*

**GEOFF BATEMAN**

**Area Manager (Devon)**

Environment Agency  
Information Centre  
Head Office



### **Your Views**

We hope that this report will be read by everyone who has an interest in the environment of the River Dart Catchment. Your views will help us finalise the Action Plan.

Have we identified all the problems in the catchment?  
If not, we would like to know.

Are there any issues which you would like to highlight?

Please fill in the questionnaire provided and send your comments by  
**Friday 17 October 1997** to:

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Environment Planner - Devon Area  
Manley House  
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Devon EX2 7LQ

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**Published June 1997.**

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# 1. Introduction

## 1.1 The Environment Agency

The Environment Agency has been formed by bringing together the National Rivers Authority (NRA), Her Majesty's Inspectorate of Pollution (HMIP), the Waste Regulation Authorities (WRAs) and some units of the Department of the Environment (DoE) dealing with the technical aspects of waste and contaminated land.

### 1.1.1 Our Principal Aim

Our aim, as set out in the Environment Act 1995<sup>1</sup>, is to protect or enhance the environment, taken as a whole, in order to play our part in attaining the objective of sustainable development.

Sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs"<sup>2</sup>.

### 1.1.2 Our Objectives

The Environment Agency works towards sustainable development through seven objectives, set by Ministers:

- An integrated approach to environmental protection and enhancement, considering the impact of all activities and natural resources;
- Delivery of environmental goals without imposing excessive costs on industry or society as a whole;
- Clear and effective procedures for serving its customers, including the development of single points of contact with the Agency;
- High professional standards, using the best possible information and analytical methods;
- Organisation of its own activities to reflect good environmental and management practice, and provision of value for money for those who pay its charges, and for taxpayers as a whole;
- Provision of clear and readily available advice and information on its work;
- Development of a close and responsive relationship with the public, including local authorities, other representatives of local communities and regulated organisations.

### 1.1.3 The Role of the Environment Agency

**Flood Defence** has the role of protecting people and the developed environment from flooding by providing effective defences and protection of floodplains. Safeguarding life is our highest priority and to meet this aim we provide a flood forecasting and warning service. Flood Defence also aims to protect and enhance the natural environment by promoting works that are sustainable and work with nature.

The **Water Resource** function comprises the conservation, redistribution and augmentation of surface and groundwater supplies. It includes the powers to encourage water conservation and to promote transfer schemes and to balance the needs of water users and the environment by issuing licences for users to abstract water from rivers and boreholes.



The **Pollution Control** function includes:

- Integrated Pollution Control (IPC) regulating the most polluting, or technologically complex, industrial and other processes in air, on land or in water.
- Water quality and pollution control which prevents and controls pollution and monitors the quality of rivers, estuaries and coastal waters.
- Radioactive Substances regulating the disposal of radioactive material, including that from licensed nuclear sites, and regulating the accumulation, keeping and use of radioactive materials, except from licensed nuclear sites.
- Waste Regulation setting consistent standards for waste management practice to regulate the treatment, storage, movement and disposal of controlled waste. The Agency also has a requirement to register and monitor those who produce waste imposing obligations to reuse, recover, or recycle products and materials.
- Reporting on the extent of contaminated land and contributing to its management (primarily undertaken by local authorities).
- Abandoned mine operators are also required to work with the Agency so that steps can be taken to prevent minewater pollution in the future.

The Environment Agency is responsible for maintaining, improving and developing **Fisheries**. This is carried out by licensing, regulation and enforcement schemes which cover salmon, sea trout, non-migratory trout, coarse and eel fisheries. The Agency also carries out improvements to fisheries by improving the habitat, fish stocks and providing advice to fishery owners. The Agency is also the sea fisheries authority for tidal waters. We control commercial fishing for sea fish and shellfish in these waters.

The Agency must also take account of **Recreation** and access. Over 1000 sites in our control are managed for recreational use. We also have a general duty to promote the recreational use of water and land throughout England and Wales.

In fulfilling all its functions the Environment Agency is required to contribute to the **Conservation** of nature, landscape and archaeological heritage. We have a *regard* to conserving and enhancing flora, fauna, geological or physiographical features when carrying out our pollution control functions, and a duty to *further* conservation when carrying out our other functions. We also have a duty generally to promote the conservation of flora and fauna dependent on the aquatic environment.

The Environment Agency will **not** be dealing with:

- Waste collection and litter - responsibility remains with local authorities;
- Noise pollution - responsibility remains with local authorities' environmental health departments;
- Drinking water quality - responsibility remains with private water companies and local authorities;
- Public health;
- Those aspects of the control of air pollution which remain with local authorities'.
- Planning permission is the responsibility of the Local Authority who will contact us when necessary. The local authorities also deal with contaminated land issues in liaison with us.

## 1.2 Local Environment Agency Plans

Local Environment Agency Plans assist the Agency to achieve its objectives (above). The plans consider all elements of the environment which the Environment Agency has a role in regulating or can influence through its statutory powers or duties. These plans assist in planning the Agencies future activities, and the activities of those bodies, groups or individuals the Agency must work with in order to achieve its objectives. The plans aim to integrate and co-ordinate these activities. The plans are part of an ongoing dialogue between ourselves and the various organisations involved in the protection and management of the environment. This consultation report has already been the focus for discussions between ourselves and the Catchment Steering Group. This group consists of a range of organisations and individuals involved with the catchment environment. We will encourage this dialogue to continue with both the Steering Group and other interested parties. Following the consultation period, we will consider the responses received and will use them to help us develop an Action Plan which we will then publish. This is the key document in the Agency's local planning process as it will contain details of the main actions that we and other organisations will be carrying out over the next few years to address environmental issues in the catchment.

### 1.2.1 The Consultation Report

This report contains the following sections:

#### Part 1- The Management Plan

- **The Catchment Area** - provides a brief introduction to the area.
- **Issues and Proposed Actions** - highlights the environmental issues in the catchment and proposes actions to help to resolve them.

#### Part 2 - Supporting Information

- This section provides supporting information for the issues raised in Part 1.

### 1.2.2 Summary of Consultation, Action Plan and Annual Reviews

We will collate responses to this Report and distribute a Summary of Consultation in July 1997 to all those who responded. An Action Plan will then be published in December 1997. Each year we will review the progress that has been made with the actions identified in the Action Plan and publish an Annual Review. We will also report on any major new issues that may affect the way we manage the environment in this area. Within five years of publishing the Action Plan we will undertake a major review of the progress we have made.

### 1.2.3 Local Environment Agency Plans and Development Plans

We can control some of the factors influencing the quality of the environment, but we have limited control over the way that land is developed. This is the responsibility of local planning authorities.

Local authorities prepare statutory development plans (see Section 5.1 for more information). The policies in these plans will guide the way that land is developed in the future. We provide advice and guidance to local planning authorities and work with them to develop and adopt policies which minimise the impact of any development upon the environment. We will reinforce these policies, where we can, when commenting on planning matters or in making our own decisions. LEAPs are one way we aim to influence the content of Local Authority plans.

### 1.2.4 Local Environment Agency Plans and Non Statutory Plans

The protection and management of the environment requires the Agency and other organisations to work together in partnership. This Local Environment Agency Plan (LEAP) gives the basis for a greater understanding of the Agency's work, enabling such partnerships to be developed.

The Agency is working with various bodies which also seek to develop partnerships and collaborative work to manage and improve the environment. These include:

- Biodiversity Action Plan for Devons Rivers and Wetlands<sup>19</sup> -
- Dartmoor National Park Plan Second Review 1991<sup>3</sup>
- The Nature of Dartmoor: A Biodiversity Profile<sup>16</sup>
- Devon's Local Agenda 21 Network Issues Report<sup>4</sup>
- Lyme Bay and South Devon Shoreline Management Plan (in preparation)
- South Devon Area of Outstanding Natural Beauty (AONB) Management Plan (in preparation)
- Dart Estuary Management Plan (in preparation)

#### 1.2.5 Local Environment Agency Plans and Catchment Management Plans

This LEAP slots into a sequence of plans which were being prepared by the former National Rivers Authority (NRA) to cover all river catchments in England and Wales by the end of 1998. LEAPs will be used by us to cover the same topics as Catchment Management Plans but they will also deal with new topics to cover the full range of our responsibilities.

#### 1.2.6 Local Environment Agency Plans and the Catchment Steering Group

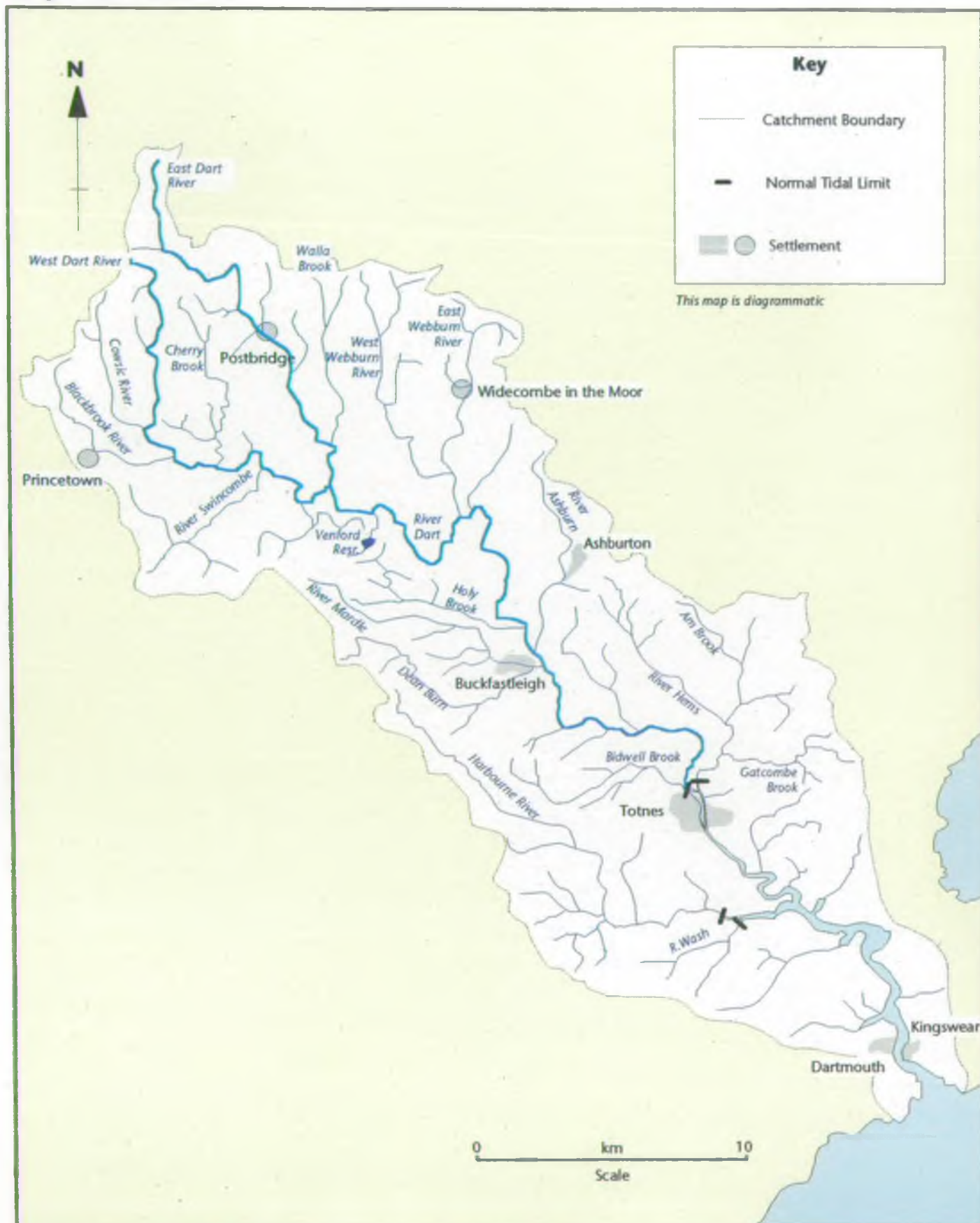
This group represents a range of commercial, local authority and environmental interests. The group comment upon the Consultation Report and Action Plan prior to public release. They will monitor the implementation of the Action Plan and provide us with specific advice on the importance of issues within the catchment. They act as a communication link between ourselves, our committees (including the Area Environment Group) and the local community, and will help to promote and develop initiatives of benefit to the environment within the catchment. The steering group members are:

Mrs M Tomlinson	Devon Area Environment Group
Mr D Pakes	Dart Fisheries Association
Mr I Scofield	Dart Angling Association
Mr M Brabin	Dartmoor Preservation Society
Ms S Goodfellow	Conservation, Dartmoor National Park Authority
Mr R Scoble	Netsmen
Mr J Darby	Farming, ADAS
Mr C Sturmer	Farming, Duchy of Cornwall
Mr E Gameson	South West Water Services Ltd
Mr R Humphreys	Dart Estuary Project Officer
Mr P Simpson	Riparian Owners, River Dart Country Park
Mr J Bloomer	South Hams District Council
Mr K Carter	South Hams District Council
Mr D Trout	Parish Councils
Mr D Ramsden	Conservation
Mr A Dutfield	Local Industry



# Part 1

**Map 1 River Dart**





## 2. The Catchment Area

Table 1 General catchment information

Area of catchment	475 km <sup>2</sup>
Length of 'controlled' water in catchment	210 km
Length 'main' river in catchment	28 km
Height of source	East Dart, approx. 545 m AOD; West Dart, approx. 535 m AOD
Average annual catchment rainfall	approx. 1760 mm
Total population (1991)	approx. 31,000
Major settlements	Dartmouth, Totnes, Buckfastleigh, Ashburton
Administrative districts	South Hams, West Devon, Teignbridge and Torbay

The River Dart is formed from the East and West Dart rivers that rise in the centre of North Dartmoor (see Map 1). The topography of the catchment is shown on Map 2.

The West and East Dart rivers rise on south-east Dartmoor. This is an upland granite mass that rises to over 600 m AOD. Dartmoor comprises open moorland with high rainfall and acid, peaty soils. Much of Dartmoor is used for extensive grazing by cattle, sheep and ponies. Many of the headwaters also provide valuable spawning grounds for salmonid fish.

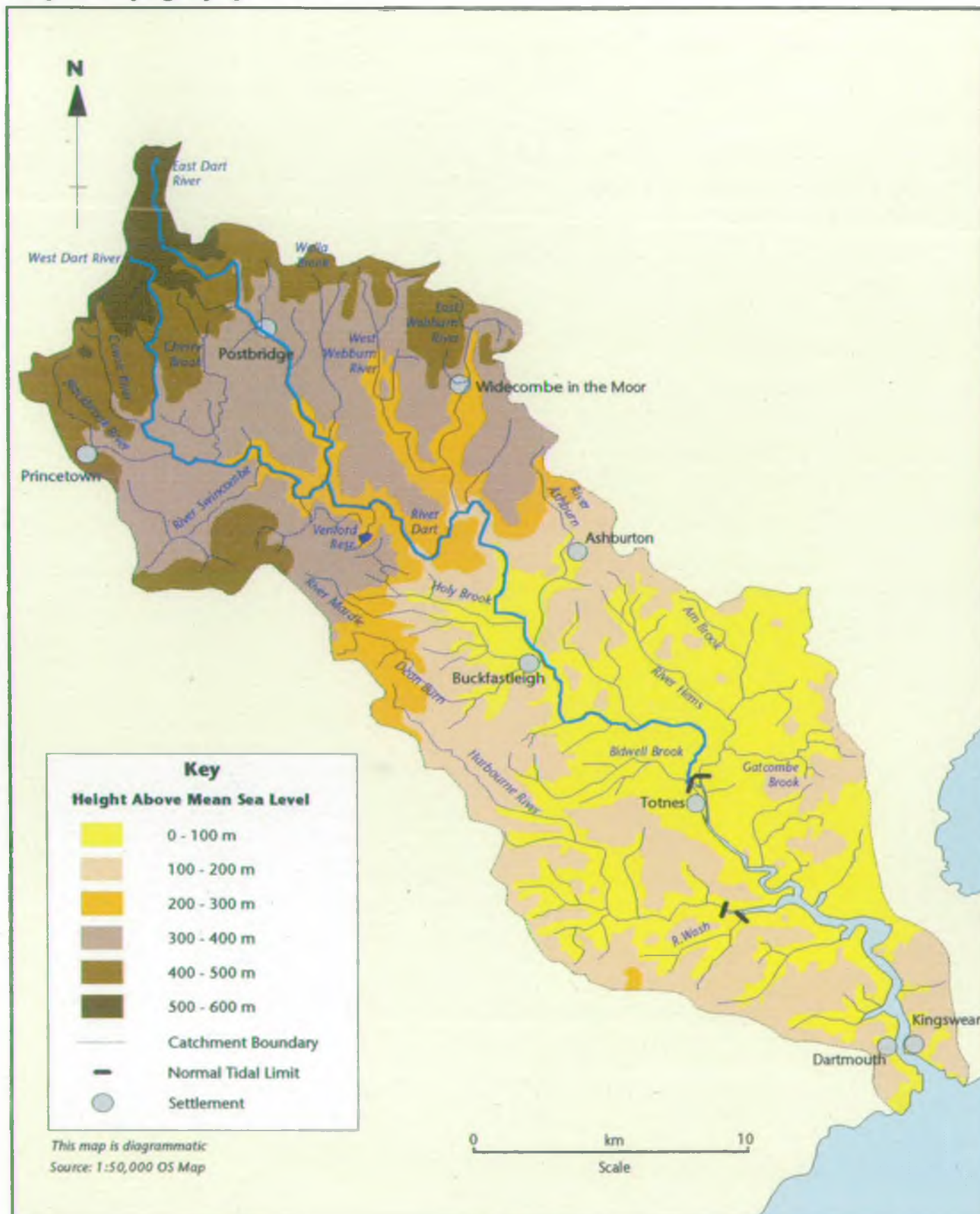
The perimeter of Dartmoor is typified by steep, undulating land with many of the valley sides comprising deciduous woodland. The area surrounding the open moorland is typified by small enclosures and is mainly used for small scale livestock farming. Field size becomes progressively larger as one moves away from the moorland.

The River Dart eventually flows under the A38 trunk road, close to Buckfastleigh. This not only marks the edge of Dartmoor National Park, but also serves as an approximate boundary between the granite mass and the relatively low lying but undulating area known as South Hams. This area is noted for its rich red soils which support more intensive livestock and arable farming. A number of watercourses (River Wash, River Hems, Bidwell Brook and Am Brook) have their source in this area. The River Dart continues through this area to its tidal limit at Totnes. The steep valley sides result in a minimal floodplain. Two major tributaries join the River Dart in its estuary, these are the River Hems and the Harbourne River.

Venford Reservoir is the only reservoir in the Dart Catchment. It is one of the smaller SWWSL public water supply reservoirs. There is a second public water supply abstraction on the lower dart at Littlehempston. The Littlehempston intake abstracts water both directly from the River Dart and from a suite of 'radial collectors' in the vicinity.

Industry in the catchment, apart from agriculture and tourism, is very limited. There is some light industry in the Totnes and Buckfastleigh area. Dartmouth and Dartmoor National Park are significant tourist destinations. Buckfast Abbey and the Dartington Cider Press Centre are very popular attractions, each attracting over half a million visitors every year.

**Map 2 Topography**

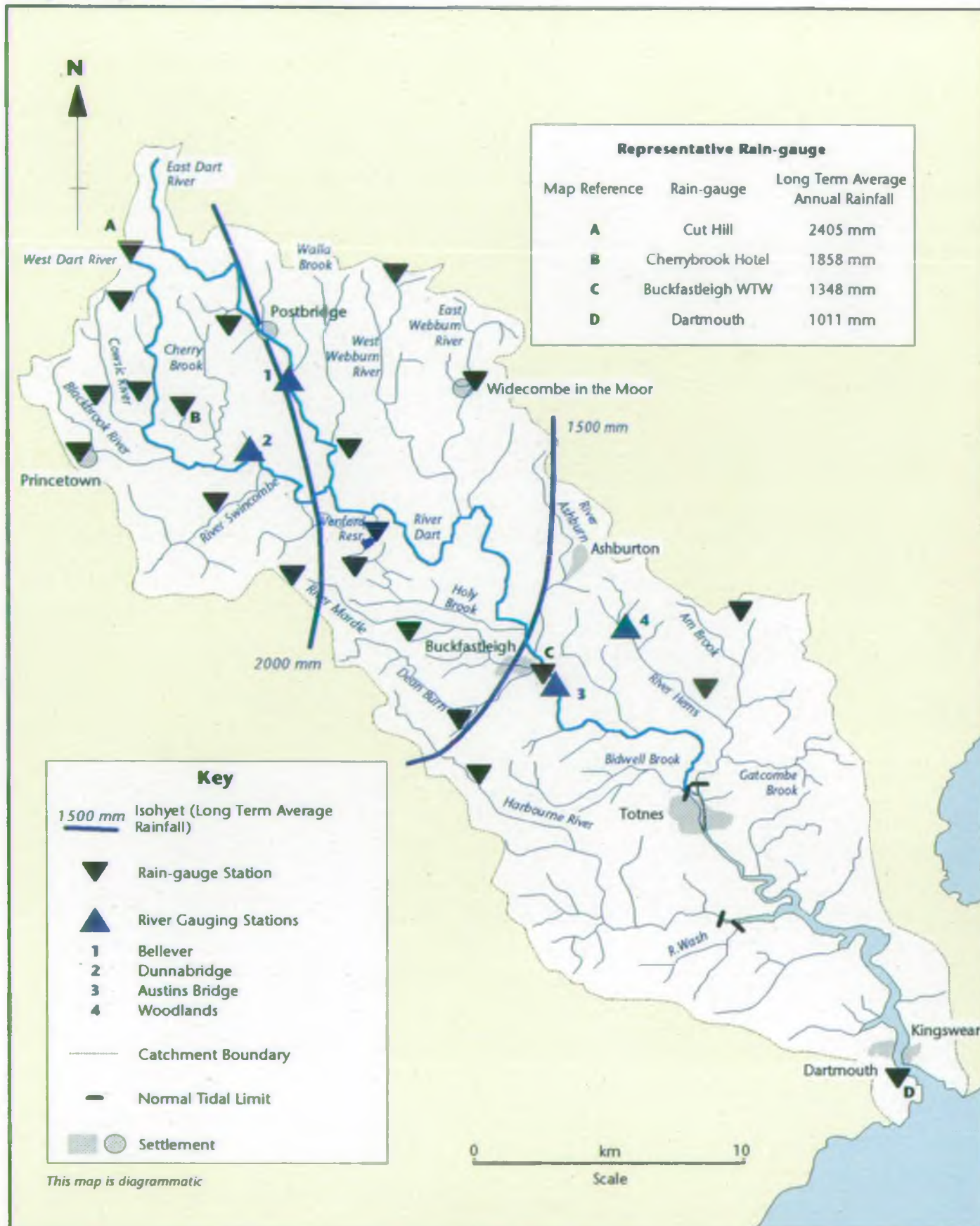




### Map 3 Simplified Geology



## Map 4 Hydrometric Network





## 2.1 Geology

Map 3 shows the geology of the catchment. The northern part of the catchment comprises the Dartmoor granite, whilst lower down where the East and West Dart rivers merge into one, the river flows over the rocks of the metamorphic aureole, where the strata have been altered. The cause of this alteration is the intrusion of the granite into the shales and subordinate sandstone's of the Carboniferous Culm Measures which resulted in a rise in temperature.

Around Buckfastleigh and southwards towards Totnes the softer Devonian slates and shales make up the underlying strata.

For its last 22 km, the river Dart initially trenches through the lava's, tuffs and sills of the Volcanics. The meandering course is, to a large extent, determined by the variation of hard and soft beds within the rocks. In places, large embayments are found (e.g. opposite Dittisham). These are due to the erosion of comparatively soft slaty shales which replace the volcanic rocks. Below Dittisham, the catchment is made up, in the main, of Lower Devonian hard grits and slates. The bed of the estuary above Dartmouth harbour consists of alluvial deposits. These have been found to a depth of about 30 m below low-water mark, indicating the erosive action of the river at a time when the land in the vicinity was at a much higher level relative to the sea.

## 2.2 Hydrogeology

There are no major aquifers within the catchment. However, usable groundwater is present both in the weathered zone and in fissures in the bedrock. As a result of this, the rocks have been classified as minor aquifers. Groundwater discharges from these minor aquifers provide for river baseflow during dry weather. Where mining has taken place significant additional drainage pathways will have been created within the rock, in shafts, tunnels and drainage adits.

There are no groundwater monitoring stations in the Dart Catchment.

## 2.3 Rainfall

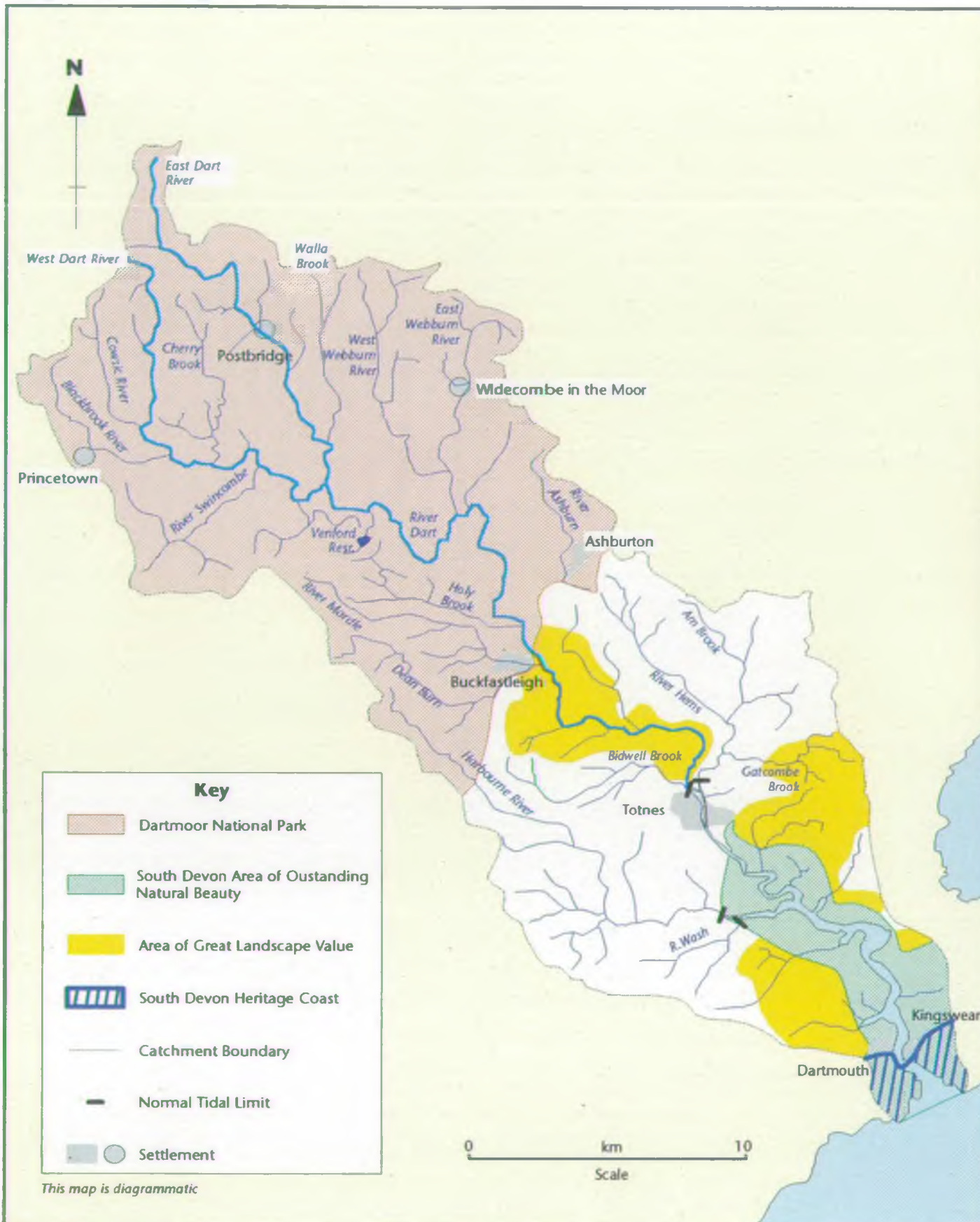
Map 4 shows the considerable contrast in rainfall between the wet high grounds of Dartmoor and the more sheltered low lying areas further south in the catchment. The wetter parts tend to be on the highest parts of the moor where average annual rainfall often exceeds 2300 mm and there is a gradual decline in rainfall towards the coast where there is an average annual rainfall of approximately 1000 mm.

The isohyets show the variation in long term annual average rainfall over the Dart Catchment. Daily rainfall totals are monitored at 13 sites in the catchment with monthly totals monitored at a further 8 sites.

## 2.4 River Flow

River flows in the lower River Dart have been measured at Austins Bridge gauging station (see Map 4 Hydrometric Network) since September 1959. An analysis of the data records for the period 1959 to 1996 indicates a mean daily flow of 11.041 m<sup>3</sup>/s (cumecs) and a measured Q95 flow of 1.455 m<sup>3</sup>/s. The Q95 flow represents the flow that is exceeded on average, for 95% of the time, which is equivalent to 347 days in an average year. It can be compared with the daily mean flow to indicate how significant the groundwater contribution is to the river flow. For example, at Austins Bridge, the Q95 represents only 7.6% of the daily mean flow, indicating that groundwater contributes very little to the River Dart.

**Map 5 Landscape**





The maximum daily mean flow recorded at Austins Bridge is 267.953 m<sup>3</sup>/s which occurred on 27 December 1979. The maximum instantaneous flow during this flood was estimated to be 550 m<sup>3</sup>/s. The minimum recorded daily mean flow is 0.585 m<sup>3</sup>/s which was measured on 27 August 1976.

## 2.5 Water Quality

In 1995 chemical assessment showed 73.7% of the River Dart Catchment was of very good quality, 19.3% was of good quality, 4.7% was of fairly good quality and 2.3% was of fair quality. In biological terms, 80.3% of the river was of good or very good quality, while the remaining 19% was of fairly good quality. Between 1990 and 1995 there was an overall improvement in chemical quality of 4.3% of monitored river length, while biological quality improved by 6.2%. Although water quality has recently improved there are still parts of the catchment where the desirable quality has not been achieved. These are described in Sections 4.5, 4.6 and 4.9 of this report.

## 2.6 Landscape

### Designations

Large parts of the catchment are designated for their landscape importance (see Map 5). The upper half of the catchment lies within the boundary of Dartmoor National Park, while the tidal section and surrounding valley landscape downstream of Totnes is part of the South Devon Area of Outstanding Natural Beauty (AONB). The short coastal section included in this catchment is part of the South Devon Heritage Coast. Parts of the lower catchment are designated as Areas of Great Landscape Value (AGLV) and Coastal Preservation Area. The existence of all these designations means that various policies, particularly in terms of planning and development control, apply.

Landscape Assessments have been produced for the South Devon AONB and Dartmoor Environmentally Sensitive Area (ESA).

### Description

The central high moorland of Dartmoor is the source of most of Devon's major rivers including the River Dart and several of its larger tributaries. The East Dart rises in Dartmoor's main area of blanket bog around Cranmere Pool, with the West Dart flowing from the flanks of Cut Hill, a little to the south. The source of the Cowsic is close by. In contrast, the Swincombe rises from the blanket bog of the south moor, around the notorious Foxtor mires.

This central moorland plateau creates an impression of a vast, wild landscape, with few views to the more managed areas surrounding it. There are very few trees apart from isolated fragments of ancient oak woodland with stunted and twisted growth. Granite tors, with their curious shapes, create landmarks in the open scene.

Around the edges of the high moorland enclosed fields become the dominant feature, indicating the greater influence of man in shaping the landscape. Also on the margins of the open moor are blocks of coniferous plantation, which have a uniform, alien appearance. Granite walls, barns and farmhouses are obvious structures. This more modified appearance is often linked with the river valleys. The rivers are steep and bouldery here, and the valleys become well defined and more wooded. Below Dartmeet, and along the East and West Webburn, the valley sides are covered by oak woodland.

**Key**

- Catchment Boundary
- Normal Tidal Limit
- Settlement

**Scheduled Ancient Monument**

- 1 Ashprington
- 2 Berry Pomeroy
- 3 Dartmouth
- 4 Dittisham
- 5 Kingswear
- 6 Stoke Gabriel
- 7 Totnes
- 8 Tuckenhay
- 9 Waddeton
- 10 Cornworthy
- 11 Ashburton
- 12 Broadhempston
- 13 Ipplepen

**Built Conservation Areas**

- 14 Sharpham House
- 15 Dartington Hall

**Historic Parks / Gardens**

Devonport Leat

This map is diagrammatic

0 km 10  
Scale



Outside the National Park, the landscape changes to one of rounded hills, divided by deep valleys and criss-crossed by hedgebanks. Many of these are alongside a network of narrow lanes and the whole landscape has an enclosed feel, with few distant views possible. Traditional buildings are more varied in style and construction, with cob used as often as stone. There are no large settlements away from the River Dart itself. The River Harbourne is the main tributary in this part of the catchment; despite having its source quite high on the moor, this river has a more lowland character, meandering through a narrow floodplain. This section of the Dart Valley has a broader, flatter bottom, with some floodplain pastures alongside the river.

Totnes is the largest town in the catchment; it is located around the lowest bridge over the river, and at the head of the Dart Estuary. The estuary is a typical South Devon ria (drowned river valley) with relatively little access, a winding course, steep wooded slopes down to the water's edge in many places and sheltered side creeks. Only at Dartmouth and Kingswear is there extensive development and this section, with its harbour and marina, has a distinctly nautical atmosphere.

## 2.7 Archaeology

Nationally important sites are designated as Scheduled Ancient Monuments (SAMs); there are 135 of these, mostly located in the upper catchment. Two Historic Parks and Gardens are recognised in the catchment; Sharpham House and Dartington Hall, both of which overlook the river. Buildings and structures of county importance are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990, for example, the Britannia Royal Naval College in Dartmouth. Twelve Built Conservation Areas have been declared in the catchment. See Map 6 for location of SAMs, Historic Parks and Gardens and Built Conservation Areas.

The archaeology of Dartmoor has been extensively studied. Man's influence on this seemingly natural landscape dates back around 10,000 years. At this time the area was mostly woodland with just the highest parts open heathland, where it was easier for early man to hunt. Gradually areas were cleared and grazing or burning prevented regrowth. This allowed the development of bogs instead, which slowly replaced the high forest.

Neolithic Man began to lead a less nomadic life and to grow crops and tame sheep and cattle, although there is little evidence of permanent settlements older than 2300 BC. However a more complex culture was developing and remains of burial sites and dwellings still exist. By the time of the Bronze Age the system of reaves (low stony banks) was in place, good examples can be seen around Dartmeet. The reaves run in parallel lines ignoring other features such as slopes and probably extended into lowland areas where they have since been lost.

Changes in the climate around 1000 BC meant a general retreat from the higher areas as the bogs and heathland spread. Iron Age hill forts such as Hembury Castle protected the territory of different tribes on the margins of the moor. In the less difficult country to the south, new tools and techniques allowed farming to progress.

The Normans created a Royal Hunting Forest on Dartmoor and around this time the system of tenant farmers and common lands which still exists today was set up. More buildings were erected, including houses, farms and early churches, using granite.

During the second half of the 12th century Dartmoor became the biggest tin producing area in Europe. Rivers and streams were totally modified by tin streaming and leats were constructed to carry water to other sites. The tin trade was controlled through Stannary towns such as Ashburton, with strict laws being applied and taxes collected. Tin mining continued through to the late 19th Century, with more advanced techniques being developed and more associated buildings being constructed. Abandoned mines, blowing houses and the results of tin streaming can all still be widely seen for example around Hexworthy and the Powder Mills near Postbridge.

Enclosure of agricultural land took place earlier in South Devon than in many other parts of Britain and this led to the development of the typical field pattern that is so obvious in the lower part of the Dart Catchment. The valley was well known for its fruit orchards, with associated cider making.

The Dart Estuary became an important trading centre; mills were built on several of the creeks, producing both paper and flour. Dartmouth was an important harbour as a result of the deep water and sheltered position. Two crusades left England from the town, tin and cloth were exported and wine imported, while it was also a vital link in the Newfoundland cod trade to Spain.

In the 18th Century there was a new surge of development and improvement. New enclosures were created and farming practices began to change. Instead of the traditional stock native to Devon, hardier varieties were introduced, like the Scottish Blackface sheep and Galloway cattle. These animals were able to stay out on the moor all year round and their arrival meant further changes to the vegetation. The increase in wool production meant that it became viable to build mills at Ashburton and Buckfastleigh.

The bleak and daunting Dartmoor Prison was built in the early 19th Century as part of this "improvement". Initially for French prisoners from the Napoleonic wars and later American prisoners, as the prison grew so did the new settlement of Princetown. When the wars ended it looked as though the prison might be abandoned but it was then developed into its present form.

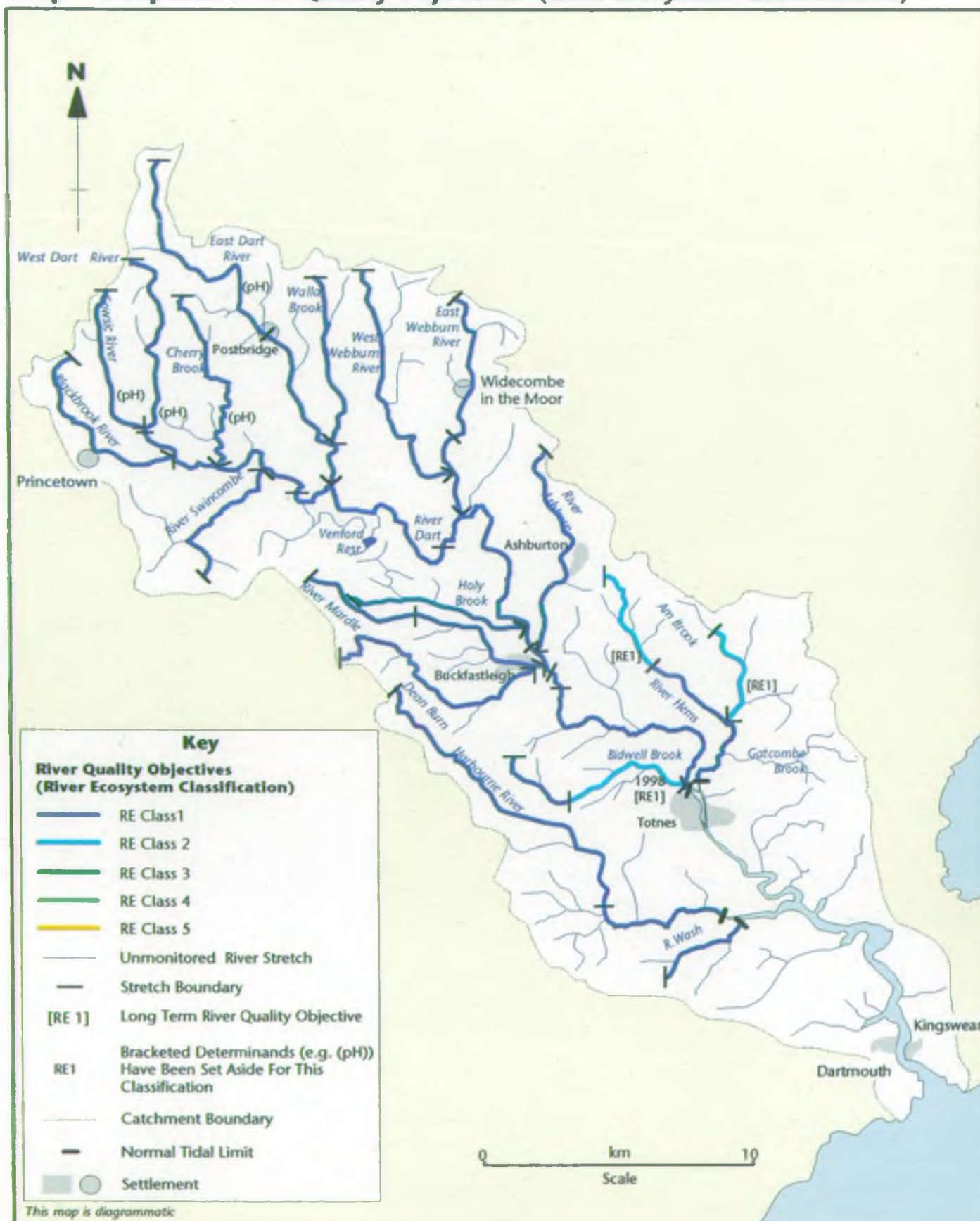
Dartmoor was always important as a source of water and the Devonport leat was constructed in 1790 to take water from the West Dart around the contours of hills and valleys to supply the dockyard. Venford Reservoir on Holne Moor was the second of a long series of reservoirs built to deal with the ever growing needs of the surrounding areas. Manipulation of water is not restricted to the moor; Staverton weir, probably built to supply the mill, is the longest in Devon.

Even as late as the mid-18th Century, communication was restricted in the catchment. The main road across the centre of the moor was not completed until 1792, while the estuary hindered east-west links further south. The railway was built along the banks of the Dart between Ashburton and Totnes and although part is now the route of the A38, the rest remains preserved as a steam-hauled line, as does the line along the eastern shore of the estuary to Kingswear.





**Map 7 Proposed River Quality Objectives (River Ecosystem Classification)**



### 3. Our Proposed Targets for River Water Quality

We manage water quality by setting targets called River Quality Objectives (RQOs). They are intended to protect current water quality and future use, and we use them as a basis for setting consents for new discharges and planning future water quality improvements.

We also manage water quality by applying standards set in EC directives and other international commitments. Failure to comply with these standards are outlined in the issues section; more detail is available in Part 2.

We have proposed our RQOs using a classification scheme known as River Ecosystem (RE) which covers a number of critical organic and metal criteria associated with chemical water quality (see Appendix ). The RE classification scheme was introduced by the National Rivers Authority, following public consultation, in 1994. It replaces a former scheme introduced by the Water Authorities in the late 1970s and used by the NRA until 1994. The RE classification comprises five hierarchical classes as summarised below.

Table 2 The RE classification scheme

RQO (RE Class)	Class Description
RE1	Water of very good quality suitable for all fish species
RE2	Water of good quality suitable for all fish species
RE3	Water of fair quality suitable for high class coarse fish populations
RE4	Water of fair quality suitable for coarse fish populations
RE5	Water of poor quality which is likely to limit coarse fish populations

The RQOs we set must be achievable and sustainable; we must be able to identify what needs to be done to meet the RQO, and to ensure as far as practicable that water quality can be maintained at this level in the future.

Where we are unable to identify solutions or resources to resolve current water quality problems, we can also set a Long Term RQO; we will test compliance against RQOs but use Long Term RQOs as a basis for setting consents for new discharges. This will ensure that future developments will not hinder our efforts to improve water quality.

The rivers of the Dart Catchment have been divided into 30 classified reaches and the RQOs that we intend to set are shown on Map 7.

Section 3.1 provides more information on the RQOs proposed for the Dart Catchment and includes a map which details compliance with them. Where a reach does not comply with the proposed RQO, the reasons are investigated and the necessary actions are taken to ensure compliance.

#### 3.1 Proposals for RQOs for the Dart Catchment

There are 30 classified river stretches in the Dart Catchment comprising a total of 212.4 km of river. The RQOs based on the RE classification that we are proposing for the catchment are shown on Map 7. We will aim to achieve these proposed RQOs from 1997 unless a later date is shown next to the class, for example, an RE2 (1998) means we will aim to achieve an RQO of RE2 from 1 January 1998. Please comment on the River Quality Objectives that we have proposed, even if it is to say you agree with them.

Section 5.9.1 details compliance with these RQOs. Where a reach does not comply with the proposed RQO, the reasons are investigated and, where appropriate, these have been raised as issues in Sections 4.5 and 4.9.

## 4. Issues and Proposed Actions

### 4.1 Problems Associated with Development

#### Background

The Dart Catchment is predominantly rural, but contains some urban areas, including Dartmouth, Totnes and Buckfastleigh. Development in the catchment can cause environmental problems (for a description of urban development in the catchment see Section 5.1).

A number of water pollution problems can be attributed to development within the Dart Catchment. Problems can occur during building or road construction, for example, through increased siltation and contaminated runoff to surface water drainage systems.

Air pollution can damage flora, fauna and buildings and have significant effects on soils and water. It can also cause serious problems for those with asthma, bronchitis and other respiratory diseases. Sources of air pollution include; traffic, industrial processes and power generation. These sources may be present within or outside of the catchment (see Section 5.10 for further detail).

The National Air Quality Strategy<sup>5</sup>, requires local authorities to review air quality in their district. These reviews will contribute to the knowledge of air quality in the catchment.

Increasing population or industrial development puts an extra load on to the water supply, sewerage and sewage treatment infrastructure, transport network and waste disposal facilities; landfill sites can release chemicals to surface and underground water and to the soil, both during operation and after closure. Such sites also generate significant quantities of methane, a 'greenhouse gas'.

Development in inappropriate areas can cause environmental damage, and developments within floodplains reduce the flood storage capacity and can increase the risk of flooding. Development on contaminated land can lead to the release of toxic material to the environment.

Developments can lead to a loss of flora, fauna, features of geomorphological or geological interest, features of archaeological significance and have an impact upon the landscape.

#### Effects

**Water quality** - There are a number of industrial estates throughout the catchment. The storage, disposal and use of chemicals on these estates poses a risk to water quality in the catchment from runoff and leakage. Problems with storage and disposal have been identified in some areas and remediation work is taking, or has taken place. In other areas the risk to water quality remains unknown. Risk assessments are required for these areas.

**Air quality** - Dartmoor has an extremely rich lichen flora; they grow both on rocks and trees, with a number of rare species present. Lichens are very sensitive to air pollution and there is concern that, particularly around the southern edge of the moor, loss and damage to these species is occurring. There may also be some damage to other lower plants such as mosses, which grow well in the moist climate of the area. However more information is required to establish the status of these sensitive communities in the catchment.

The deposition of compounds which contain nitrogen, which can act as a fertiliser, can change the make up of plant communities. There are concerns that nutrient enrichment from nitrogen deposition from air may be affecting heathland on Dartmoor.

Air pollution is also thought to be causing acidification on Dartmoor, see Issue 4.10, Acidification, for details.



**Contaminated land** - The precise nature of contaminated land in the catchment is not fully known. New statutory guidance<sup>6</sup> to be enacted this year will require local authorities to identify contaminated land within their area. Once these have been identified, it will be necessary to decide what remedial work is required.

**Impacts on sites of importance for Earth Science** - The value of geological and geomorphological sites and features is often not fully recognised; not only do they provide a record of the past history of the earth's development, they also help us understand more about present conditions and processes. There is a need to ensure proper protection. They fall into two groups; exposure sites, where features (e.g. typical rock strata) are uncovered above or below ground in a way that allows study; and integrity sites, which are limited or unique in extent (e.g. fossil deposits) and which need more careful preservation.

Quarries and mines, often disused, provide excellent exposure sites; they are, however, particularly vulnerable to neglect and damage. Sites have undoubtedly been lost in the past by use as waste disposal locations.

Limestone caves are relatively scarce in the south-west, but where they occur they contain important features associated with the actions of water on rock, as well as often containing important fossil records, again casting light on the past history of the area.

**Loss of key habitats and species** - Important habitats and species have undoubtedly been lost to developments in the past. For example at Longmarsh, Totnes tipping has destroyed much of the tidally influenced wetland that once existed and only a small remnant remains.

**Increased risk of flooding** - There are many areas in the catchment where we have concerns that proposed developments will increase flood risk. We aim to ensure that development does not reduce the standard of flood defence and that opportunities for environmental enhancement are taken.

Our main concerns are at:

- **Ashburton** - While the town benefits from a flood alleviation scheme on the River Ashburn, a minor tributary (the Balland Stream) has insufficient capacity and as a consequence, urban flooding occurs in the vicinity of the cattle market. Opposition to upstream development that could adversely affect risks will be maintained.
- **Littlehempston** - At present flooding is a regular problem along the valley floor of the River Hems and at its confluence with the Gatcombe Brook. A Local Authority flood alleviation scheme should, when implemented, alleviate this. However this scheme is at the tidal limit and a rise in sea level could reduce the benefits accrued.
- **Portbridge** - Recent developments on the margins of Torbay have contributed towards improving this long standing flood risk location. However, continued development pressures in the catchment will require to be considered with this location in mind.
- **Colaton St Mary** - Like Portbridge, residential flooding is of concern. With the steady encroachment of Torbay into this catchment, further works will be required to address flooding concerns expressed by the public in the vicinity of Stoke Road.
- **Harbertonford** - Located astride the River Harbourne, the town has historically been badly flooded. The options for a flood alleviation scheme are currently being appraised. Until such a scheme is complete, development in the town and upstream that would increase flood risk will be opposed.
- **Totnes** - Much of the historic town is defended behind tidal and fluvial defences. The standard of defence required by these works will be reduced by a rise in sea level. It is essential that new developments take this into account.

- **Dartmouth** - As with Totnes, a rise in sea level will have a detrimental effect on the standard of protection afforded to the lower town. Again, new developments will be required to take this into account.
- **Shinners Bridge** - Occasional flooding at this location requires that careful attention be paid to upstream developments. We will oppose development that would worsen flood risks.
- **Staverton Mill** - Severe flooding risks at this location require that any approved redevelopment of the mill and nearby site should take this fully into account at the design stage. We will oppose any expansion into flood risk areas currently undeveloped.

In addition to the above, there are many locations where flooding occurs. We shall continue, under the terms of Department of the Environment Circular 30/92, to oppose all developments that would exacerbate known flooding until such time as works are implemented to mitigate the adverse effects.

**Table 3 Summary of proposed actions for problems associated with development**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
<ul style="list-style-type: none"> <li>• Conduct pollution risk assessments of industrial sites in the catchment.</li> </ul>	Agency Local industry
<ul style="list-style-type: none"> <li>• Review air quality in the area, in line with National Air Quality Strategy.</li> <li>• Improve knowledge of status of communities sensitive to air pollution in the catchment.</li> </ul>	LAs DNPA, NT, Agency
<ul style="list-style-type: none"> <li>• Produce database on contaminated land sites in the catchment.</li> <li>• Ensure there is effective consultation with Local Authorities (LAs).</li> </ul>	LAs Agency LAs
<ul style="list-style-type: none"> <li>• Provide floodplain mapping information to the planning authorities.</li> <li>• Ensure new developments take account of sea level rise at Totnes, Littlehempston and Dartmouth.</li> <li>• Appraise scheme at Harbertonford.</li> <li>• Oppose developments which would increase flood risk at Staverton Mill, Shinners Bridge and Ashburton.</li> </ul>	Agency LAs Agency, LAs Agency Agency, LAs
<ul style="list-style-type: none"> <li>• Ensure sites of earth science value are identified and protected from development.</li> </ul>	Agency

## 4.2 Concerns Over Abandoned Mines

### Background

Mining activities within this catchment are more localised and on lower grade ore deposits than in other areas of South West England; Section 5.2.6 provides further information on mining in the catchment. Mining activities can result in long term impacts on the environment, and in particular on water quality. Streams draining shale and slate areas flanking Dartmoor are particularly vulnerable as the mineralisation here includes sulphide ores. When these ores are exposed to the oxidising action of air, water and bacteria, sulphurous and sulphuric acids are produced. There are two major problems associated with the production of these acids; acidic water draining from the mine into surface and groundwater, and increased leaching of metals from the surrounding ores. Potential contaminants include tin, iron precipitates, copper, arsenic, bismuth, zinc and lead. Discharges from mines within the slates and shales are also likely to have a potential impact on minor unmonitored watercourses in close proximity to the mine discharges.

Contamination of land may have occurred from the former operation of metalliferous mine workings in the area; elevated concentrations of heavy metals, compared with background levels, are often encountered in land that has been previously backfilled with mining waste or spoil. Leaching of heavy metals from contaminated land can subsequently impact upon both local ground and surface water quality. During work on spoil heaps or contaminated land sites, soil containing metalliferous mining waste must be disposed of in an appropriate landfill (see also Section 4.1).

## Effects

**Impact on groundwater** - There is little evidence available to assess the impact of abandoned mines on groundwater as no comprehensive monitoring programme exists at present, due to the fact that the catchment only has minor aquifers which are not used extensively for public water supply and which would require highly intensive monitoring to provide meaningful information. Pollution events will normally be noted when they affect the uses of groundwater, such as for abstractions, or the appearance of groundwater as the baseflow of streams. The abstraction of groundwater in the area where mining has occurred is extremely limited (see Section 5.7.2). Identifiable impact on surface watercourses from groundwater would be limited to small tributary streams with low dilution; these are not normally sampled on a regular basis.

**Impact on surface water quality** - Routine monitoring of water quality in the catchment which includes monitoring for zinc and copper has not highlighted any problems which could be attributed to abandoned mines. In addition, serious mine pollution would affect the invertebrate community of the watercourse and our routine biological monitoring program has not shown any particular problems. However localised impacts may occur close to mine discharges on small unmonitored streams within areas of sulphide mineralisation.

**Table 4 Proposed action for impact of abandoned mines**

Proposed Action	Action by Lead Other
• Assess effects of abandoned mine workings on unmonitored watercourses.	Agency

## 4.3 The Impact of Mineral Extraction

### Background

There are only two working quarries within the catchment; Whitecleaves at Buckfastleigh and Linhay Quarry at Ashburton (see Section 5.2.7). Quarrying can have a considerable impact on the environment, on water quality, by generating high loads of suspended solids in nearby watercourses and on water resources by altering groundwater levels, and hence surface water flow.

### Effects

**Impact on water quality** - Disposal of runoff from both Whitecleaves and Linhay quarries has historically been an issue, causing high suspended solids levels in local watercourses. Installation of settlement systems at Whitecleaves has solved the problem at this site. A settlement pond is used at Linhay; the discharge water is pumped to a tributary of the Ashburn Stream. Occasionally discharges containing elevated levels of suspended solids occur.

**Impact on nature conservation** - Potters Wood SSSI partially lies within land leased by the operators of Whitecleaves quarry; this site features caves which are of national importance as roosts for the Greater Horseshoe bat.

Linhay Quarry lies within Dartmoor National Park, and has a significant impact on the surrounding environment.

Mineral extraction has caused a loss of a number of key habitats in the catchment (see Section 5.12 Conservation of the Natural Environment for key habitats).



**Table 5 Summary of proposed actions for the impact of mineral extraction**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
<ul style="list-style-type: none"> <li>• Ensure key habitats are identified and protected from mineral extraction activities.</li> </ul>	Agency, DWT, DCC
<ul style="list-style-type: none"> <li>• Continue to liaise with Linhay Quarry to seek further improvements to the discharge and to reduce the impact of the quarry on the environment.</li> </ul>	Agency, Linhay Quarry Owners, DNPA, DCC
<ul style="list-style-type: none"> <li>• Need to ensure that the scientific interest of Potters Wood SSSI is maintained.</li> </ul>	EN, Whitecleaves Quarry owners, SHDC

## 4.4 Concerns Over Low Flows

### Background

Low flows in watercourses can damage the environment in a number of ways, by: affecting aquatic wildlife, exacerbating water quality problems due to reduced dilution. They can also reduce the amount of water available for abstraction.

Most of the flow in the catchment is derived from surface water (see 2.4 River Flow). As a result flows drop markedly during prolonged dry periods.

At a catchment scale abstraction is not considered to adversely affect flows in the catchment. Only an estimated 4.6% of the total available water resource is abstracted and not returned to the catchment (see 5.7.3).

There are some concerns that low flows in the river during dry summers have been exacerbated by changes in land use and drainage. The potential for water retention on the moor is thought to have declined, possibly resulting in a reduced retention time for water in the catchment. This hypothesis needs to be investigated. The vegetation cover on Dartmoor is thought to have changed in recent decades, with a loss of heather and degradation of blanket bog being recorded in certain parts. This issue has also been raised in the River Teign LEAP<sup>7</sup>.

Some observers have attributed recent dry summers such as those in 1990 and 1995 to climate change. However the year to year variability of rainfall patterns is such that it is not possible to test this hypothesis simply by using historical rainfall data. Furthermore, although climate change models have been developed which can predict with some confidence increases in average temperatures and increases in sea level rise, current models cannot yet provide any reliable predictions for changes to precipitation patterns<sup>8</sup>. This is true even at global and UK levels let alone at a catchment level. We are sponsoring research nationally into the implications of climate change for the Environment Agency. Part of this research will examine the latest information on the possible effects of climate change on river flows.

Low flows are known to restrict salmonid migration, either through failing to stimulate fish to migrate or by preventing their passing obstacles on the river. There are some concerns that low flows make fish more vulnerable to the net fishery by trapping them in the Dart Estuary. However, net catch returns do not show any marked improvement during periods of low flows.

**Table 6 Summary of proposed actions for concern over low flows**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
<ul style="list-style-type: none"> <li>• Gather and assess data on moorland vegetation changes, and river hydrology.</li> </ul>	Agency, DNPA, IoH, Universities, MAFF
<ul style="list-style-type: none"> <li>• Support research into climate change and flows in watercourses.</li> </ul>	Agency

## 4.5 Impact of Effluent Discharges

### Background

We regulate the disposal of effluent by issuing consents to discharge into controlled waters, including treated sewage and industrial effluent. Rivers and coastal waters can naturally render the main constituents of many effluents harmless and with proper controls over effluent disposal the environment will not be harmed.

Map 8 shows all Sewage Treatment Works in the catchment serving a population of greater than 100, and the level of treatment. It also shows trade discharges greater than 5m<sup>3</sup>/day made to controlled waters.

We aim to maintain and, where appropriate, improve the quality of water. We achieve this by setting water quality targets for the catchment based on River Quality Objectives (RQOs) to protect recognised uses, standards laid down in EC Directives and other standards derived from previous research and information where appropriate. See Section 5.9 for further information.

There are a number of sites in the catchment where water quality is impacted by unsatisfactory sewage discharges and sewerage systems.

Improvements to SWWSL's discharges are subject to funding approved by OFWAT, the water industry's regulator. The following improvement schemes are in SWWSL's current business plan AMP2, which runs to 2005; Princetown STW, Broadhempston STW, Dartmouth STW, and Stoke Fleming (North and South). Details of these schemes can be found in Section 5.9.

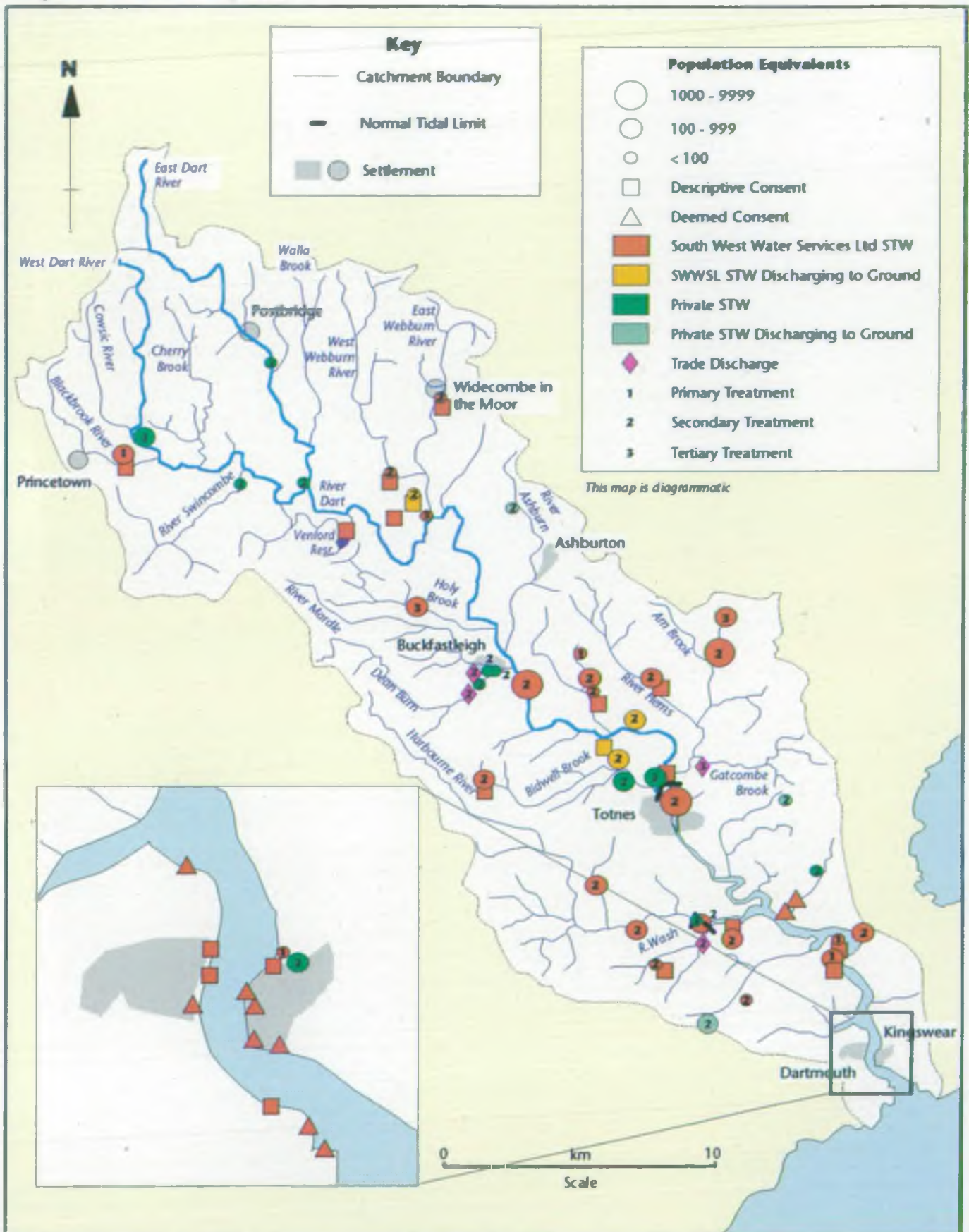
### Effects

**1. The Blackbrook River** - The Blackbrook River shows uncharacteristic plant growth which may be caused by an excess of nutrients. The watercourse has received runoff from the Prison farm at Princetown. This is an intensive operation, involving large quantities of fertiliser. Princetown STW also discharges into an important salmonid spawning area of the Blackbrook River, resulting in a visible deterioration in the stream quality. A fisheries survey undertaken in 1996 to assess the impact of the discharge showed that stocks locally did not appear to be affected by the discharge, and that populations of fry below the discharge were greater than further upstream. Although the local impact is clearly limited, the discharge does contribute to a general deterioration of water quality, and may contribute to eutrophication and excessive weed growth which alters the natural ecology of the river.

**2. The River Ashburn** - The River Ashburn was significantly non-compliant with its RQO of RE1 in 1995 due to a single very high Biochemical Oxygen Demand (BOD) result in July 1995. No STWs discharge to this stretch, and the poor results are thought to be due to storm discharges from a SWWSL main sewer. The Ashburn River may also have an impact on the quality of the main River Dart.

**3. The River Mardle** - The River Mardle from Combe to the River Dart confluence marginally failed its RQO of RE1 in 1993, 1994 and 1995 due to high BOD. It is thought that these failures may be due to either discharges from consented storm overflows and unconsented surcharges (as the elevated BOD samples correspond to high rainfall events) or problems with the sewerage system in the vicinity of Buckfast and Buckfastleigh.

## Map 8 Effluent Disposal



Information correct as of March 1997

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River Dart Local Environment Agency Plan



**4. The Dean Burn** - The Dean Burn from its source to the River Mardle confluence marginally failed its proposed RQO of RE1 in 1995 due to low Dissolved Oxygen (DO) levels and high BOD loads. Cause of non-compliance is thought to be for similar reasons to the lower stretch of the River Mardle (see 3. The River Mardle).

**5. The River Dart** - The River Dart from Dart Bridge to Austin's Bridge significantly failed to achieve its RQO of RE1 in 1995 due to poor BOD results, probably due to poor water quality from the Rivers Ashburn and Mardle and Dean Burn (see 2, 3, 4).

The River Dart from Austin's Bridge to downstream of Buckfastleigh STW significantly failed to achieve its RQO of RE1 in 1995 due to high BOD results. Buckfastleigh (Kilbury) STW discharges into this stretch approximately 0.5 km upstream of the monitoring point, but it is not thought to be the cause of non-compliance in this stretch. Significant non-compliance in this stretch is most probably due to inputs further upstream (see above).

**Exceedence of Environmental Quality Standards (EQS) for pesticides downstream of Buckfastleigh STW** - In the past, concentrations of pesticides downstream of Buckfastleigh STW have exceeded their proposed EQS. These pesticides are insecticides which originate from the washing of sheep fleeces and use of wool materials by textile enterprises. The effluent from these traders are treated on site before discharge into the public sewerage system where they are further treated in Buckfastleigh STW. Significant improvements have been made to both the treatment of these effluents prior to the discharge into the sewerage system and to the treatment provided by Buckfastleigh STW. As a result of this, levels of these pesticides have been substantially reduced.

One of the traders, Buckfast Spinning Company Limited is authorised as a Part A process (see Section 5.2.1) under Section 6 of the Environment Protection Act 1990. A number of improvement conditions are included in the authorisation including one relating to pesticides.

Historically the pesticide issues have been primarily caused by organophosphate insecticides. However, due to the perceived health risks to farmers associated with using organophosphate insecticides for dipping sheep, many farmers are switching to synthetic pyrethroid based dips.

We have proposed consent conditions for the discharge from Buckfastleigh STW to ensure compliance with EQS's for organophosphate pesticides. Recent monitoring for synthetic pyrethroids in the discharge from Buckfastleigh STW indicates these substances are present but their concentrations would not compromise individual EQS's for these substances. We are currently considering imposing controls on these substances as well and we also wish to examine the synergistic effects of these substances and will incorporate these findings into the review of the discharge consent.

**Foaming at Buckfastleigh STW** - At Buckfastleigh, there are concerns relating to the amount of foam which occurs downstream of the discharge point. There have been two significant foaming events, in April 1995 and April 1997. Extensive investigations were carried out by the Agency following both incidents, involving the analysis of foam, water and discharge samples. The 1995 investigation did not reveal the cause of the foaming, but our most recent research has revealed the presence of an unusual detergent which has been identified as a result of using highly specialised analytical techniques. We are continuing to investigate the precise nature of this detergent, and its source.

**6. The Harbourne River** - The Harbourne River from Leigh Bridge to Beenleigh, has marginally failed to achieve its proposed RQO of RE1 since 1993. This stretch is affected by Harbertonford STW. The works is performing well within its consent, but it is prone to hydraulic overloading and storm discharges.

**7. The River Hems** - The River Hems (Source to Portbridge) marginally failed to meet its proposed RQO of RE2 in 1992, 1993 and 1994. Further deterioration has resulted in a significant failure for 1995. Landscope (Gullaford Farm) STW discharges to a tributary of this stretch but it is not known to what extent it might be affecting water quality. We have recommended that development is restricted

at this site (see Section 5.1.6). Cause of non-compliance is understood to be mainly due to agricultural inputs (see Section 4.9 Impact of Farming and Forestry on Rivers and Wetlands) and minor sewerage problems.

**Poor performance of Broadhempston STW** - This works is showing poor performance with sewage fungus often visible downstream of a storm overflow which discharges to a small tributary of the River Hems. The STW has been identified in AMP2 as requiring improvement under the Urban Wastewater Treatment Directive (UWWTD) (Appropriate Treatment).

**8. Local Impacts on water quality** -The following do not lead to RQO failures but do have a local impact; water quality in Holy Brook is impacted by the discharge from Scorrilton STW and water quality in the Poundsgate Stream, a tributary of the River Webburn, is impacted by the discharge from Poundsgate STW.

**Table 7 Summary of proposed actions for impact of effluent discharges**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
<ul style="list-style-type: none"> <li> <b>Blackbrook - Nutrient Enrichment</b>  Liaise with Prison to reduce nutrient inputs to the Blackbrook.  Press for improvements to Princetown STW as early as possible within the AMP2 programme under the UWWTD (Appropriate Treatment).  Object to development which would increase sewage flows to the works until improvements are carried out. </li> </ul>	Agency, HM Prison Agency, SWWSL  Agency, DNPA
<ul style="list-style-type: none"> <li> <b>River Mardle and Dean Burn - RQO failures</b>  Investigate consented discharges from storm overflows and unconsented discharges during high rainfall events.  Investigate potential problems with sewerage system in the vicinity of Buckfast and Buckfastleigh. </li> </ul>	Agency, SWWSL  SWWSL, Agency
<ul style="list-style-type: none"> <li> <b>Ashburn River - RQO failures</b>  Investigate storm sewage discharges. </li> </ul>	Agency, SWWSL
<ul style="list-style-type: none"> <li> <b>River Dart - RQO failures</b> Investigate degree to which water quality in River Mardle, Dean Burn and Ashburn is causing downgrading in main River Dart.  <b>Pesticides</b>  Issue consent conditions to achieve compliance with appropriate environmental quality standards for organophosphorous insecticides in effluent from Buckfastleigh STW.  Consider the inclusion of conditions for synthetic pyrethroids.  Investigate synergistic effects of synthetic pyrethroids and review consent if necessary.  Conduct an investigation into the occurrence of organophosphorus and synthetic pyrethroids in raw materials for spinning, the potential for harm to the environment when released from the process and report on how these substances can be rendered harmless (condition in IPC authorisation).  Introduce regular aquatic invertebrate monitoring upstream and downstream of STW.  <b>Foaming</b>  Continue to monitor for foaming incidents at Buckfastleigh STW, and pursue causative agent(s).  Continue to liaise with SWWSL and local industry over possible solutions to the problem. </li> </ul>	Agency  Agency, SWWSL  Agency, SWWSL Agency  Buckfast Spinning, Agency  Agency  Agency, Angling interests Agency, SWWSL, local industry
<ul style="list-style-type: none"> <li> <b>River Hems</b>  <b>RQO failure</b> Assess impact of Landscope (Gullaford Farm) STW.  Investigate sewerage problems in the vicinity of the River Hems (Source to Portbridge).  <b>Poor performance of Broadhempston STW</b> Make improvements to Broadhempston STW as identified in AMP2 under the UWWTD (Appropriate Treatment).  Object to further development, leading to increased sewage flows in STW catchment until improvements to STW are carried out. </li> </ul>	Agency SWWSL, Agency  SWWSL, Agency  Agency, TDC, SWWSL
<ul style="list-style-type: none"> <li> <b>Harbourne River - RQO failure</b> - Assess impact of Harbertonford STW.  Make recommendations from above investigations for appropriate actions to improve water quality. </li> </ul>	Agency, SWWSL Agency
<ul style="list-style-type: none"> <li> <b>Holy Brook and Poundsgate Stream - local impact</b> - Object to further development, leading to increased sewage flows in Scorrington and Poundsgate STW until improvements to STWs are carried out, under AMP2. </li> </ul>	Agency, TDC, SHDC SWWSL

## 4.6 Concerns Over Effluent Discharges in the Vicinity of the Dart Estuary Shellfishery

### Background

Permission to commercially harvest oysters and mussels is granted by the Ministry of Agriculture, Fisheries and Food (MAFF), through Several Orders. There is currently only one Several Order in current use in the estuary for a site at Waddeton, this Order expires in 1997 when Devon Sea Fisheries Committee hope to take over the Several Order. The Waddeton site is classified under the Shellfish Hygiene Directive<sup>9</sup>. South Hams District Council are responsible for monitoring under this Directive and this site was classified as class B (see Appendix A10) in 1994, 1995 and 1996. Where the Hygiene Directive applies we will ensure there is no deterioration in water quality from consented discharges.

Shellfish beds at Blackness were worked under a lease from the Harbour Authority until 1982, and used as a storage area for oysters until 1992. Following monitoring under the Shellfish Hygiene Directive the site was classified as class C and a commercial decision was taken by the operator not to continue to use the site, although the lease is still held by the ex-operator.

There is no provision to impose improvements to discharges under the Shellfish Hygiene Directive. The Shellfish Waters Directive, however, sets standards to protect shellfish from pollution and would afford the shellfishery greater protection. The Dart Estuary is currently not an identified shellfishery under this Directive. Shellfish beds in the estuary are shown on Map 28 Dart Estuary Shellfish Areas.

Table 8 Summary of proposed actions for concerns over effluent discharges in the vicinity of the Dart Estuary shellfishery

Proposed Action	Action by Lead Other
<ul style="list-style-type: none"><li>• Review sites designated under Shellfish Waters Directive.</li><li>• Ensure there is no deterioration to water quality through discharge consenting procedures.</li></ul>	Agency, DoE Agency

## 4.7 Potential Eutrophication of the Dart Estuary

### Background

Estuaries tend to be naturally quite high in nutrients; however an excess of nutrients (principally nitrates and phosphates) can result in increased production of algae and plants. If algal production becomes excessive then this can affect the chemical, biological and aesthetic quality of the estuary.

Routine estuary chemical water quality data has been obtained for six sites in the Dart Estuary since 1990. Samples were collected from various water depths over a range of tidal, meteorological, and river flow conditions. The data indicate that overall the water quality in the Dart Estuary is good, but that on occasions elevated levels of BOD can occur which appear to be related to algal blooms, as they are generally related to increased chlorophyll levels.

In 1994 and 1995, specialist investigations of water quality in the Upper Dart Estuary were carried out. These showed that large diurnal variations in dissolved oxygen concentrations can occur during the summer. These are apparently associated with algal activity, as depressed levels occurred at night due to algal respiration and elevated levels during the day due to algal photosynthesis.

The large variations in dissolved oxygen coupled with increased chlorophyll levels in the Estuary during the summer suggest that the estuarine waters are potentially eutrophic. On the available information, the major source of nutrients to the Dart Estuary is riverine, but effluent discharges to the estuary may be significant.

There is some anecdotal evidence that eutrophication may be occurring; the Dart Angling Association have reported increased algal growth in the estuary in recent years.

## Effects

Low DO levels in the summer, when migratory fish are moving through the estuary, could affect their migration. A number of salmonid fish have been found dead in the estuary during summer months; the reason for these deaths is unknown.

## Proposed Action

Future studies are planned to investigate the potential nomination of the estuary as a Sensitive Area (Eutrophic) under the EC Urban Waste Water Treatment Directive<sup>10</sup> or a Polluted Water under the EC Nitrates Directive<sup>11</sup>. Designation of the estuary may require the installation of nutrient removal at STWs discharging to the estuary or to seek advice from MAFF on how to control the application of nitrate fertilisers in the catchment.

Table 9 Proposed action for potential eutrophication of the Dart Estuary

Proposed Action	Action by Lead Other
• Investigate the potential nomination of the estuary as a Sensitive Area or Polluted Water.	Agency, DoE

## 4.8 Risk of Cryptosporidium Entering Public Water Supply

### Background

*Cryptosporidium* is a microscopic animal which can infect the gut of mammals, birds and reptiles. One species *Cryptosporidium parvum* can cause the disease Cryptosporidiosis, a symptom of which is prolonged severe diarrhoea in humans. This can be fatal in individuals with suppressed immune systems, such as the old or infirm. It is transmitted via an environmentally resistant stage called an oocyst, shed in the faeces of infected individuals or animals. Oocysts are resistant to water treatment processes and enter new hosts via the mouth. *C. parvum* is thought to be widely present in the environment and may be found extensively in cattle and sheep.

Occasionally outbreaks of Cryptosporidiosis occur in human populations, and the public water supply is often implicated in these situations. The risk of *Cryptosporidium* entering the water supply is thought to be greatest where there is a direct river abstraction, particularly in an agricultural catchment. There is one direct river abstraction used for public water supply in the catchment at Littlehempston.

### Effects

There have been two outbreaks of Cryptosporidiosis in Torbay in recent years. In 1992 an outbreak affected at least 160 people. In August 1995 there was a further outbreak causing 575 confirmed cases of the disease; during which SWWSL issued a notice to all those living in the area to boil water before drinking. This outbreak is the subject of a pending court case.

### Proposed Action

In recognition of the national increased awareness of the potential risk to public health posed by this organism we are working with SWWSL, MAFF and Environmental Health Departments on a task group which will assess the risk of *Cryptosporidium* entering the public water supply. This task group will also examine the feasibility of introducing measures, to reduce the input of the organism to watercourses in catchments where public supplies are at risk, such as the Dart Catchment.



Table 10 Proposed action for risk of *Cryptosporidium* entering public water supply

Proposed Action	Action by Lead Other
<ul style="list-style-type: none"> <li>Assess risk in catchment and examine feasibility of introducing catchment controls.</li> </ul>	<i>Cryptosporidium</i> task group

## 4.9 Impact of Farming and Forestry on Rivers and Wetlands

### Background

Over the last ten years farmers have made great improvements in farm waste storage facilities and disposal methods. This has resulted in a significant reduction in the number of point source pollution incidents attributed to dairy and beef cattle farms and contributed to an overall improvement in water quality in the catchment. However, work still needs to be done to solve the problem of diffuse pollution, for example; from runoff from waste spread to land. Guidance to farmers is provided by MAFF through the 'Code of Good Agricultural Practice for the Protection of Water'<sup>12</sup>.

Stretches are listed below, which fail to achieve the desired water quality target due to organic pollution and where inspections by pollution officers have highlighted discharges or runoff from agricultural sources. Problems have been found from farms bordering the River Hems, Am Brook and Bidwell Brook. All farms found to be causing problems have been visited and remedial work has either taken place or is underway.

### Effects

**River Hems** - The River Hems from Source to Portbridge marginally failed to meet its proposed RQO of RE2 in 1992, 1993, and 1994. Further deterioration has resulted in a significant failure for 1995. Cause of non-compliance is understood to be mainly due to agricultural inputs and minor sewerage problems ( see Issue 4.5, Impact of Effluent Discharges).

The River Hems from Portbridge to Littlehempston has marginally failed its RQO of RE1, due to high BOD results.

**Bidwell Brook** - The Bidwell Brook from its source to Tigley marginally failed the proposed RQO of RE1 in 1995 due to one high BOD result. Cause of this elevated value is unknown, though it is possibly related to high rainfall which occurred on the same day. The Bidwell Brook at Dartington shows fairly good biological water quality (see Map 22); the fauna present suggests there may be an impact from organic pollution.

**Am Brook** - The Am Brook from Source to Hems confluence fails to achieve its long term RQO of RE1 due to high ammonia levels.

**Devonport Leat** In July 1995 over 300 fish (mainly brown trout) were killed in a half kilometre section of the leat at Tor Royal, near Princetown. The incident was attributed to low flows in the leat at the time but was exacerbated by organic pollution from farms in the area (see also Sections 4.4 and 5.7).

**Loss of blanket bog and valley mires due to agricultural drainage** - These important wetland habitats are not only important in their own right but also hold water on the moor and provide support for river flows during dry periods, acting as sponges releasing water slowly. Dartmoor contains the most extensive areas of blanket bog in the South West. Small numbers of golden plover breed in this habitat, Dartmoor being its only breeding site in Southern England, this species is declining in numbers nationally.

Valley mires are also important, for example; Foxtor mires are the source of the River Swincombe, from which water is abstracted for public supply; the wetland area is undoubtedly important in maintaining flows. The tin-streaming activities associated with most Dartmoor rivers have contributed to the formation of mires, due to the partial damming of valleys, with subsequent filling by peat. Keeled skimmer dragonflies are particularly associated with this habitat.

**Decline in heather moorland** - The general decline in extent and quality of heather moorland is symptomatic of changes in management and more intensive agricultural practices (see also Issue 4.18, Concerns with the Recreational Use of the Catchment). Heavy grazing tends to encourage grass moor at the expense of heath; this leads in turn to more rapid runoff, particularly when the vegetation is kept short, with consequent effects on the aquatic environment. While the Dartmoor ESA has been well received by individual landowners, there have, as yet, been few agreements over the commons where the majority of heather moorland is present. Modifications to the scheme may result in improved uptake.

Heather is also being lost in some places as a result of bracken invasion. Bracken control can sometimes be achieved by mechanical control (cutting or rolling), but in upland areas the topography makes this difficult and chemical control may be the only answer. The appropriate herbicide is asulam, which is approved for use near, but not in water, subject to approval from the Environment Agency. This can be relatively easily controlled when spraying small areas using a knapsack sprayer, but when using aerial application it is less easy to ensure wetland areas and watercourses are avoided.

**Deterioration of salmonid habitat** - Concerns have been expressed by fishery interests that changes in land use and land management practices have resulted in a degradation in the environmental quality of the Dart headwaters. The results of these changes are siltation of river gravels, extensive algal/plant growth and a tendency towards increased eutrophication of many streams. These factors are seen as a major threat to the continued survival of salmon stocks.

There is obvious visual evidence of siltation in many parts of the catchment resulting from poaching of banks by livestock (see also Issue 4.18, Concerns with the Recreational Use of the Catchment). Bank erosion also leads to channel widening which reduces flows and leads to further siltation. A study carried out on the River Torridge has demonstrated that siltation of spawning areas severely limits the survival of salmonid ova, and that productivity in degraded reaches is markedly reduced. The processes by which sediment is supplied to watercourses are complex and a research project is currently being carried out by Exeter University. The findings of these studies may be relevant to other river catchments, including the River Dart.

Investigations carried out to date by the Agency have shown that there has been no decline in the water quality of the Dart headwaters, and detailed statistical analysis of juvenile salmonid densities in identified areas similarly shows no significant decline. Although it is known that the problems which have resulted from changing farming practices do have the potential to severely impact salmonid fisheries, the effects on the Dart fishery to date appear limited, particularly when compared with other South West rivers where land use problems are more extreme.

Table 11 Summary of proposed actions for impact of farming and forestry on rivers and wetlands

Proposed Actions	Action by Lead Other
<ul style="list-style-type: none"> <li>Ensure all farms identified during catchment inspections carry out remedial measures work to improve water quality in Bidwell Brook, Am Brook and River Hems.</li> <li>Examine options to prevent/reduce risk of fish kills in Devonport leat.</li> <li>Encourage uptake of ESA agreements.</li> <li>Work with MAFF to ensure agri-environment schemes have appropriate prescriptions and that payments are set at correct level.</li> <li>Implement actions from River &amp; Wetlands BAP for Heather Moorland.</li> <li>Set targets for increasing breeding populations of golden plover in the catchment.</li> <li>Implement salmon management strategy.</li> <li>Consider whether establishment of buffer zones alongside rivers is a possibility to reduce damage to banks by stock.</li> <li>Facilitate the securing of funding for bankside fencing to reduce erosion, where appropriate.</li> <li>Continue gravel rehabilitation work to remove the build-up of silt to re-establish the gravels for salmonid spawning. These works may also increase the diversity of the macroinvertebrate community.</li> <li>Continue to remove trash dams where problems are identified.</li> </ul>	<p>Agency, Farmers</p> <p>Agency MAFF, Agency, DNPA Agency, DNPA, EN</p> <p>Agency, DNPA RSPB, Agency, DWT, EN</p> <p>Agency Agency, DNPA</p> <p>Agency, Landowners</p> <p>Agency</p> <p>Agency, Riparian Owners</p>

## 4.10 Acidification of Dartmoor

### Background

Moorland areas are typically acid due to the underlying geology and soils. The acidity of Dartmoor, however, is exacerbated by atmospheric acid deposition. The main sources of acid deposition are sulphur dioxide and oxides of nitrogen. In the northern hemisphere, these compounds come mainly from burning fossil fuels, but also from natural sources such as organic decay, volcanic eruptions and lightning strikes. Natural sources account for less than 5% of acid deposition in the UK.

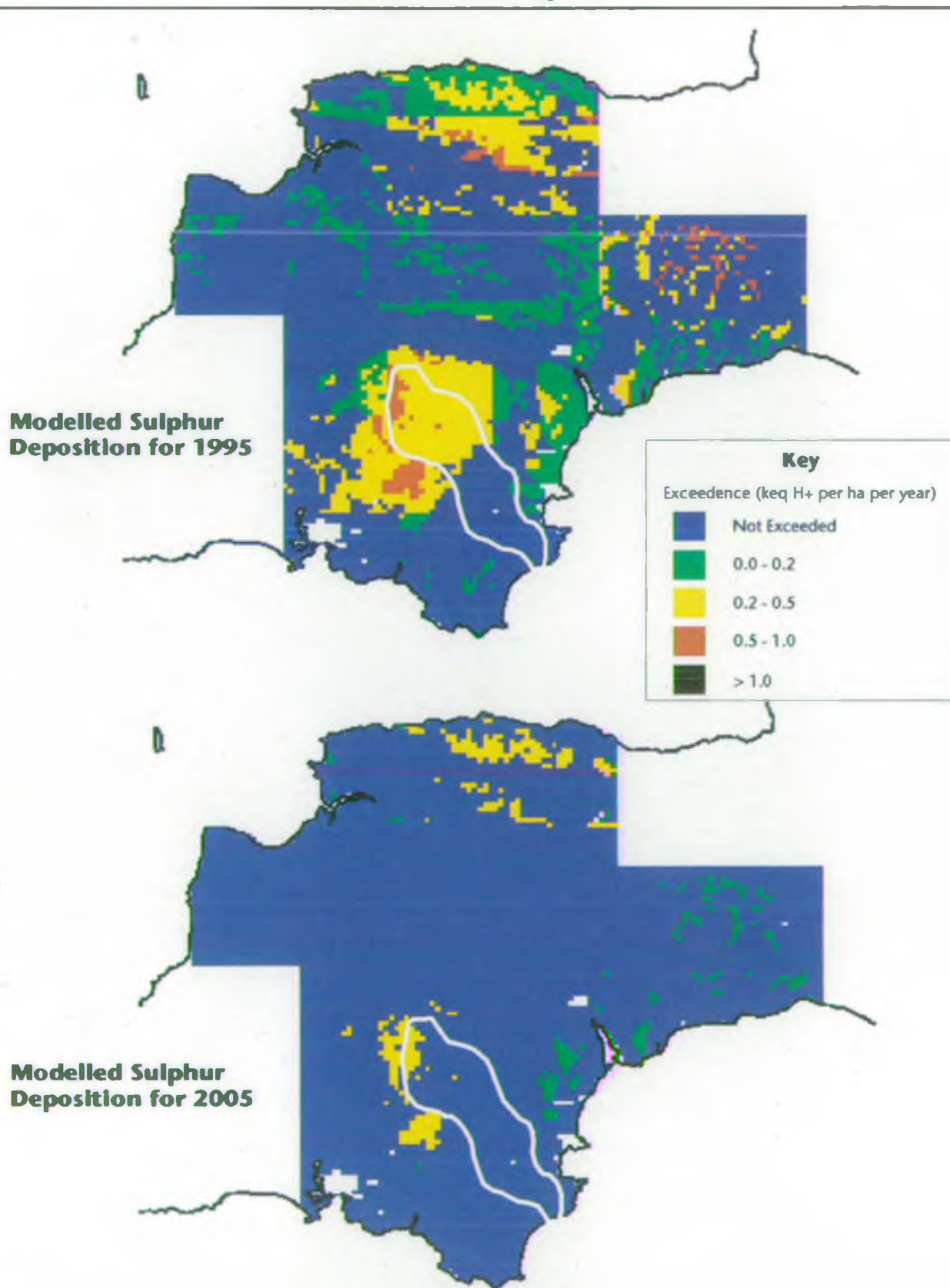
Emissions of nitrogen oxides are thought to be responsible for about one third of the acidity of rainfall, and the proportion appears to be increasing. Road vehicles are responsible for about half of the emissions of nitrogen oxides in the UK.

Research in the UK over the last 20 years has led to the development of effects based emission control policies through the formulation of a critical loads approach. This approach involves assigning a critical load of acidity to particular ecosystems; that is the amount of acid deposition below which harmful effects do not occur according to present knowledge. Some ecosystems, for example moorland and moorland streams, are very sensitive to acid deposition and therefore have a low critical load. Current or predicted acid deposition over an area can be compared with its critical load to see if it has been or will be exceeded.

Map 9 shows modelled critical load exceedences for soils in 1995 and 2005. The data for 2005 is based on the predicted emissions of sulphur dioxide and oxides of nitrogen from the major sources. It can be seen that the critical loads are notably exceeded over Dartmoor. The predicted exceedences in 2005 are greatly reduced; these reductions are due to the international reductions in sulphur emissions which have been agreed under the Second Sulphur Protocol of the United Nations Economic Commission for Europe.



**Map 9 Exceedences of Critical Loads of Acidity for Soils**



Source: Critical Loads Mapping and Data Centre, ITE Monks Wood - Data acknowledgement: CLAG Soils sub-group, Hull University

Under the terms of this Protocol the UK has agreed to reduce its SO<sub>2</sub> emissions by 80% by 2010 from a 1980 baseline. The UK's sulphur strategy published in December 1996<sup>13</sup> indicates that the UK will meet interim targets for 2000 and 2005. Compliance is also expected with the 80% reduction target for 2010.

The critical load models assume land use remains unchanged. However changes in land use could have significant effects on the level of acid deposition. Forestry, in particular coniferous forests, can increase the level of acid deposition where they are present<sup>14</sup>, this is primarily due to the way the forest canopy 'scavenges' pollutants from the atmosphere; additionally as pine needles break down they release acidic compounds.

## Effects

In parts of the country where acidification has been studied in some depth, numerous effects on both terrestrial and aquatic ecosystems have been recorded. Acidification of watercourses has been shown to affect adversely invertebrates, fish, amphibians and birds (particularly dippers)<sup>15</sup>.

**Impact on fish stocks** - There are concerns that the acid conditions of the moorland headwaters of the catchment limit the productivity of juvenile salmonids. However, an investigation on the Narrator Brook, a tributary of the River Plym, to determine the effect of acidification on salmonids, has shown that brown trout stocks appear to have adapted to the acid conditions and, at this site, remain largely unaffected. In areas seriously impacted by acidification, for instance the Wye catchment in Wales, many streams are devoid of fish life. Conditions here are clearly markedly worse than the Dart where for the most part, juvenile salmonid densities are at a satisfactory level. There is currently no evidence to suggest that pH levels currently experienced in the Dart are influencing juvenile salmonid stocks.

**Key habitats** - There are concerns that blanket bog and valley mire habitats, and their associated species may be being affected by acid deposition<sup>16</sup>. There is some concern that acid deposition may be having an adverse effect on the ecology of streams and rivers; certainly there is some evidence of acidification in SSSI's around Britain.

Table 12 Summary of proposed actions for acidification of Dartmoor

Proposed Actions	Action by Lead Other
<ul style="list-style-type: none"> <li>Ensure Part A processes authorised under IPC legislation achieve planned emission reductions.</li> <li>Promote measures to reduce emission of nitrogen oxides from traffic.</li> <li>Examine performance of salmonid fishery as part of Salmon Action Plan<sup>17</sup>.</li> <li>Conduct research and monitoring to improve understanding of acidification of Dartmoor and its effects.</li> <li>Assess impact of any proposals for afforestation within the acid sensitive area.</li> </ul>	<p>Agency, Industry</p> <p>DCC, LAs</p> <p>Agency</p> <p>Universities, DNPA, Agency</p> <p>Agency, FA</p>

## 4.11 Lack of Current Information on the Natural Environment

There are certain important habitats, species and geological features in the catchment, about which there is insufficient knowledge to gauge whether action is required to protect them.

### Examples

**Lack of information on true value of wet woodland** - Wet woodland, usually dominated by alder or willow, is known to have an interesting ground flora and to be particularly valuable for lichen communities. Its value for invertebrates is less well known. There are good examples of wet woodland in the Dart Catchment and we need to find out more about their value so that they can be properly managed.

**Lack of information on kingfishers** - Kingfishers are extremely popular and are present in good numbers in this catchment; we are working with other partners to establish a better understanding of where they breed.

**Deterioration of valley mire (linked species - curlew, keeled skimmer)** - Mires occur in valley bottoms where peat has accumulated. They are nationally important and support an uncommon and diverse plant community. They are also a breeding location for a few remaining pairs of curlew and a stronghold for the keeled skimmer dragonfly, a nationally scarce species. The hydrology and water quality of mires must be protected if they are to be sustained, but we do not fully understand the requirements of this habitat at present.

**Lack of current information on the three-lobed water crowfoot** - This is a nationally scarce plant which occurs in shallow pools on heathland which dry out in summer. It used to occur near Newton Abbot but has not been recorded for many years. The national Biodiversity Action Plan<sup>16</sup> includes targets to restore it to former sites, so we need to know if that is a possibility in this catchment.

**Lack of comprehensive information on earth science sites and features** - There are concerns over the impact of quarrying on landscape and earth science features. Regionally important geological sites (RIGS) are being identified to aid their protection. We will support this initiative and encourage conservation of recognised features.

**Table 13 Summary of proposed actions for lack of current information on the natural environment**

<b>Issue</b>	<b>Options/Actions</b>	<b>Action by Lead Other</b>
Lack of information on true value of wet woodland	<ul style="list-style-type: none"> <li>Identify key sites.</li> <li>Support survey to determine invertebrate interest.</li> </ul>	Agency, DWT, DNPA, EN, NT Agency, NT
Decline in sand martin and kingfisher populations	<ul style="list-style-type: none"> <li>Support county-wide survey of nest sites.</li> <li>Retain all known sites and seek to create suitable conditions for colonisation elsewhere.</li> </ul>	DBWPS, RSPB, Agency, NT Agency, NT
Deterioration of valley mire (linked species - curlew, keeled skimmer)	<ul style="list-style-type: none"> <li>Examine possibility of looking at hydrology and water quality of key sites.</li> </ul>	Agency, Universities
Lack of current information on the three-lobed water crowfoot	<ul style="list-style-type: none"> <li>Resurvey former sites to determine suitability for re-establishment.</li> <li>If appropriate, implement programme from UK BAP.</li> </ul>	Agency, NT Agency, NT
Lack of comprehensive information on earth science sites and features	<ul style="list-style-type: none"> <li>Identify and document County Geological Sites.</li> <li>Promote measures to prevent loss of earth science sites and features in rivers and floodplains.</li> </ul>	Devon RIGS Group, Agency Agency, LAS, EN

## 4.12 Further Threats to Key Catchment Habitats and Species

Here we describe threats to key habitats and species which have not been mentioned in the other issues.

### Examples

**Military use** - The use of areas of Dartmoor in the catchment for military training purposes has resulted in some damage to moorland habitats, through cratering and erosion. Particular concerns are damage to blanket bog and erosion of peat. The peat deposits on Dartmoor contain an important

palaeoecological record covering the last 10,000 years and can help to show how such features develop, as well as supporting a variety of important wildlife habitats and species.

**Need to protect otter populations** - Devon's otter populations are nationally important, providing a focus from which the species will expand into areas still empty following the major decline of the 1960s and 70s. The Dart Catchment does not support the high numbers found on the North Devon rivers, but there are signs of use throughout most of the catchment. None of the current threats to this species appear to be a problem in this catchment; pollution, especially with PCB's; poor water quality leading to insufficient prey; inadequate riparian habitat for resting or breeding; and accidental deaths, especially from road kills. Plans are well developed through the biodiversity action planning process for work to aid recovery of this very popular species and will include regular surveys to monitor the situation. The Agency is the UK contact point for otters and will co-ordinate actions.

**Decline in water voles** - Water voles have declined very significantly over the whole of their range. Causes are still not absolutely clear but include loss and fragmentation of suitable habitat; disturbance; predation by mink; and pollution. Mink may well have contributed to the decline in Devon, but they appear to be less common than before, possibly connected to the resurgent otter population. The south west has never been a major stronghold for water voles, but it is important that all remaining sites are retained; during the national survey carried out in 1990, signs were found on parts of the upper catchment. The Agency is the contact point for this species and national and county plans for its conservation have been produced.

**Uncontrolled burning on Dartmoor** - Dartmoor contains the most extensive areas of blanket bog in the south-west and the most southerly examples in Britain. It is an important wetland habitat that is the source for many of Devon's rivers and supports their flows during dry periods. Swaling (controlled burning of heath or grass to encourage new growth for grazing) is a valuable management tool, but uncontrolled burning can be disastrous, causing the death of the mosses which form the bog and hold the water.

**Loss of reedbed due to bank erosion** Reedbed in the Sharpham area of the Dart Estuary is under threat of being lost from bank erosion. Previously banks in the area have been artificially maintained with low stone walls, these are no longer maintained. This issue will also be examined as part of the Dart Estuary Management Plan, thus ensuring that this issue is considered as part of an overall strategy for the estuary.

Table 14 Summary of proposed actions for further threats to key catchment habitats and species

Proposed Actions	Action by Lead Other
• Increase public awareness of the dangers of fires on Dartmoor.	DNPA
• Encourage adoption of best practice for swaling (controlled burning).	DNPA, FRCA
• Consider approach to loss of reedbed in Sharpham area.	Agency, Estuary project officer
• Implement actions from Rivers and Wetlands Biodiversity Action Plan <sup>19</sup> for Otters and Water Voles.	Agency

#### 4.13 Spread of Invasive Bankside Plants

There are several alien species of plant present in the catchment which are excellent colonisers and which are spreading at the expense of more natural vegetation. Himalayan balsam is well known and has been present for many years; it spreads easily along rivers and streams forming dense stands that exclude other plants.

Japanese knotweed is less closely linked to the water environment, but it is extremely invasive. Although it does not set seed in Britain, it can regenerate from small fragments of root or stem. It will



grow through tarmac or concrete and spreads rapidly once established. Control is difficult and disposal must be carried out with care to avoid spreading the problem to, for example, tip sites. Soil containing parts of the plant should be treated as contaminated. We will control the plant on any sites that we own or manage and we will work with others to try to reduce the problem. Dartmoor National Park Authority have a control programme with which we will try to co-operate.

Giant hogweed grows up to fifteen feet tall; not only does it seed very heavily, establishing dense blocks of the plant within a few years, but it also presents a significant health risk. It is covered in sharp hairs, and contact with these or the sap causes severe blistering on skin, together with possible long-term sensitivity to sunlight. It appears to be rare in the Dart Catchment but we would like to know of any sites, especially close to water. We have produced a booklet dealing with these three species and their control and this is available from our offices on request.

There are also some invasive aquatic plants, which appear to be spreading mainly through garden ponds and lakes to which they have been introduced. The two most problematic species are *Myriophyllum aquaticum*, sometimes sold as parrot's feather, and *Crassula helmsii*, known as Australian swamp stonecrop or New Zealand pigmyweed. We will encourage garden centres to stop selling these plants and suggest that they are removed from ponds where possible. We would wish to know more about the distribution of these plants in the catchment.

**Table 15 Summary of proposed actions for spread of invasive bankside plants**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
<ul style="list-style-type: none"> <li>Encourage recording of invasive plants by field staff and others.</li> <li>Raise awareness of problem of <i>Crassula</i> and <i>Myriophyllum</i> through garden centre trade associations.</li> <li>Encourage removal from ponds of <i>Crassula</i> and <i>Myriophyllum</i> where already established.</li> <li>Continue surveys for invasive bankside species.</li> <li>Carry out control on any Agency owned or managed sites.</li> <li>Encourage control by riparian owners and other interested parties.</li> <li>Co-operate with owners and other bodies to achieve eradication of giant hogweed on Wray Brook.</li> <li>Make invasive plants booklet widely available.</li> </ul>	<p>Agency Agency, Garden Centre Trade Associations Agency</p> <p>Agency Agency Agency Agency, LA, DCC, HA</p> <p>Agency</p>

#### 4.14 Lack of Information on Archaeological/Historic Value of the Catchment

##### Background

The catchment includes many sites of historic and archaeological value. Most of these are found on Dartmoor (see Section 2.7).

##### Effects

Archaeological/historic features as yet unidentified are at risk from new development or changes in land use.

**Table 16 Proposed action for lack of information on archaeological/historic value of the catchment**

<b>Issue</b>	<b>Options/Actions</b>	<b>Action by Lead Other</b>
Absence of general assessment of archaeological/historic value of catchment	<ul style="list-style-type: none"> <li>Support production of document(s) covering entire area; investigate potential for collaboration.</li> </ul>	DCC, LAS, EH, DAS, Agency, RCHME, Uni. of Exeter, NT

## 4.15 Barriers to Fish Migration

### Background

There are 28 weirs and other obstacles in the catchment, some of which are complete barriers to the migration of salmon and sea trout (see Map 10). Many of the major weirs in the system have efficient fish passes and allow migratory fish free passage. The obstructions due to the reservoir is of little consequence as there is no spawning habitat available further upstream. There are, however, weirs which do not have passes and seriously inhibit the movement of fish as they only permit migration in a limited range of flows. In many cases improving conditions at these weirs is of considerable importance as they prevent free access to major spawning areas.

When a new dam is constructed or an old dam damaged or allowed to fall into a state of disrepair, The Agency can require the owner to install a fish pass if conditions for fish passage are likely to be compromised. Under these circumstances, the weir owner is liable for the costs of the works. Although we can install fish passes on any existing weir, it must be at our own cost. Many of the works required on weirs in the catchment require considerable expenditure. We have limited resources to carry out these improvements and are now very reliant on external contributions and collaborative schemes to ensure that they are achieved.

Many weirs which have passes installed become obstacles under low flow conditions where they are associated with large abstractions, including hydroelectric power. Often a large proportion of the total river flow is abstracted leaving only a small quantity to flow over the weir or through the fish pass. For new abstractions it is possible to set conditions to protect the river, for example, winter only abstraction or a prescribed flow, but for existing abstractions where there is a licence of entitlement, we can only negotiate with the abstractor to limit the quantity taken at certain times of the year; this is largely dependent upon goodwill.

There are abstractions at some sites in the system which create problems for the downstream migration of smolts. The installation of screens has proved an effective means of alleviating the problem, and recent changes in legislation will make it a requirement for abstractors to have screens installed by 1 January 1999, where a need is identified. Fish farms and abstractors also have to allow some flow from their discharge at all times to allow downstream migration of smolts.

### Examples

Staverton weir was breached in 1995. Following consultation with interested parties, the Agency repaired the breach creating a new route for fish migration at the same time. This considerably improved conditions for fish migrating over the weir as the existing fish pass had fallen into a state of disrepair. South Hams District Council is currently considering completely reinstating the whole weir, which may include blocking the existing route used by migrating fish. Such works would necessitate the installation of a new fish pass to ensure that the weir did not create an obstacle.

Kilbury weir is gradually falling into a state of disrepair. Presently, migrating fish are able to negotiate the structure in moderate flows and above, but they experience problems in low flows. A fish pass installed on the weir is of limited value since when the river drops, the pass soon runs dry. Due to the prohibitively high cost of rebuilding the weir, it is likely that it will continue to deteriorate. It is important to ensure that a complete barrier to fish movement is not created as this deterioration occurs.



## Map 10 Barriers to Migratory Fish



There are several major obstructions on the River Harbourne. This major tributary of the Dart contains several areas of quality spawning habitat which, if fully utilised, would contribute significantly to the overall salmonid production in the catchment. The number of obstacles on the Harbourne that require improvements is substantial.

During the summer months we are often involved in the removal of boulder dams from moorland rivers and streams. These structures have been created by the general public visiting the moor. Many of these 'tripper' dams are of a considerable size and, on occasion, machinery has been required to dismantle them. It is important that these dams are regularly removed as they are commonly impassable to fish migrating to spawning areas.

**Table 17 Summary of proposed actions for barriers to fish migration**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
<ul style="list-style-type: none"> <li>Identify sites which create problems for the downstream migration of smolts.</li> <li>Following National Guidance on screening criteria; advise abstractors of Agency screening requirements and work towards implementation.</li> <li>Continue to remove temporary obstruction on moorland streams and seek to modify man-made barriers in the system to permit fish passage.</li> </ul>	<p>Agency Agency Abstractors</p> <p>Agency, fishing associations, riparian owners, other (for possible sources of funding)</p>

#### **4.16 Risk of Over-exploitation of the Salmon Fishery**

##### **Background**

Many of the factors which influence numbers of migratory fish returning to the river to spawn are beyond our control, for instance, distant water fisheries and the Irish drift net fishery. This places particular importance on measures adopted locally to maximise the number of fish returning to spawn, and to ensure that conditions in the river system are favourable for successful spawning and survival (the latter is addressed in the other issues).

Analysis of current and historical catch returns from rivers across the country has shown a marked decline in the numbers of salmon entering rivers between 1 January and 31 May. Returns from the River Dart indicate a similar decline.

The future management of salmon stocks on the Dart will be facilitated by the production of a Salmon Action Plan for the river in 1998-9. We have produced a national strategy for the management of salmon<sup>17</sup>, part of this strategy is to develop individual action plans for all major salmon rivers in England and Wales. The national strategy sets out four objectives for the future management of salmon stocks:

- Optimise recruitment to home water fisheries;
- Maintain and improve the diversity and fitness of stocks;
- Optimise the total economic value of exploited fish whilst allowing for social equity considerations;
- Meet the necessary costs of managing the resource.

Existing fisheries data held by us will be important in identifying problems within the catchment. The data will be used for setting targets for spawning and assessing how the salmon fishery complies with these targets. It is recognised that a fish counter installed on the river to assess the extent and timing of the migratory fish run would be a valuable management tool, and would greatly increase the quality and quantity of information currently available. The cost of a fish counter would be

considerable and has, to date, proved prohibitive on the Dart and all other salmon rivers within the Devon Area. Funding for a counter would have to be found outside the Agency. The minimum cost for the installation of a counter on the Dart would be approximately £50k. Considerable time would need to be available for manning a counter once installed.

Migratory fish may be legally taken from the River Dart by the net fishery in the estuary, or the rod fishery in the freshwater river. Adult fish are also being taken from the river, estuary and adjacent coastline by illegal fishing.

Poaching can have a dramatic effect on fish stocks if uncontrolled. We maintain a programme of regular enforcement on the Dart to minimise the numbers of fish taken illegally, and presently the extent of poaching carried out is thought to be limited. However, the importance of maintaining an enforcement presence on the river and at sea is recognised as a necessary requirement to prevent levels of illegal activity escalating.

The current Net Limitation Order for the Dart setting the maximum number of nets which may be licensed for the capture of migratory fish at 18 expires in December 1997.

Initial analysis of a variety of data indicates that there is cause for concern over the state of salmon stocks, and in particular the spring component of the run.

We are currently proposing to renew the current Net Limitation Order at the existing level for a period of two years to allow detailed analysis of the available data prior to arriving at a final proposal.

We are only empowered to control the overall cropping levels in a river system, and are not able to determine the proportion of fish which may be taken by the net and the rod fisheries. This is a decision that can be made by Government only, requiring legislative change. Our current powers to regulate licensed fishing are limited to the conservation of the resource, and to improve the management of individual stocks.

It has become apparent following a marked decline in the numbers of spring fish returning to the Dart that particular importance needs to be given to protecting this component of the salmon run. Irrespective of the possibility of catch restrictions associated with the net limitation order, additional specific control measures to maximise the numbers of spring fish returning to spawn should be considered either on a voluntary or mandatory basis when the current three year voluntary measures expire at the end of the 1998 season. The problem has been recognised by the Duchy of Cornwall Estates, Dart Fisheries Association and the Dart Angling Association which introduced rules in 1996 to protect spring fish.

**Table 18 Summary of proposed actions for risk of over-exploitation of the salmon fishery**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
• Promote conservation measures for spring fish and agreed restriction on netting.	Agency, fishery interests
• Consider introduction of rod and net fishing byelaws to reduce exploitation of spring fish.	Agency, fishery interests
• Introduce interim 2 year NLO for 18 nets.	Agency
• Carry out detailed analysis of fishery data including juvenile surveys, egg deposition rates and catch returns.	Agency
• Introduce catch controls and new NLO to restrict exploitation in line with findings of above.	Agency



#### 4.17 Additional Threats to Fish Stocks

Concerns about fisheries have already been referred to in Concern Over Low Flows (see Section 4.4), Impact of Farming and Forestry (see Section 4.9), Acidification of Moorland Headwaters (see Section 4.10), Barriers to Fish Migration (see Section 4.15) and Risk of Over-exploitation of the Salmon Fishery (see Section 4.16). Other threats to fisheries are mentioned here.

##### Examples

**Brown trout stocking** - Historically, fishing interests have stocked various reaches of the Dart with farmed brown trout originating from a variety of sources. This practise, which is carried out to improve angling quality, may have an adverse effect on the native population through increasing competition for food and habitat, and by increasing predation of native juveniles. Furthermore, the continued introduction of farmed fish will modify the genetic integrity of remaining native stocks, and may attract avian predators able to take advantage of an unnaturally high population.

**Fish-eating birds** - In common with many rivers in the area, there has been a marked increase in the numbers of cormorants and goosanders observed in the Dart Catchment. Concerns are regularly expressed by various fishing interests that this increase in levels of predation is adversely affecting the fishery. The most occur during the smolt run in March where large numbers of salmonids descend the river into the estuary at a size that makes them particularly vulnerable. The lower reaches of many other South West rivers contain coarse fish stocks which like salmonids are known to be susceptible. On the Dart, predation in freshwater will be almost exclusively of salmonid species. MAFF is presently carrying out research to determine what the effects of cormorants frequenting a river system are on the fishery, the findings of which should assist in determining the most appropriate means of dealing with the issue. We shall not support licensed killing of fish-eating birds until and unless proof of serious damage has been established and killing is proved to be the most effective means for preventing significant loss of fish stocks. However, we are committed to working positively with owners and anglers to establish the full facts in each situation.

Goosander are uncommon in Devon, having first bred as recently as 1984. It is a northern species which appears to be expanding its range. They are somewhat unpopular with anglers, since they feed on small fish, including salmonids. There is concern that some may have been killed despite being fully protected under the Wildlife & Countryside Act.

Table 19 Summary of proposed actions for additional threats to fish stocks

Issue	Proposed Actions	Action by Lead Other
Stocking with farmed brown trout	<ul style="list-style-type: none"><li>Discourage stocking with fish other than those originating within the catchment.</li><li>Promote habitat enhancement as a preferred method of improving stock levels.</li></ul>	Agency fishing associations  Agency
Impact of fish eating birds on salmonid and coarse fish stocks	<ul style="list-style-type: none"><li>Co-operate with the licensing authority to progress further research into this issue.</li><li>Continue to work positively with owners and anglers to establish the full facts in each situation.</li></ul>	Agency MAFF, landowners, anglers  Agency MAFF, landowners, anglers

#### 4.18 Concerns with the Recreational Use of the Catchment

##### Background

Many people spend their spare time enjoying our rivers and coasts. We have a general duty to promote the recreational use of water in England and Wales and we will support sensitive and sustainable access initiatives that respect the interests of local people.

There are some sites in the Dart Catchment where there are opportunities to improve facilities for recreational use. We try to do this where we can, particularly if land is in our control. There are also areas where recreation is having an adverse effect on the environment. The Agency recognises that recreation can conflict with other interests such as conservation, and we work with other organisations to resolve these problems. In promoting new recreational facilities we ensure that the environment is safeguarded.

Section 5.6 provides more information on recreation in the Dart Catchment.

## Examples

**Restricted public access to rivers** - Access to rivers in the catchment is restricted to existing footpaths and other rights of way. Many of these routes are difficult to use especially for the less able. We do not encourage new access routes or promote the use of particular rights of way without the support of landowners and countryside interests. The DNPA wish to see new paths in the Dart and Webburn woodlands.

**Visitor pressure** - Some footpaths in the catchment are under pressure from people. Large numbers of visitors are known to cause erosion to sites at Newbridge, Dartmeet and Bellever, where the National Park Authority has exercised control by careful use of blockstone revetment. Visitor management is becoming ever more important in the countryside and so should play a part where rivers and wetlands are concerned. Use of paths by mountain bikes, and even motorcycles, can also cause extensive damage.

Damage to river banks from heavy recreational use are resulting in erosion and channel widening. In turn this leads to slowing of flows in the widened section, with accompanying sediment deposition and a change from the typical coarse gravel substrate. The deterioration of salmonid habitat resulting from deposition of sediment is a particular concern ( see also Impact of Farming and Forestry on Rivers and Wetlands, Section 4.9). There is obvious visual evidence of siltation in parts of the catchment; the main problems are situated around sites with good access, such as Lower Cherrybrook Bridge.

Visitor pressure is also exacerbating the decline in the quality and extent of heather moorland (see also Impact of Farming and Forestry on Rivers and Wetlands, Section 4.9).

**Disturbance to wildlife** - Some concern has been expressed about disturbance of wetland habitats on the high moor, again as a result of visitor pressure. There are also concerns about:

- erosion and disturbance of heathland due to visitor pressure;
- disturbance of tors and clitter with associated birds;
- cavers disturbing bats;
- disturbance of bankside habitat used by otters or birds, in particular the wooded middle reaches of the catchment which are subject to quite heavy recreational pressure.

**Implications of River Dart charity raft race** - There are a number of concerns about the safety implications of this raft race, especially since some of the weirs are in a state of disrepair. Concerns have also been raised regarding litter problems created, for example, debris from broken rafts.

**Access agreements for canoeists** - As one of the premier canoeing rivers in England, the Dart is heavily used by participants of the sport. Access agreements between riparian owners and the British Canoe Union (BCU) are in force, which allow canoeists to use part of the river during the winter. Outside these agreements there is no public right of navigation on non-tidal watercourses. The Dart is heavily used, especially in the section known as 'The Loop' between Newbridge and Holne Bridge, with canoeists prepared to travel long distances. Although existing access agreements tend to protect the interests of anglers during the fishing season, and spawning areas in the winter, conflicts arise

where canoeists use the river in the closed period. It has been suggested that a byelaw is created by the Dartmoor National Park Authority to prohibit canoeing during the closed period, thus making the activity an offence. This would allow a greater level of control, and prevent irresponsible canoeists from causing damage to spawning areas.

There is also widespread concern about parking in the area and the risk of obstruction of the narrow roads, as well as the fact that canoeists often have to change into or out of wetsuits at the roadside.

Dartmoor National Park has been working with the BCU, riparian owners and others to address these problems. We are also involved as an independent and unbiased arbitrator and will continue to seek consensus on the best way to manage canoeing.

**Damage and disturbance from management for angling** - In 1995 serious damage to the river corridor habitat occurred along a small section of the river Dart as a result of management for angling. There are concerns that such an incident could be repeated.

**Impact of sewage from boats** - Concern has been raised over the impact of sewage from boats on water quality and water sports in the coastal waters and estuary of the catchment.

**Table 20 Summary of proposed actions for recreational use of the catchment**

<b>Issue</b>	<b>Proposed Actions</b>	<b>Action by Lead Other</b>
Visitor pressure	<ul style="list-style-type: none"> <li>Need to continue with careful visitor management. NB: Further actions to be added when identified.</li> </ul>	DNPA, LAS
Impact of sewage from boats on water quality and wildlife	<ul style="list-style-type: none"> <li>Encourage disposal of sewage waste at shore based facilities.</li> <li>Support Estuary Management Plan initiatives.</li> <li>Monitor impact of recreational activities on conservation i</li> <li>Support Estuary Management Plan Initiatives. nterests and water quality in the Estuary.</li> </ul>	Dart Harbour & Navigation Authority Agency Agency
Access agreements for canoeists	<ul style="list-style-type: none"> <li>Take part, as neutral party, in any discussions over canoe access.</li> </ul>	Agency, DNPA, BCU, riparian owners
Implications of the River Dart charity raft race	<ul style="list-style-type: none"> <li>Review safety of race and encourage adoption of appropriate safe practices.</li> <li>Encourage removal of debris from river.</li> </ul>	Agency, Race Organisers  Agency, Race Organisers
Lack of public access to rivers, especially for the less able	<ul style="list-style-type: none"> <li>Discuss possibilities of improved access to, and interpretation of, the water environment.</li> <li>Investigate proposals for footpaths/cycleways.</li> <li>Develop vehicular access and public transport links for the less able.</li> <li>Create angling facilities for less abled at Totnes.</li> </ul>	DNPA, Agency LAS  LAS DCC, DNPA  Agency, DAA
Disturbance to wildlife	<ul style="list-style-type: none"> <li>Raise awareness of public regarding disturbance.</li> </ul>	DNPA, RSPB

#### 4.19 Concerns Over the Use of Anti-fouling Paints on Boats

Paints to prevent fouling of boats with various marine organisms, such as barnacles and algae, have been in existence since the 1960s. Until recently, most paints have been based on the anti-fouling compound tributyltin (TBT). Field and laboratory studies have shown that TBT has had an environmental impact in a number of locations around England and Wales<sup>20</sup>. One of the major effects of TBT is shell thickening and reduced meat yield in the oyster *Crassostrea gigas*. In 1987 the UK

Government introduced a number of controls on the sale of TBT based paints and banned their use on boats less than 25 m in length.

Between 1986 and 1992 MAFF monitored a number of sites throughout the UK for TBT levels in water, sediment, oysters and mussels, including two sites in the Dart Estuary; Dart Marina and Blackness Point.

In 1986 the mean summer TBT concentrations in water in Dart Marina were 95 ng/l; in 1992 the mean summer concentration was equal to the Environmental Quality Standard of 2 ng/l which is designed to protect aquatic life<sup>21</sup>.

At Blackness point levels of TBT in water, oysters and mussels have declined since the 1987 ban. In 1986 the mean summer water concentration was 38 ng/l, which declined to 5 ng/l in 1992<sup>21</sup>.

The ban in 1987 has clearly led to a decrease in TBT concentrations in the estuary, although concentrations at Blackness Point were last recorded (in 1992) as being marginally above the EQS. The remaining sources of TBT are likely to be resuspension from sediments, boats over 25 m in length and possibly the illegal use of TBT on smaller boats.

Alternatives to TBT based paints are mainly based on copper and zinc metal oxides or the herbicide Irgarol. There are concerns that Irgarol 1051, which is similar to the persistent herbicides atrazine and simazine, could have adverse environmental effects. In one study conducted in the estuaries of Kent, Sussex and Hampshire the compound was detected at significant levels in areas of high boating activity, particularly in marinas<sup>22</sup>.

## Effects

MAFF's sampling of oysters at Blackness point has shown that there has been no abnormal shell thickening since 1988 and that meat yield has increased considerably since 1986.

Current levels of TBT in the estuary are unknown.

There is currently no monitoring of the herbicide Irgarol 1051 in the estuary and its toxicity to aquatic organisms is poorly understood.

## Proposed Actions

At the 4th North Sea Conference Ministers from the nine North Sea Countries agreed to take action within the International Maritime Organisation, with the aim of a world-wide phase out of TBT. If significant progress has not been made by the end of 1997, they agreed to consider phasing out the use of TBT on ships flying the North Sea States' flags. Ministers have also agreed to promote research on environmentally safe anti-fouling technologies. The UK government agreed with this approach but has stated that the implications for fuel consumption must be considered.

**Table 21 Proposed actions for concern over the use of antifouling paints on boats**

<b>Proposed Actions</b>	<b>Action by Lead Other</b>
<ul style="list-style-type: none"><li>Assess current status of TBT in estuary.</li><li>Consider the need to conduct monitoring of Irgarol.</li><li>Support research into Irgarol and its environmental effects.</li></ul>	MAFF, PML, Agency Agency Agency

# Part 2

## 5. Supporting Information

### 5.1 Urban Development/Land Use Planning

Here we consider the built environment and the process of planning and regulating the construction of new development including roads, housing and industry.

County, district and unitary planning authorities plan and control development; although they must consult us, they do not have to follow our advice.

#### 5.1.1 Land Use Planning

Our objectives are to protect the environment from the harmful effects of development and to minimise flood risk. Our levels of involvement are:

- **National** - Liaison with the DoE and other national organisations, consultation on new or revised legislation, Planning Policy Guidance and Circulars;
- **Regional** - Liaison with Regional Government offices, consultation on Regional Planning Guidance;
- **Forward planning** - Making a positive input to the drafting of development plans, including Structure Plans, Unitary Development plans, Local Plans, Mineral Local Plans and Waste Local Plans - thus ensuring not only a sustainable form of development but that Policies reflecting the Agency's interests are incorporated appropriately and that site designations will not be detrimental to the environment or unnecessarily compromise the Agency's activities at a later date.
- **Development control** - Responding to consultations on development proposals.

Local authorities prepare statutory development plans. In January 1994 the former National Rivers Authority (NRA) published guidance notes for local planning authorities on ways of protecting the water environment through development plans; these notes are currently being updated to cover all our new areas of responsibility. The notes highlight topics that concern us and offer guidance on model policies. For example, the Government view is that development should be guided away from areas that may be affected by flooding and should be restricted where it would increase the risk of flooding. To achieve this, it expects local authorities to use their planning powers and the Agency to assist by providing advice on development and flood risk. The work that is now underway on preparing flood plans is an example of this advice (see Sections 4.1 and 5.8).



### 5.1.2 Local Development Plans

The Regional Planning Guidance for the South West was published in July 1994<sup>23</sup>. This guidance recognises the need to achieve sustainable development and aims to influence the policies of County Structure and Local Plans to secure the best development strategy for the region, including advice on a variety of environmental issues.

There is only one approved Structure Plan relevant to the catchment: the Devon County Structure Plan, Third Alteration<sup>24</sup>, covering the period up to 2001. The Structure Plan provides a strategic planning framework for development and land use within Devon and contains policies and advice to ensure the protection and conservation of the environment.

Devon County Council has produced a draft review of the Structure Plan 'the Devon County Structure Plan First Review 1995-2011'<sup>25</sup>, which takes the plan period forward to 2011 and embodies the principles of sustainable development; We have commented on this plan.

The catchment lies within South Hams District Council, Teignbridge District Council and West Devon Borough Council, and has much of its area within Dartmoor National Park (a local planning authority) and a small part within Torbay Borough Council (see Map 11). The existing statutory Local Plans and those currently in preparation are shown in Table 22. Local Plans are prepared in conjunction with the Devon County Structure Plan. Table 22 also shows the housing and employment land provision up to 2011. In the National Park the preservation and enhancement of the landscape will be given priority over other considerations in the determination of development proposals.

Dartmouth and Totnes both function as Area Centres, which means they are important in providing facilities, shops and services for the surrounding rural area. They are both also subject to development constraints due to historical, environmental and landscape aspects; development significantly in excess of existing commitments should be constrained at Totnes, with some limited further development possible at Dartmouth<sup>26</sup>. However, some economic, commercial and infrastructure investment may be appropriate to meet the local needs of the area.

Buckfastleigh, one of the fastest growing settlements in the Dartmoor National Park in recent years, and Ashburton have both been identified as Selected Local Centres. This gives a degree of priority for the development of facilities and the provision of small scale local employment opportunities.

Princetown, the main settlement of the high moor, has two specific sites identified within the village that would benefit from enhancement and the National Park Authority will also encourage and assist with undergrounding of overhead cables within the Princetown Conservation Area.

Industry in the catchment is fairly limited and is confined almost exclusively to the south of the catchment. There is limited light industry in the Totnes area. Tourism plays a significant role in the Dartmouth area and further north in the Dartmoor National Park.

## Map 11 Built Environment



Information correct as of March 1997

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River Dart Local Environment Agency Plan



Table 22 Local Plans in the Catchment

Local Authority	Housing Provision (dwellings) to 2011 <sup>24</sup>	Employment Land Provision to 2011 <sup>25</sup>	Local Plan Plan Status
South Hams District Council	Dartmouth 387 Dartington 6	120 ha (NB: this is mainly outside the catchment).	South Hams Local Plan <i>Finally adopted April 1996.</i>
Dartmoor National Park	None in this catchment.	Insignificant in this catchment.	Dartmoor National Park Local Plan. <i>Adopted December 1995.</i>  NB: planning policies and proposals set up to 2001.
Teignbridge District Council	None in this catchment.	Total 60 ha (NB: this is mainly outside the catchment).	Teignbridge Local Plan (as modified). <i>Adopted October 1996.</i>  NB: planning policies and proposals only set up to 2001.
Torbay Borough Council <i>NB: TBC becomes a Unitary Authority, with effect from April 1998</i>	None in this catchment.	Not relevant for this catchment, but priority will be given to employment developments with $\geq 27$ jobs/acre <sup>1</sup> .	Torbay Borough Local Plan - Consultation Draft. <i>Consultation Review.</i>
West Devon Borough Council	None in this catchment.	35 ha (NB: this is mostly outside the catchment).	n/a

**Notes:** The stages in the preparation of local plans prior to their adoption are usually as follows: Consultation Draft, Deposit Draft, Public Inquiry (at which objections to the plan are raised verbally). Inspector's Report, Adopted Plan.

<sup>1</sup> A Planning Application for development of employment land at White Rock has been received by Torbay Borough Council. The Agency were consulted on this application, and have made a response. A decision is expected in due course.

### 5.1.3 Transport Network

We are a statutory consultee to the Department of Transport when new trunk roads are developed. We also have input into road schemes proposed by County and District Councils.

We have powers under the Water Resources Act, 1991<sup>26</sup> to control highway drainage through prohibition notices and discharge consents.

A number of important routes cross the catchment (see Map 11) including the A38. The road network is under increasing pressure from heavy traffic loads, particularly in the holiday season. Many of the more remote towns and villages are approached by narrow roads, resulting in severe congestion during peak holiday periods, which can have adverse environmental effects. In order to alleviate traffic congestion which has long been a problem in Buckfastleigh, a Buckfastleigh Relief Road is planned for commencement by 2011<sup>25</sup>. However, within national parks it is now the policy of the Government that no new long-distance routes should be constructed, nor existing roads upgraded unless a compelling need, not met by any reasonable alternative, is demonstrated.

A study is to be undertaken by 2011 to identify an appropriate solution to reduce congestion and improve accessibility for the A385 which runs between the A38 and Totnes<sup>25</sup>.

Devon's rail network forms a key element of an integrated and balanced transportation system. Totnes has the only rail station in the catchment which is served by the national network. There are no further proposed new stations within the catchment.

#### **5.1.4 Local Waste and Minerals Plans**

Devon County Council are responsible for all aspects of land use planning in connection with mineral working and waste disposal within the catchment.

Devon Minerals Local Plan is currently in the Consultation Draft (1994) stage<sup>27</sup>. A draft waste strategy for Devon's household waste has been drawn up by a working group consisting of representatives from district councils, the County Council, and ourselves.

Through consultation with the County Council we will seek to ensure the Waste and Minerals Local Plans contain policies which will protect the environment. Mineral extraction and waste disposal in the catchment are described in Sections 5.2.7 and 5.3.5 respectively.

#### **5.1.5 Development Sites and Flood Risk in the Catchment**

We object to any development which would increase the risk of flooding until suitable flood alleviation schemes have been implemented. A brief summary of flood defence and development control in the catchment is given in Section 5.8.1, issues relating to these sites can be found in Section 4.1.

#### **5.1.6 Development Sites and Sewerage**

There are a number of settlements in the catchment served by STWs which the Agency judges to be unsatisfactory. We recommend against further development in these areas until remedial works have been carried out by SWWSL. Issues relating to these STWs can be found in Section 4.5.

### **5.2 Controlled Industrial Processes and Use of Radioactive Substances**

Our responsibilities include the regulation of large and complex prescribed industrial processes and the regulation of the storage, use and disposal of radioactive substances.

#### **5.2.1 Controlled Industrial Processes**

We are the statutory authority in England and Wales for regulating the largest and most complex industrial processes. To do this we use a system known as Integrated Pollution Control (IPC). This system requires the use of best available techniques not entailing excessive cost (BATNEEC) to prevent the release of particular substances into the environment or, where this is not practicable, to minimise their release and render them harmless.

Two lists of processes have been prescribed by regulations for control: Part A processes are controlled under IPC by the Agency; releases to the air from Part B processes are controlled at a local level under a system of Local Authority Air Pollution Control.

Part A processes are those which are potentially the most polluting industrial processes, including large combustion plant, iron and steel manufacturing, the chemical industry, solvent recovery and incineration plants; these may affect all aspects of the environment (air, water, land). Part B processes are only controlled for their releases to air.

#### **5.2.2 Local Perspective**

There is one Part A process found in the catchment at Buckfastleigh; Buckfast Spinning Company Limited is authorised to carry out a textile treatment process. The process discharges treated effluent to the local sewage treatment works, and solid wastes are disposed through licensed contractors. Improvement conditions have been included in the authorisation which require the company to address many issues by certain dates. Amongst these are:

- a study of techniques to further prevent or minimise fugitive releases (including odorous substances), including a timetable of proposed improvements if appropriate;



- to provide proposals on how reliable annual estimates of the mass discharged to the environment are to be provided for prescribed substances (mercury, cadmium, aldrin, dieldrin, endrin, hexachlorobenzene and all isomers of hexachlorocyclohexane and DDT);
- a review of the use of water and energy;
- an investigation on the occurrence of organo-phosphorus and synthetic pyrethroid insecticides in the raw materials and the potential that these have for causing harm to the environment when released from the process, including a report to address the means by which such releases may be rendered harmless;
- a report reviewing the release of aldrin, dieldrin and endrin and all isomers of hexachlorocyclohexane, and a programme of how such releases are to be prevented or minimised by the fitting of advanced forms of abatement techniques; to include a timetable to be presented for improvements, if appropriate.

Issues relating to this site can be found in Part 1 (Section 4.5).

### 5.2.3 Radioactive Substances

We are the principal regulator in England and Wales under the Radioactive Substances Act 1993. This statute is concerned with the storing, use and disposal of radioactive substances and in particular, the regulation of radioactive waste.

Radioactive substances are present in the environment as a result both of natural processes and of human technological developments. The uncontrolled and incautious use of these substances can pose both immediate and long-term hazards.

We are the Competent Authority for a number of EC Directives on the shipment of radioactive substances and sealed sources between EU Member States. We also regulate shipments of radioactive waste into, out of, or through England and Wales.

The major nuclear establishments are licensed to operate by the Nuclear Installations Inspectorate (NII), but discharges from them are authorised by the Agency. These discharges arise from the day-to-day operations at the sites. Site operators are required to ensure that discharge conditions are met and also ensure that radiation dose limits to the public are not exceeded as a result of the discharges.

### 5.2.4 Local Perspective

There are a number of sites in this area which are registered under the Radioactive Substances Act 1993, for keeping and using small radioactive sources

Each of these sites have been assessed and permission granted by us on the basis that the use of radioactive materials is justified and that operators are prepared to abide by conditions to safeguard human health and protect the environment. The permissions take the form of certificates of registration for keeping and using radioactive materials and certificates of authorisation for the accumulation and disposal of radioactive waste.

### 5.2.5 Radon

Radon is a natural radioactive gas which forms from the decay of uranium and thorium in rocks and soils. In 1990 Devon and Cornwall were designated by the DoE as affected areas. These were areas

where more than 1 in 100 homes were likely to have radon concentrations above the level recommended by the National Radiological Protection Board.

District councils conduct monitoring of radon concentrations in homes in the catchment. They also provide advice and in some cases home improvement grants, in order to reduce exposure to radon.

#### 5.2.6 Mineral Extraction

The extraction of material from quarries and mines can damage both underground and surface water resources. The damaging effects of mineral extraction are often long term and sometimes permanent; issues relating to mineral extraction, together with the effect of abandoned mines, in the catchment can be found in Part 1, Sections 4.2 and 4.3.

Map 12 shows the locations of mines and quarries in the Dart Catchment.

#### Mines

The Dart Catchment covers two geologically distinct areas; in the south the catchment is principally underlain by Devonian and Carboniferous rocks and the northern part of the catchment drains the high ground underlain by the Dartmoor Granite intrusion (see Section 2.1). Historical metalliferous mining has occurred in several areas of the catchment. Mineral deposits in this catchment are generally low grade and of limited extent compared to other areas of Devon and Cornwall. Metalliferous mining is no longer economic in this catchment.

We discuss mining here in relation to the geology and mineralisation of the area.

#### Dartmoor Granite

Approximately one third of the catchment is underlain by granite. The granite is predominantly a barren crystalline intrusive volcanic rock. The metal oxide ores of tin (cassiterite) and iron (haematite) are the principal minerals found within the granite. The sulphide mineral pyrite has been noted as an accessory mineral, but is not likely to be present in sufficient quantities to affect water quality.

A closely spaced group of mines around Birch Tor in the north of the catchment produced tin and some iron. A scattered group of mines in the vicinity of Hexworthy worked tin ore from the granite.

#### Devonian and Carboniferous rocks

The Carboniferous rocks include shales, grits, cherts, slates and limestones of the Culm Measures. The Devonian rocks include slates, grits and limestones, with localised outcrops of volcanic basalts and tuffs.

Heat generated during the volcanic emplacement of the granite resulted in the mineralisation of the adjacent Carboniferous and Devonian rocks. Metalliferous mineralisation in these rocks is concentrated within a 4 - 6 km wide band adjacent to the granite margin. Some scattered mineralisation is associated with Devonian limestones, slates and volcanic rocks at greater distances from the granite.

A greater variety of metallic ores are recorded within the Devonian and Carboniferous rocks compared with the Dartmoor Granite. Many of these are metal sulphide ores. Chalcopyrite (copper-iron sulphide) was the principal economic mineral. Other metal sulphides include iron, arsenic, bismuth, zinc and lead. Nickel and silver minerals are also present. Sulphide minerals are more prone to weathering and consequently have a greater significance to water quality than oxide minerals.

Oxide ores are of secondary importance to sulphide ores in the Devonian and Carboniferous rocks. The main oxide ore is tin oxide (cassiterite), but iron oxide (haematite) and manganese oxides are also present. Manganese is associated with cherts, volcanics and umber deposits - precipitates of iron and

## Map 12 Mining and Quarrying





manganese hydroxides. Pitchblende, a uranium oxide mineral is also reported at one location, though never worked.

The impact of abandoned mines on the Dart Catchment is discussed in Section 4.2.

### 5.2.7 Quarries

There are two working quarries within the catchment, these are Whitecleaves at Buckfastleigh and Linhay Quarry at Ashburton (see Map 12).

Whitecleaves Quarry works a narrow band of Dolerite which is used for road surfacing. The quarry lies adjacent to the boundary of Dartmoor National Park, and contains Potters Wood SSSI.

Linhay Quarry works limestone which is used for animal feed, aggregate and armour stone. This site lies within Dartmoor National Park, and has a significant impact on the surrounding environment (see Section 4.3).

## 5.3 Waste Management

### 5.3.1 Waste Management Licensing

On 1st May 1994 the waste management licensing system established by the Environmental Protection Act ' was implemented. This legislation introduced a range of new duties for which the Environment Agency took over responsibility when it was formed. In particular Waste Disposal Licences became Waste Management Licences. The new system brought in improved environmental standards and licence holders now have to prove their suitability as a licence holder by demonstrating that they have financial capability, technical competence and no history of relevant convictions. A licence can only be surrendered when we are satisfied that the site no longer represents a risk to the environment and a completion certificate has been issued by us.

### 5.3.2 The National Waste Strategy

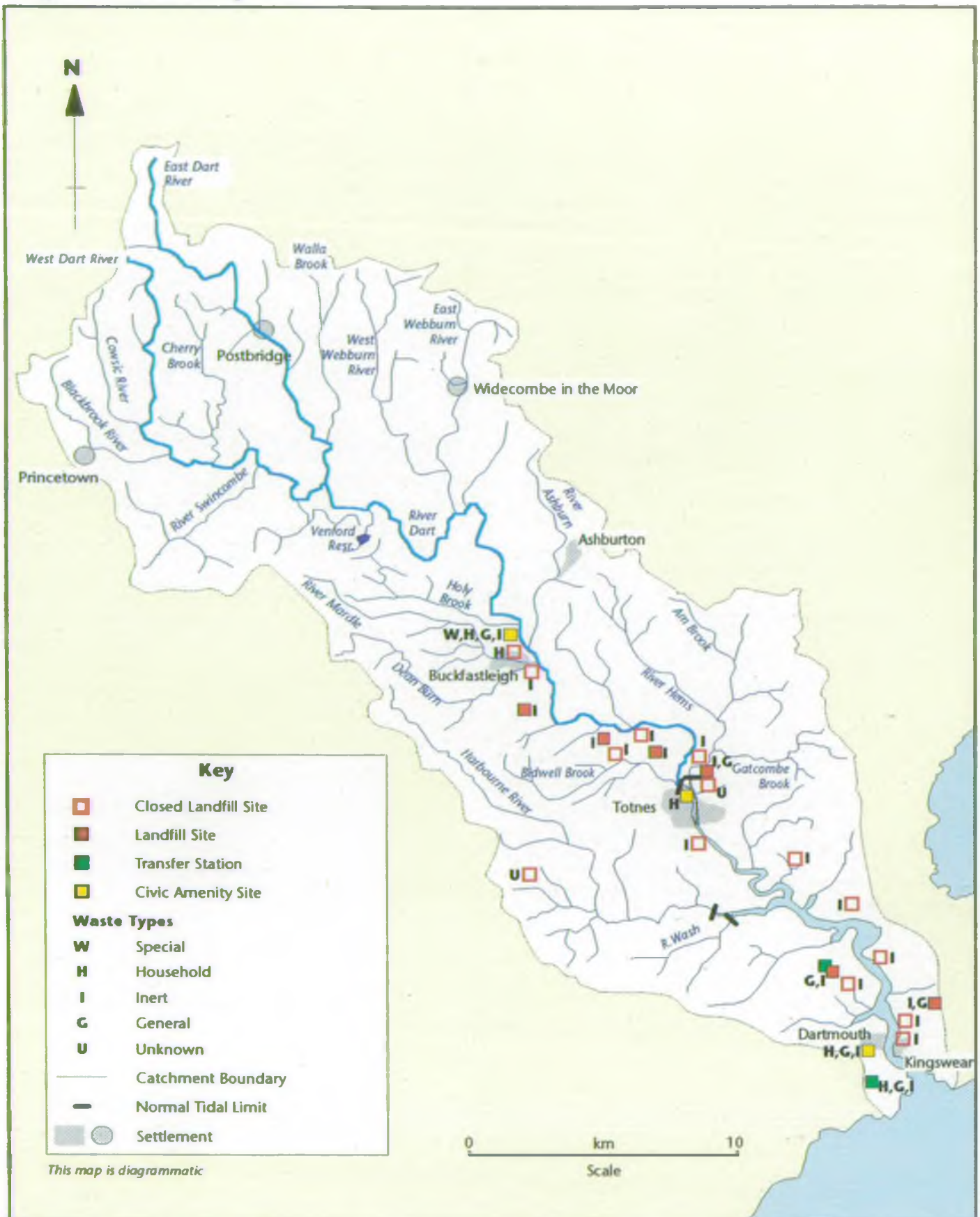
The National Waste strategy published in 1996<sup>28</sup> introduced the concept of a hierarchy of options for managing waste in the UK of reduction, re-use, recovery (recycling, composting or converting into energy) or if none of these are viable, disposal. The aim is to increase the quantity of waste being handled by the options at the top of this hierarchy. The document therefore sets a number of targets including one to recycle or compost 25% of household waste by 2000. We will shortly begin a national survey of the waste being produced so that the waste strategy can be developed further.

Currently 70% of controlled waste is landfilled and a target has been set to reduce this to 60% by 2005. Landfill has been an attractive option because it is inexpensive, suitable for many types of waste and may often be regarded as the only option for some inert wastes. Regardless of how well they are located or engineered, however, they have the potential to cause pollution. They can release chemicals to surface and underground water and to the soil and they generate significant quantities of methane and carbon dioxide which are 'greenhouse gases'. During operation, noise, odour, unsightliness and vehicle movements may all have a local impact and after a site closes the land may contain some contaminants making it unsuitable for certain uses. Today new landfill sites are engineered to a high specification, their operation is governed by strict licence conditions and they are required to be monitored for signs of pollution both during and after operation.

With the introduction of the Landfill tax this year, however, and new legislation affecting those that produce waste, the balance is shifting away from landfill towards other options such as energy recovery, recycling and waste reduction.



**Map 13 Waste Disposal**



### 5.3.3 Waste Minimisation

We are keen to promote the reduction of waste at source. In recent years there have been a number of very successful waste minimisation projects. One of the most well known of these was Project Catalyst in the North West of England, which looked at all wastes and identified potential annual savings totalling £8.9 million for the companies which were involved. We have begun our own programme of waste minimisation known as the '3 Es' project, concentrating on Emissions, Efficiency and Economics. The project will involve localised groups of businesses across the whole Country and aims to demonstrate how the philosophy can be applied to save money and improve performance as well as reduce waste and emissions. We are also supporting other waste minimisation initiatives where possible.

### 5.3.4 Producer Responsibility

Another incentive to increase the quantity of waste being handled at the top of the waste hierarchy is being provided by new legislation to make those that produce waste more responsible for it. The Producer Responsibility Regulations are being applied first to packaging waste and came into force in March 1997. They require certain companies who handle packaging to ensure that a certain percentage of that packaging is recovered and recycled.

### 5.3.5 Local Perspective

Most of the household waste generated within the catchment is taken via the Torbay transfer station to Heathfield landfill site near Kingsteignton for disposal. A network of small civic amenity facilities located in the towns serves the residents of the area for the disposal of bulky household items and as recycling points. Several privately operated waste disposal sites are also located within the catchment, which deal largely with inert waste.

The location of the waste management facilities within the catchment, their current state of operation and the waste types accepted at them are presented in Table 23 and Map 13.

There are currently 17 licensed sites within the catchment. These include five landfill sites, one transfer station, one combination of landfill and transfer station and three civic amenity sites. In addition there are two effluent treatment works licensed to accept controlled waste and five metal recycling sites not included in Table 23.

Table 23 Current Waste Management Sites in the Catchment

Site Name and Type	Site Status	NGR	Waste Type
Nethway Quarry - Landfill	restoration	SX 905 528	inert and general
Dartington Hall - Landfill	operational	SX 791 626	inert only
Dean Prior - Landfill	operational	SX 740 641	inert only
Marlands - Landfill	operational	SX 807 617	inert and general
Hood Quarry - Landfill	non-operational	SX 772 631	inert only
Foxenhole Farm - Landfill & Transfer Station	operational	SX 854 539	inert and general
Dartmouth Midi Skips - Transfer Station	operational	SX 871 505	inert, general and household
Totnes - Civic Amenity Site	operational	SX 804 609	household waste
Buckfastleigh - Civic Amenity Site	operational	SX 742 668	inert, general, household and special
Dartmouth - Civic Amenity Site	operational	SX 864 514	inert, general and household

There are 15 known closed landfill sites within the catchment. Their location and the types of waste accepted at them are given in Table 24.

**Table 24 Closed Waste Landfill Sites in the Catchment**

<b>Site Name and Location</b>	<b>Site Status</b>	<b>NGR</b>	<b>Waste Type</b>
Bakers Pit - Buckfastleigh	Closed and restored	SX 741 665	Household waste
Buckfast Blue Ltd - Buckfastleigh	Closed 1994	SX 747 660	Inert Waste
Staverton Joinery Ltd - Totnes	Closed 1991	SX 784 637	Inert and waste from joinery
Dean Quarry - Buckfastleigh	Unlicensed, now closed	unknown	Soil only
Hood Quarry - Dartington	Closed	SX 773 630	Demolition and construction
Waddeton - Stoke Gabriel	Unused site, now closed	SX 875 574	Inert but site never used
Littlehempston Reservoir - Totnes	Closed 1991	SX 804 622	Inert
Waterhead Creek - Kingswear	Closed	SX 885 513	Inert
Downton Wood - Dittisham	Closed 1993	SX 855 537	Inert, wood
Longmarsh - Totnes	Closed 1994	SX 811 594	Inert
Larcombe Quarry - Diptford	Unknown	SX 750 582	Possibly household
Mockwood Quarry - Totnes	Unknown	SX 808 616	Possibly household
Maypool Woods - Galmpton	Closed	SX 882 547	Demolition waste
Darthaven Marina - Kingswear	Closed	SX 883 512	Inert
Stoke Gabriel Cricket Club - Aish	Closed	SX 842 587	Inert

Certain waste management activities are exempt from the requirement for a waste management licence. This includes a range of activities such as shredding or baling materials for recycling and the spreading of waste on land for agricultural benefit.

Each exempt operation must be registered with us and it must comply with the criteria given in the waste management licensing regulations for that particular activity.

There are a number of exempt activities within the catchment the most significant of which is the spreading of industrial wastes on agricultural land; we are regularly notified of landspreading operations being carried out at farms in the Ashburton and Buckfastleigh areas. The waste being applied to the land is predominantly from food and animal processing and septic tank sludge. We liaise with landspreaders to ensure that they follow the current guidance available. We also assess the information provided to us by spreaders when they pre-notify us of their intent to spread waste. This helps to make sure that fields are not overloaded with waste or that unsuitable fields are not used for landspreading.

Uncontrolled and illegal tipping of waste known as 'fly-tipping' can pose hazards to wildlife, may attract vermin and can cause pollution as well as ruining the appearance of an area. An increase in fly-tipping was expected to occur following the introduction of the Landfill Tax in October 1996 and the Special Waste Regulations in September 1996. No increase in fly-tipping has yet been recorded in this area but we are monitoring the problem and will take action where necessary.

## 5.4 Forestry

Well-managed woodland in the right places does not harm the water environment and will often bring benefits. The Forestry Authority regulates forestry in the UK by licensing some operations such as felling and providing grant aid through the Woodland Grant Scheme.

Forests and woodlands are scattered throughout the catchment (see Map 14). A Forestry Authority census of British woodland is in progress; the South West counties will be covered over the next few years. Some of these woodlands are of national importance, and are designated as SSSIs (see Map 14). In addition the South Hams Local Plan has



## Map 14 Forestry



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identified woods which are significant in the landscape. A number of these 'important woodlands' are in the Dart Catchment, with many along the estuary.

The Forestry Commission owns a number of sites, which are managed for them by Forest Enterprise. Forest Enterprise are committed to working within the 'Forest and Water Guidelines'<sup>29</sup> to ensure forestry operations do not damage the water environment.

The catchment lies within a critical load area. This is an area designated by the DoE, where sulphur levels, causing acidification (low pH), are considered to be impacting on the ecosystem. Section 5.10 on Air Quality explains this in further detail.

## 5.5 Farming

Over 80% of the land in England and Wales is farm land. The way this land is used affects the quality of the environment.

There are a limited number of ways we can influence how farmers use land. However, we can control and prevent pollution in the same way as we do with any other industry. Other agencies such as Ministry of Agriculture, Fisheries and Food (MAFF) also encourage sensitive farming practices using financial incentives.

### 5.5.1. Land Use

The River Dart Catchment is one of remarkable contrast. It covers the high moorland of Dartmoor, wooded valleys and finally the rolling grassland surrounding the Estuary at Dartmouth and Kingswear. The high land of Dartmoor forms a large percentage of the catchment and is suitable predominantly for livestock rearing. Figure 1 and Table 25 summarise the agricultural land use in the catchment.

Table 25 Agricultural Land Use in the Catchment

Land Use	1995 (ha)	% of Total Farmed Area (1995)
Grassland < 5 years	2,853	12.5
Grassland > 5 years	13,260	58.0
Rough Grazing	1,311	5.7
Crops and Fallow	3,752	16.4
Farm Woodland	830	3.6
Other Land	333	1.5
Set-aside	542	2.4
<b>Total Agricultural Area</b>	<b>22,880</b>	<b>100.0</b>

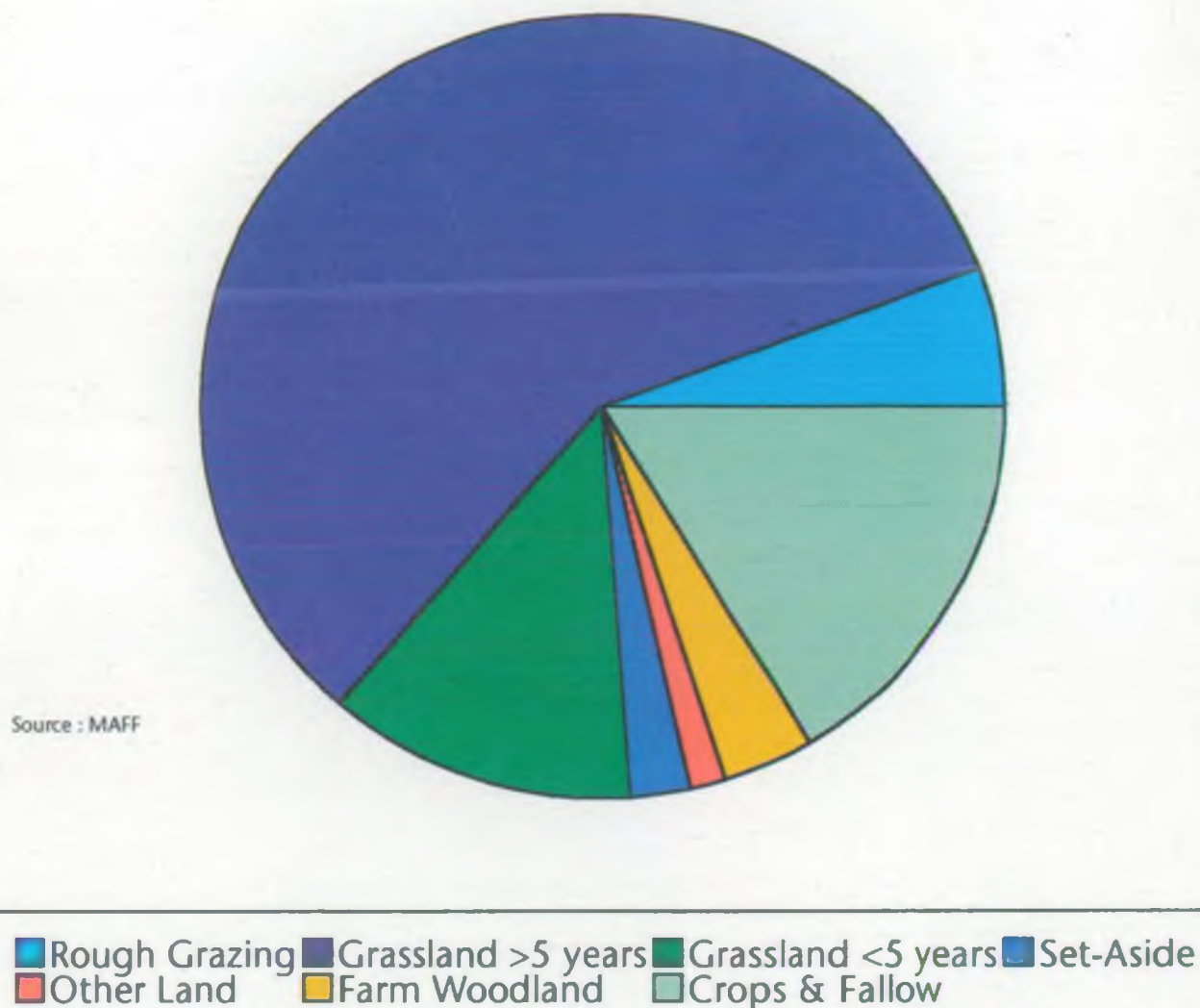
Source: MAFF

Changes in boundaries caused by parish grouping make the 10 year comparison, carried out in some other Devon catchments, unreliable for this area, and these figures have not been quoted

### 5.5.1. Farming Types

Livestock farming based on grassland is the dominant activity in the area. On Dartmoor cattle and sheep rearing predominate. Away from the moorland, the sheep and beef cattle production is diversified with some dairy farming, pigs, poultry and arable production. Livestock numbers in the catchment are shown in Table 26.

**Figure 1 Agricultural Land Use 1995**



**Notes:**

- Grassland in one form or other is by far the greatest agricultural land use in the catchment, most of which is long term grassland (>5 years), usually called permanent pasture.
- Farm woodland forms 3.6% of the total farmed area. Although the lack of reliable 1985 data makes percentage change of farm woodland impossible to calculate, generally in Devon there is a trend whereby woodland is on the increase due to incentives such as grant schemes to encourage the planting of trees and also increased conservation interest.
- Set-Aside, an EC scheme introduced as part of the Common Agricultural Policy (CAP) reform to allow farmers to remove land from production by receiving compensation, was introduced during this decade (1985 to 1995); 542 hectares (2.4%) of the total farmed area has been set aside in this catchment. This scheme only applies to individual farmers who grow in excess of approximately 39 acres and there is currently a compulsory minimum rate of set-aside of 10% reducing to 5% in 1997. This scheme now forms part of the Agri-Environment Scheme Regulation 2078.



**Table 26 Livestock Numbers in the Catchment**

	<b>1985</b>	<b>1995</b>	<b>% Change 1985 - 1995</b>
Total cattle & calves	33,355	29,928	-10.3
Total sheep & lambs	79,276	68,848	-13.2
Total Pigs	5,566	3,425	-38.4
Total Fowls	20,527	65,655	219.8

**Source: MAFF**

The number of pigs and poultry holdings in the catchment is small. The decline in pig numbers and trebling of the total fowl flock reflect the rapid fluctuations which may occur in both these enterprises and the figures should therefore be treated with caution.

The number of dairy cows has fallen by 20.1% in the last ten years and the number of dairy holdings by 30.8%, increasing the average size of dairy herds from 74 to 85 cows. The beef enterprise has been the main beneficiary, with the numbers of cattle in the beef herd increasing by 30.7%. Surprisingly, as it goes against the general trend in other areas, the sheep flock has declined by 13.2%.

The total area of cropping has shown a substantial fall of just over 1,500 hectares (29.1%) over the decade. Some of this has been put into set-aside at the expense of spring barley which is the least profitable crop in cereal rotation.

**Table 27 Farm Types found in the Catchment**

<b>Farm Type</b>	<b>% of Total No. of Holdings (1995)</b>	<b>% of Change In No. of Holdings (1985 - 1995)</b>	<b>Notes</b>
Dairy	11.4	-30.8	Quotas and more stringent hygiene and pollution standards have tended to favour larger farms.
Cattle and Sheep	20.7	16.3	Some dairy farms have switched to beef cattle.
Pigs and Poultry	0*	<i>Incalculable</i>	
Cropping	0*	<i>Incalculable</i>	The cereal area has fallen by just over 37% during the decade (mainly spring barley).
Horticulture	1.8	25.0	The area covered by horticultural crops, has risen substantially by 26.6% (98 to 124 hectares)
Mixed	1.5	-38.5	
Part-time	63.3	10.8	

**Source: MAFF**

Although a considerable number of farms in the area grow cereals and other crops, or keep pigs and poultry, this is as a mixed and/or part-time farming system in support of livestock.

#### **5.5.1. Farm Pollution Control**

Routine farm visits and inspections are carried out on a regular basis within the catchment. Issues relating to pollution problems due to farming have been raised in Section 4.9.

#### **5.5.1. Future Trends**

The agricultural use of the catchment is likely to remain much as it is at present, but perhaps with fewer, but larger units. With the agreements through the Common Agricultural Policy (CAP) and General Agreement on Trade and Tariffs (GATT) there may be increased set-aside of land, reduced management and increased opportunities for conservation and recreation within the countryside.

The existence of the Environmentally Sensitive Areas (ESAs) on Dartmoor (see Map 23) should reduce further intensification of farming practices within this part of the catchment. The ESA Scheme is voluntary and was designed and funded by MAFF to encourage farmers to adopt agricultural practices, for the benefit of wildlife, archaeology and landscape.

Other MAFF Schemes designed to encourage environmental improvements include the Habitat Scheme, Countryside Access, Farm Woodland Premium, Moorland and Organic Aid. In addition there is the Countryside Stewardship Scheme (now operated by MAFF), Wildlife Enhancement Scheme (English Nature) and Woodland Grant Scheme (Forestry Authority). The uptake of these schemes will be dependent partly on the level of financial inducement. Conservation activities in the past have mainly been financed by individuals, but unfortunately the financial returns through such projects (for example as in public access) have been modest. There are also a large number of land management agreements managed and funded by Dartmoor National Park.

Farmers increasingly look to diversify into activities other than agriculture in order to supplement their incomes. South Devon is a tourist destination, and many farmers have added to their income (albeit in a small way) by providing accommodation, produce and services to visitors. Much farm-based work is now concerned with activities such as woodland management, running farm shops and equestrian businesses, and the provision of sporting facilities, nature trails, holiday cottages and various agricultural services<sup>30</sup>.

## 5.6 Recreation

The Dart Catchment is extensively used for recreation, ranging from activities intimately tied to the water environment, to enjoyment of the wider countryside (see Map 15).

### 5.6.1 Water-based recreation

The River Dart is undoubtedly one of the West Country's premier white-water canoeing rivers; Section 4.18 gives details on current access agreements to the river and problems associated with this activity.

The river is also used for a major charity raft race annually. This runs between Buckfastleigh and Totnes and passes over a number of weirs. There are some concerns about the safety implications of this (see Section 4.18).

The Dart Estuary is a regionally important centre for yachting and boating, and is the focus of the Dartmouth Royal Regatta which draws thousands of visitors to the town. Its historic use as a sheltered harbour continues today, with marinas and many moorings located there. With such a large number of boats present it is almost inevitable that some problems arise in connection with litter and effluent (see Sections 4.18). Other issues are likely to be addressed through the Dart Estuary Management Plan which is being developed in parallel with this LEAP by the Dart Estuary Project which is supported by South Hams District Council, Dart Harbour & Navigation Authority, Environment Agency, English Nature, South West Water Services Ltd and the Duchy of Cornwall.

### 5.6.2 Land-based recreation

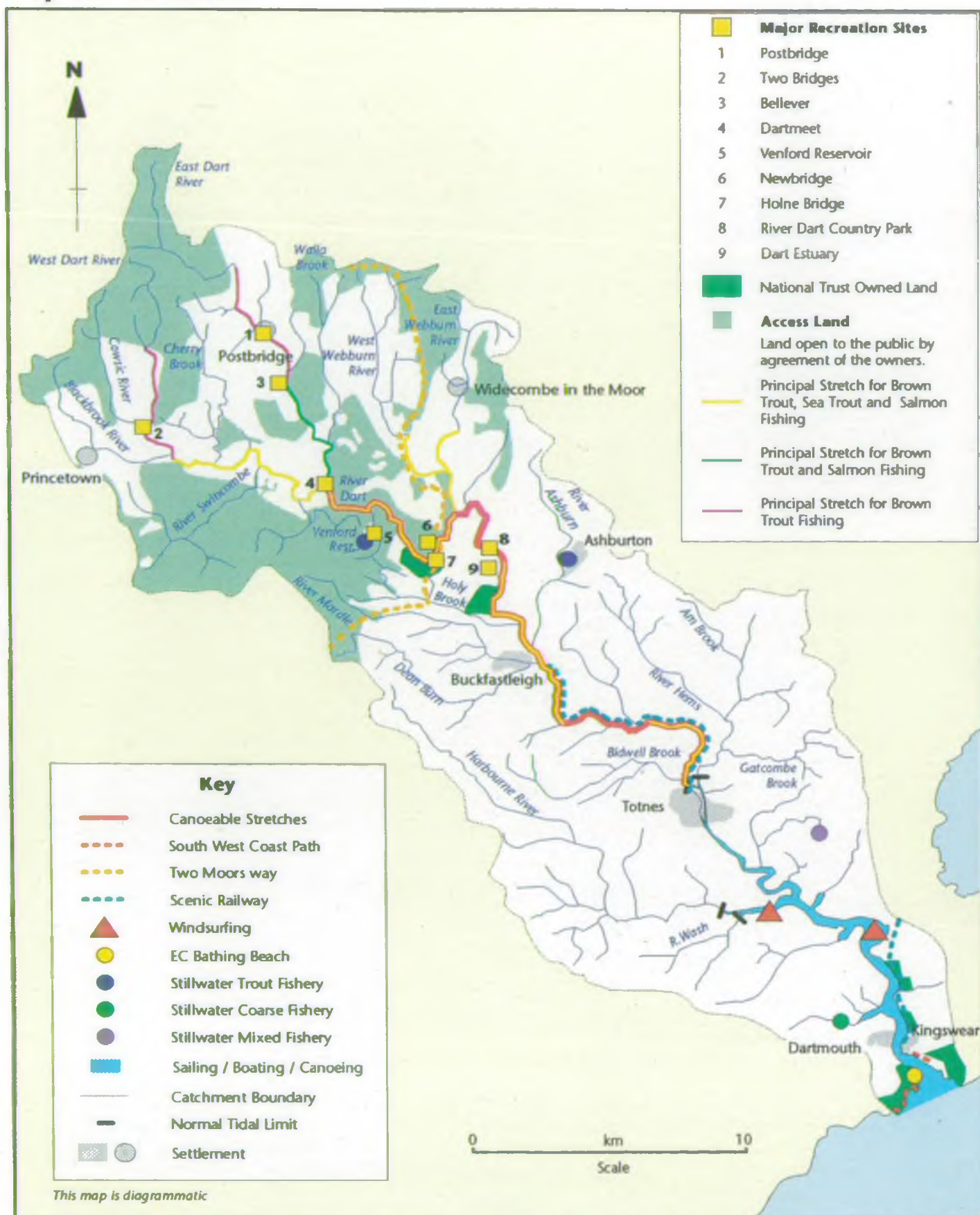
Dartmoor's rivers are one of the main attractions of the area, drawing large numbers of visitors to certain sites. The Dart Catchment has its fair share of these sites, in particular Newbridge, Dartmeet and Bellever. Here, and elsewhere, the extreme visitor pressure has resulted in significant bankside erosion (see Section 4.18).

There are good opportunities for walking and, in some areas, riding alongside the River Dart and its tributaries; much of the upper part of the catchment is public access land either by right or under an agreement.

The Two Moors Way crosses the upper catchment, while the South West Coast Path follows the coast, crossing the Estuary via the Kingswear Ferry; both are long-distance footpaths. In addition, there are some riverside footpaths in the wooded valley sections. For example, the Dart Valley Trail runs from Dartmouth to Kingswear via Dittisham and Greenway, and includes two ferry crossings.



## Map 15 Recreation



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### 5.6.3 Angling

The salmon angling season is from the 1 February - 30 September, and the sea trout and brown trout season from March 15 and September 30. The long term average rod catch for salmon is 224, and for sea trout, 678.

The Duchy of Cornwall is a major land and fishery owner in the Dartmoor area, and actively manages the fishery of much of the East and West Dart and their tributaries. These waters provide many miles of quality fishing for brown trout which can be taken almost up to the sources of many the moorland streams. Salmon and sea trout angling this far upstream is very much more dependent upon flows, and generally, few of either species are taken above Princetown on the West Dart, and Bellever on the East Dart.

The fishery on much of the main River Dart below Holne is operated by the Dart Angling Association. The character of the river alters much as it moves away from Dartmoor, and brown trout fishing gives way to salmon and sea trout angling as the dominant rod fishery from Dartmeet to Totnes.

There are many good fishing locations in this reach, and fishery values are generally as high as anywhere in the South West. The most significant pool on the Dart is Totnes weir pool. The rod fishing at this site is owned by the Duchy who leases it to the Agency. The fishing rights are presently administered by the Dart Angling Association which lease them from the Agency. In the right flow conditions, large numbers of sea trout are taken from the weir pool.

The netting rights at the pool are owned by the Agency which also owns the sole and several fishery in the river Dart from the mouth of the Hems downstream to Fleet Mill Quay. Within this stretch, the only fishing which the Agency allows is rod and line fishing for sea fish subject to prior written approval being obtained.

## 5.7 Water Abstraction and Supply

Here we consider the abstraction of water from surface and groundwater for public and private uses in the catchment. Our objective is to manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.

### 5.7.1 The Natural Resource

On average the total quantity of water available in the Dart Catchment is of the order of 687,000 MI/yr. This water represents the proportion of rainfall not evaporated or taken up by plants.

### 5.7.2 Current Licensed Abstractions

Water is abstracted from the Dart Catchment for public water supply and private water use. Private use includes the supply of water for domestic and agricultural purposes, fish farming, industrial uses, hydroelectric power and amenity purposes.

There are currently 45 surface water and 416 groundwater abstraction licences within the catchment (those above 20 m<sup>3</sup>/d are shown on Map 17). The total authorised annual quantity of water which can be abstracted from the catchment is 191,463 MI/yr. Of this licensed volume, 96% is abstracted from surface water and 4% from groundwater sources. These totals reflect the hydrogeology of the catchment, which is characterised by rocks with limited groundwater storage (see Section 2.2). As a result there is a large dependence upon abstraction from surface sources, namely rivers and reservoirs.

The total volume licensed for abstraction therefore represents 28%, on average, of the total available natural resource. However this is a distortion of actual resource consumption. In reality abstracted water is often returned to the catchment (e.g. fish farming) and is available for re-use (see below).



**Map 16 Public Water Supply**

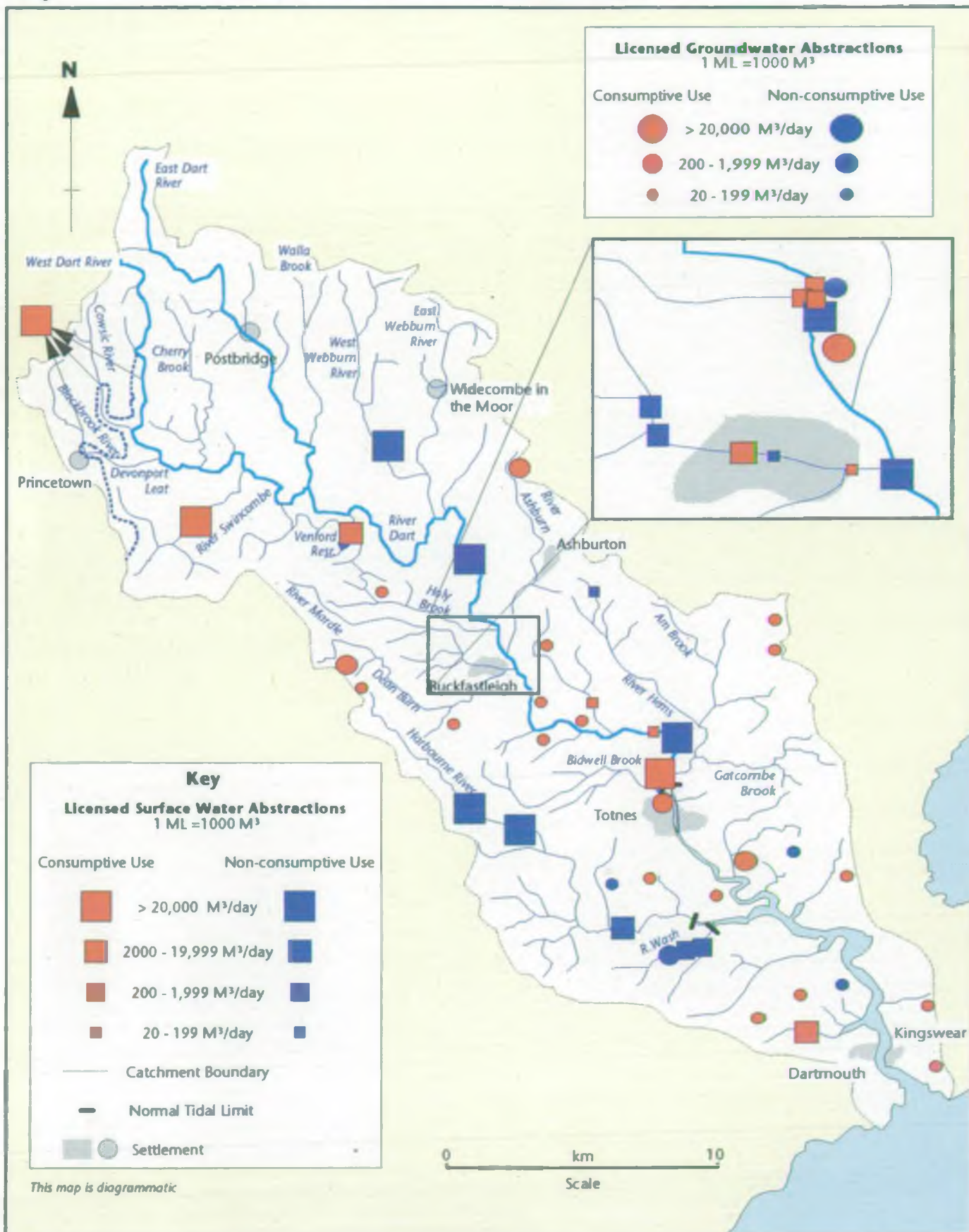


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**Map 17 Groundwater and Surface Water Abstractions**



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### 5.7.3 Consumptive and Non-consumptive Abstractions

Abstractions can be categorised according to their consumptive or non-consumptive nature of water use.

Consumptive abstractions generally involve a loss to the catchment of a proportion of the water abstracted, for example public water supply or industrial processing. Non-consumptive abstractions are those that return the majority of the abstracted water to the catchment, usually within the vicinity of the abstraction point, for example fish farms and water power schemes.

In considering the water 'lost' to the catchment through abstractions it is the 'net resource commitment', the proportion of abstraction not returned to the catchment, which is of most relevance. Table 28 shows for each abstraction purpose the approximate net resource commitment. Net resource commitment is calculated using a set of % factors which give an indication, for each abstraction purpose, of the amount of water not returned to the catchment. The total net resource commitment in the Dart Catchment amounts to 31 721 Ml/yr, a fraction (4.62%) of the total available natural resource. This figure is likely to be even lower as many abstractors take less than their authorised quantity. Therefore at the catchment scale, the available natural resource far exceeds the net abstracted quantity.

**Table 28 Net Licensed Resource Commitment in the Dart Catchment**

Abstraction Purpose	Ground or Surface Water	Authorised Quantity (Ml/yr)	Proportion of Abstraction not returned	Net Resource Commitment (Ml/yr)
Public Water Supply	Ground	6 068	100%	6 068
	Surface	25 097	100%	25 097
Agriculture (excluding spray irrigation)	Ground	836	25%	209
	Surface	8	25%	2
Spray Irrigation	Ground	33	100%	33
	Surface	21	100%	21
Fish Farming	Ground	7	0%	0
	Surface	12 974	0%	0
Industry	Ground	152	30%	46
	Surface	701	30%	210
Hydropower	Ground	267	0%	0
	Surface	138 028	0%	0
Private Water Supply	Ground	134	25%	34
	Surface	4	25%	1
Private Amenity	Ground	120	0%	0
	Surface	7 013	0%	0

### 5.7.4 Public Water Supply

Abstractions for public water supply represent 16% of the total annual licensed volume in this catchment. South West Water Services Limited (SWWSL) are the water company responsible for public water supply in the Dart Catchment.

The catchment lies within SWWSL's Roadford Strategic Supply Area (SSA) which covers a large part of Devon as well as North East Cornwall (see Map 16). The zone is served by a complex water supply system, the centrepiece being Roadford Reservoir which, in conjunction with other reservoirs and river abstractions, is used to supply North Devon, Plymouth and the South Hams.

#### 5.7.4. The Demand For Public Water Supply

The total demand for public water in the Roadford SSA during 1992 was 246 Ml/d. Approximately two thirds of this demand arose in Plymouth and the South Hams, the area served by Dart Catchment

sources. Demand in this area can increase considerably during the summer as a result of the influx of holiday makers and extensive garden watering.

#### 5.7.4. Supplying The Public Water Supply Demand - Licensed Public Water Supply Abstractions

The sources available to SWWSL within the Dart Catchment are used to meet a large part of the demand for water in Plymouth and the South Hams, in conjunction with sources in other catchments. Also, during periods of peak demand significant amounts of water can be imported into the catchment from other sources (described below), in order to help meet local demand.

There are eight public water supply licences within the Dart Catchment with a total annual authorised abstraction of 31,162 MI. As Table 29 shows, surface abstractions comprise the vast bulk of the licensed resources available to SWWSL in the Dart Catchment. Although a groundwater abstraction, the Littlehempston radial collectors, effectively abstract river water via gravel beds adjacent to the River Dart.

Table 29 Public Water Supply Abstractions

Source	Daily Licensed Quantity (MI)	Annual Licensed Quantity (MI)	Comments
West Dart. Cowsic & Blackbrook rivers (Devonport Leat)	14.55 20.46 29.55	8638	Water abstracted is transferred via Devonport Leat into Burrator Reservoir. Prescribed flows at each abstraction point following Roadford Public Inquiry.
Littlehempston Radial Collectors	24.15	5932	Prescribed flow of 0.158 m <sup>3</sup> /sec down fish pass at Totnes weir. Abstraction from river gravels in hydraulic conductivity with River Dart.
River Dart	27.28	9410	When flow at Austins Bridge is 0.789 m <sup>3</sup> /sec or less, not more than 9.092 MI/d shall be abstracted. When flow at Austins Bridge rises above 0.789 m <sup>3</sup> /sec, for each unit increase in flow above this figure a like unit may be abstracted up to licensed maximum.
River Swincombe	31.82	4319	Water abstracted is transferred into Venford Reservoir. Prescribed flow of 0.026 m <sup>3</sup> /sec (July, August and September), 0.095 m <sup>3</sup> /sec the rest of the year.
Venford Reservoir	15.91	2500	Compensation release of 0.021 m <sup>3</sup> /sec. Maximum annual aggregate abstraction with River Swincombe of 5683 MI/yr.
Halsanger Springs	0.68	68	
Old Mill Reservoir, Dartmouth	2.04	227	No longer used.
Brockhill Mire & Lambsdown Springs	0.68	68	

At the top of the catchment, abstractions from the West Dart, Cowsic and Blackbrook rivers feed the Devonport Leat which is used to transfer water across into Burrator Reservoir in the River Plym Catchment. From there the water is used to supply Plymouth and its surrounding areas.

Further down the catchment, Venford Reservoir, in conjunction with an abstraction from the River Swincombe, is used to supply local demands in the Holne, Widecombe, Ashburton and Woodland areas as well as supplying the Torbay area (River Teign Catchment).

Finally, water is abstracted from the River Dart at Littlehempston to meet demand in Totnes, Dartmouth and Kingswear as well as in Torbay (Teign Catchment) and Salcombe/Kingsbridge (River Avon Catchment). Water can also be imported into the catchment via the South Devon spine main (served by Roadford reservoir, Burrator reservoir and the River Tamar) to supply these areas during

periods of peak demand. In addition, Avon Reservoir (Avon catchment) can be used to supply Totnes and Dartmouth.

Halsanger Springs and Brockhill Mire/Lambsdown Springs are minor sources used to meet small localised demands in the Ashburton and Buckfastleigh areas.

#### **5.7.5 Reliable Yield**

A factor which must be considered when establishing the current status of the catchment as a source of public water supply is the reliable yield available from individual sources of supply. Although an abstraction licence authorises the licence holder to abstract up to a maximum quantity of water, it may not be possible to abstract this all year due to physical constraints. The "reliable yield" of a source is the theoretical amount of water that can be physically abstracted during critical dry periods. SWWSL's reliable yield from the licensed sources in the catchment is approximately 49 MI/d which is less than both the daily licensed maximum of 135.3 MI/d and the annual licensed total of 26,843 MI (which equates to 73.5 MI/d) and represents 15% of the Roadford SSA reliable yield (326 MI/d).

#### **5.7.6 Current Resource-Demand Balance**

By comparing current reliable yield with the current demand for water, an assessment can be made of the 'resource-demand' balance. With a total reliable yield of 326 MI/d and assuming average demand of 246 MI/d (1992 levels), the Roadford SSA currently has a surplus of 80 MI/d. Clearly, there should be no difficulty in meeting current demands in an average year.

However, under prolonged drought conditions, when demands are higher than average, for instance as a result of increased garden watering and higher numbers of tourists entering the region, careful management of the public water supply system is needed to avoid problems in meeting demand. We expect water companies to plan and operate public water supply systems to cope in all but the most extreme circumstances.

Following the experience of 1995, SWWSL have undertaken a wide range of measures to enable them to take a much greater proportion of the licensed resource than they were previously able to. SWWSL have also instigated an enhanced leakage control programme which has made significant savings in the Roadford Strategic Supply Area as well as introducing compulsory metering for customers with sprinklers and/or swimming pools. In addition, we have sought undertakings from SWWSL regarding operational improvements aimed at minimising the wastage of licensed resources.

We are currently in the process of agreeing a detailed Drought Management Plan (DMP) for the Roadford SSA, with SWWSL. This will establish a staged programme of water conservation measures to be taken as a drought intensifies. These will include operational management of public water supply sources, such as: maximising the use of river abstractions within licensed limits to conserve reservoir storage; demand management such as enhanced leakage control and/or hosepipe bans; as well as Drought Orders/Permits, where these are deemed necessary.

The sources in the Dart Catchment will be included within this DMP to ensure that the need for environmentally damaging emergency drought measures, such as reduction in reservoir compensation flows is minimised. The only implication for the catchment may be changes to the operational management of sources, within the current abstraction licence limits, to ensure adequate water conservation during droughts. However, any changes would not adversely affect downstream interests.

#### **5.7.7 Private Water Use**

The maximum authorised quantity of water which can be abstracted for private use is approximately 160,297 MI/yr. Of this, approximately 1548 MI/yr is from groundwater sources and approximately 158,749 MI/yr from surface water sources.

Of the total 452 private use abstraction licences in the Dart Catchment, 413 (91%) are groundwater and 39 (9%) are surface water licences. However, surface water abstractions account for a greater



volume of water than the groundwater abstractions; representing approximately 99% of the authorised private commitment.

Hydropower is by far the largest use with over 138,026 Ml/yr from surface water. The largest use of groundwater is 835 Ml/yr for agricultural purposes (excluding spray irrigation). Of the total authorised quantities for private use, almost 100% is non-consumptive.

## 5.8 Flood Defence

### 5.8.1 Regulation

We advise planning authorities on flood defence matters. We also issue consents and byelaw approvals for certain works which are likely to affect the flow of water or impede any drainage work. We aim to provide planning authorities with sufficient information to ensure that the effects of development on flood risk are properly considered.

Information is currently provided on the basis of historic flood records and survey data. We have agreed with planning authorities how we can improve this information.

### 5.8.2 Flooding Problems

A list of known flooding problems is shown on Map 18. Issues relating to flooding and known problem sites are detailed in Section 4.1.

### 5.8.3 Flood Defence Schemes

The standard of flood protection at a location is the worst flood (expressed as a return period) which can be withstood without significant damage. Flood defence schemes alleviate flooding up to the design standard, a more serious flood may still occur.

Serious floods occur less often than minor floods. The term 'return period' describes how often on average a flood might occur. For example, a 10 year return period flood might be equalled or exceeded once every 10 years, on average. A more serious flood may occur once every 100 years and therefore have a 100 year return period. This is a statistical methodology based on gauged river flows.

There are several flood defence schemes on the rivers in the Dart Catchment (see Map 18). These include:

- Dartmouth (River Dart) - not Agency maintained,
- Totnes (River Dart),
- Buckfastleigh (River Mardle and Dean Burn),
- Ashburton (River Ashburn).

In addition there are Local Authority defences on 'ordinary' watercourses at Totnes, Colaton St Mary, Torbryan and Poole. A further Local Authority scheme has been approved by us at Littlehempston.

### 5.8.4 Improvements

We can build new flood defences if flooding is a serious problem in a particular area, usually to protect built up areas from flooding. All schemes must be technically, economically and environmentally sound. We keep a list of schemes called a Programme of Capital Works which helps us to plan for the future.

Different types of land and property need different levels of protection. Table 30 shows the indicative standards (return period in years) used to design schemes. Map 19 shows the land use bands for 'main river' within the catchment. 'Main river' covers 26 km of the River Dart, 8 km of the Harbourne River, 3.2 km of the River Mardle, 1.5 km of the Dean Burn and 5.1 km of the River Ashburn.



**Map 18 Flood Defence**



Information correct as of March 1997

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River Dart Local Environment Agency Plan

**Map 19 Flood Defence, Land Use Bands**



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River Dart Local Environment Agency Plan



**Table 30 Indicative Flood Defence Standards for Different Land Use**

<b>Current Land Use</b>	<b>Land Use Band</b>	<b>Sea (Return Period - yrs)</b>	<b>River (Return Period - yrs)</b>
High density urban, containing significant residential and non-residential property.	A	100 - 200	50 - 100
Medium density housing.	B	50 - 200	25 - 100
Low density or rural communities. Highly productive agricultural land.	C	10 - 100	5 - 50
Generally arable farming with isolated properties.	D	2.5 - 20	1.25 - 10
Low productivity land with few properties at risk.	E	< 5	< 2.5
No area at risk from flooding, due to both topography and hydraulic conditions, or lack of information of the flooding that occurs.	X	n/a	n/a

**Note:** Indicative standards are only a guide: they may not always be appropriate.

Our target is to identify and investigate all flood risk locations. We maintain a register of flood problems and we are developing a Long Term Plan of Needs where work needs to be carried out.

A programme to review flood problems is being undertaken as part of the Development and Flood Risk Surveys (Section 105 Surveys), using floodplain mapping information. The introduction of a new scheme in 1996, the Flood Defence Management Framework, will assist in the identification of the relative priorities to alleviate flooding problems.

#### 5.8.5 Maintenance

We try to focus our work where it is needed most using a system called Standards of Service (SoS).

Routine work includes where necessary, grass cutting, de-silting/de-weeding, maintenance to joints in concrete and masonry walls, servicing of tide flaps, penstocks and flood gates, and the clearance of weed screens. Other maintenance work mainly consists of the removal of fallen trees and other debris to ensure that river channels remain clear to discharge flood flows.

Extensive maintenance of existing flood defence schemes in the catchment; this work is summarised in Table 31.

**Table 31 Summary of Routine Flood Maintenance Work in the Catchment**

<b>Scheme</b>	<b>River</b>	<b>Tidal/Fluvial</b>	<b>Nature of work</b>
Totnes	River Dart	Tidal	General clearance, screens, flaps, revetment, walls
Buckfastleigh	River Mardle Dean Burn	Fluvial	General clearance, screens, flaps, walls, culverts
Ashburton	River Ashburn	Fluvial	General clearance, screens, flaps, walls, culverts

#### 5.8.6 Shoreline Management Plan

The Agency, in partnership with Local Authorities, County Councils and English Nature are preparing the Lyme Bay and South Devon Shoreline Management Plan (SMP) which includes this length of coast, and covers the coastal cell from Portland Bill to Rame Head.

These plans improve our understanding of coastal processes, predict the likely future evolution of the coast, identify assets at risk and improve consultation between organisations with an interest in the shoreline. The plans will consider options and detail preferred approaches, recommend monitoring programmes and identify environmental enhancements. The South Devon SMP is currently at Stage 2 of the process, which involves collecting data and setting objectives for the plan. West Dorset District Council is leading through initiative and the SMP is scheduled to be in place by 1998.

As part of this plan we are initiating a programme of beach monitoring at Agency maintained sea defences within the area.

#### 5.8.7 Sea Level Rise and Global Warming

The future planning of sea defences needs to take account of possible sea level rise due to global warming. We have agreed an approach with MAFF, who grant aid much of the Agency's flood defence work, to allow for sea level rise within scheme design. The design policy is under constant review.

The Intergovernmental Panel for Climate Change predictions for sea level rise are used with allowances for any land movement (tectonic changes). The net sea level rise estimates are then used to establish the anticipated effects over the life of the scheme. The approach is to design the works so that as sea level rise occurs the defences can be raised without having to rebuild the whole structure. In some cases, however, the preferred option might be managed retreat.

Raising the level of defences above that necessary today can only be justified where evidence of actual sea level rise supports the need.

The current allowances for the South West region of the Agency are a rise of 5 mm/year until the year 2030 and 7.5 mm/year thereafter.

A further effect of global warming is that of increased storminess, potential consequences of this include increased wave action and greater annual precipitation.

#### 5.8.8 Flood Warning

Absolute flood protection is not possible. Because of this we need to warn people when there is a danger of flooding. Flood warnings are issued from our Regional Office at Exeter. These are based on weather radar and forecasts, and on rainfall and measured river levels. Flood warnings are colour coded Yellow, Amber or Red to indicate their severity.

Within the catchment there are river level gauges at Bellever on the East Dart, Dunnabridge on the West Dart, Austins Bridge on the Dart and Woodlands on the River Hems. Warnings are issued for the River Dart from Dartmeet to Totnes, and for the Harbourne River from Harbertonford to Bow. Tidal warnings are issued for the South Devon Coast.

We have a commitment to improve the level of service so that where possible a warning is issued at least two hours in advance of flooding. A study is currently being undertaken to identify where existing flood warning arrangements meet this standard and where it is possible to improve the network.

A leaflet is available which sets out the current flood warning service in this area and which gives details of the dissemination methods and recorded information service 'Floodcall'.

### 5.9 The Quality of Surface Waters

#### 5.9.1 River Quality Objectives (RQOs)

Our proposed targets for RQOs are set out in Section 3.1. Map 20 shows where current water quality fails to meet its target RQO. This assessment is based on three years of routine monitoring data from the Public Register collected between 1993 and 1995. We have shown failures to meet RQO as *significant* and *marginal* failures. Significant failures are those where we are 95% certain that the river stretch has failed to meet its RQO. Marginal failures are those where we are between 50% and 95% certain that the stretch has failed to meet its RQO.

In certain circumstances we can 'set aside data', that is we will not take into account some or all the results for a particular determinand when we assess compliance with an RQO. We may 'set aside' data where high concentrations of metals or low pH values are caused by the natural geology of the



**Map 20 1995 Compliance with Proposed River Quality Objectives  
(River Ecosystem Classification)**



catchment. This allows us to protect good water quality shown by other determinands in the RE classification. The Upper Dart and its tributaries rise on Dartmoor, a moorland area with underlying granitic rocks. This gives rise to very acidic soils and watercourses. This in turn can result in elevated levels of copper and/or zinc in the watercourses. Except for the Walla Brook, the whole of the Upper Dart catchment and its tributaries has provision for determinands to be set aside. Map 20 shows which determinands were set aside for the 1995 assessment.

Four of 30 classified stretches (16.7 km) significantly fail to meet their RQO. One of these stretches also has a long term RQO. A further five stretches (30.1 km) marginally fail to meet their RQO. Finally, two stretches (9.9 km) comply with their current RQO but significantly fail to meet their long term RQOs. The reasons for these failures are explained in Sections 4.5 and 4.9.

**Table 32 Stretches which Fail to Meet the Proposed RQO**

<b>Watercourse</b>	<b>Stretch</b>	<b>Proposed RQO</b>	<b>Type and reason for failure</b>
River Dart	Dart Bridge to Austin's Bridge (1.0 km)	RE1	significant failure - due to BOD, (see Section 4.5, Impact of Effluent Discharges).
River Dart	Austin's Bridge to D/S Buckfastleigh STW (0.8km)	RE1	significant failure - due to BOD, (see Section 4.5, Impact of Effluent Discharges).
Harbourne River	Leigh Bridge to Beenleigh (inferred to NTL) (5.4 km)	RE1	marginal failure - due to BOD (see Section 4.5, Impact of Effluent Discharges).
River Hems	Source to Portbridge (4.9 km)	RE2 [RE1]	significant failure [also long term RQO] - due to high BOD and ammonia levels and low DO values. (see Section 4.9, Impact of Farming and Forestry on Rivers and Wetlands).
River Hems	Portbridge to Littlehempston (inferred to NTL) (5.9 km)	RE1	marginal failure - due to BOD (see Section 4.9, Impact of Farming and Forestry on Rivers and Wetlands).
Am Brook	Source to Hems confluence (4.5 km)	RE2 [RE1]	compliant [significant failure with long term RQO] - This stretch has been compliant with its proposed RQO since 1993, but a significant failure with the long term RQO - due to ammonia (see section 4.9, Impact of Farming and Forestry on Rivers and Wetlands)
Bidwell Brook	Source to Tigley (3.5 km)	RE1	marginal failure - due to BOD (see Section 4.9, Impact of Farming and Forestry on Rivers and Wetlands); it complied in 1993 and 1994.
River Mardle	Combe to Dart confluence (5.6 km)	RE1	marginal failure - due to BOD (see Section 4.5, Impact of Effluent Discharges).
Dean Burn	Source to Mardle confluence (9.7 km)	RE1	marginal failure - due to DO and BOD (see Section 4.5, Impact of Effluent Discharges).
River Ashburn	Source to Dart confluence (10.0 km)	RE1	significant failure - due to DO and BOD (see Section 4.5, Impact of Effluent Discharges).

### 5.9.2 Improvements to SWWSL discharges

Improvements to SWWSL's discharges subject to available funding approved by OFWAT, the water industry's economic regulator. A Strategic Business Plan, Asset Management Plan 2 (AMP2)" for these schemes was developed based on guidelines agreed between the former NRA, Department of the Environment (DoE), Water Service Companies and OFWAT. The plan was submitted to OFWAT in July 1994, and will run from 1995 to 2005. OFWAT declared the associated customer charging base in July 1994. At the end of July 1995 the Monopolies and Mergers Commission published their review of SWWSL's AMP2 programme.

In order of priority, schemes included are:

- those required to meet and maintain current EC and domestic statutory obligations;
- those required to meet and maintain new EC and domestic statutory obligations;
- those which have already been justified separately, required to maintain river quality relative to the 1990 NRA survey of water quality or to achieve river or marine improvements.

The following schemes for the Dart Catchment are included in SWWSL's AMP2 program.

Table 33 AMP2 schemes within the catchment

Scheme	Investment Driver	Treatment Level	Statutory Completion Date
<b>Tidal Waters:</b> Dartmouth STW	EC BWD	Interim Scheme	March 1997
Stoke Fleming (North)	EC UWWTD	Secondary	2005
Stoke Fleming (South)	EC UWWTD-AT	FS/O	2005
	EC UWWTD-AT	FS/O	2005
<b>Freshwater:</b> Princetown STW	EC UWWTD-AT	BOD Load	2001
Broadhempston	EC UWWTD-AT	Secondary	2005

**Key:** FS/O Fine Screening and outfall relocation  
EC UWWTD = EC Urban Waste Water Treatment Directive  
EC UWWTD- AT = Appropriate Treatment Provisions of EC UWWTD  
EC BWD = EC Bathing Waters Directive  
BOD Load = There must be a minimum of 70% Load Reduction treatment

OFWAT have recently initiated a 5 year review which will result in AMP3 running from 2000 - 2010.

### 5.9.3 EC Directives and Other International Commitments

There are five EC Directives that currently apply to the Dart Catchment. The designated stretches and sites are shown on Map 21.

#### EC Bathing Waters Directive

The EC Directive concerning the quality of bathing water (76/160/EEC) seeks to protect public health and the amenity value of popular bathing waters by reducing pollution. The Directive contains standards for nineteen microbiological, physical and chemical parameters to assess bathing water quality. Compliance is assessed mainly by standards for bacteria (total and faecal coliforms) found in sewage (see Appendix A3).



## Map 21 EC Directives Monitoring



We are responsible for monitoring the quality of identified, popular bathing waters and providing the results to DoE who decide whether the standards in the Directive have been met. Where identified bathing waters fail to meet the Directive, we are responsible for identifying sources of pollution that are causing failures, and making sure that improvements are made.

Dartmouth Castle (Sugary Cove) is the only identified EC Bathing Water in the catchment. This site failed to comply with the Directive in 1986. Since that date the bathing water has complied in all years.

A number of crude sewage discharges from both Kingswear and Dartmouth are thought to have been responsible for the failing sample. Since then a long term bathing water improvement scheme has been agreed which would collect all the crude discharges from Dartmouth and Kingswear. However, as there have been no further failures of the Bathing Waters Directive since 1986 this scheme was deferred until 2005, with improvements now driven under the UWWTD (see Section 4.5). Although as an interim measure, SWWSL have agreed to implement a partial scheme which would provide screening at all the major outfalls to remove aesthetic nuisance. This work is due to be completed by the end of May 1997.

The crude discharge to the Dart estuary at Stoke Gabriel and the two primary treated discharges at Dittisham were not included in the AMP2 improvements. However, these will be put forward for improvements under the AMP3 spending programme.

#### 5.9.4 EC Surface Water Abstraction Directive

The EC Directive *concerning the quality required of surface water intended for the abstraction of drinking water*<sup>32</sup> protects the quality of surface water used for public supply (see Appendix A4); there are three identified surface water abstraction monitoring points in the catchment (also see Map 21):

- Venford Reservoir (SX686 711);
- Swincombe River Intake (SX6325 7187);
- Littlehempston, River Dart (SX8005 6163).

Details of non-compliance at these sites in the period 1993 to 1995 are shown in Table 34.



Table 34 Details of non-compliance in the Dart Catchment - at Venford Reservoir

Reason for Failure	Possible Causes of Failure	Notes
Colouration: 1995	Drought conditions followed by heavy rainfall contributed to natural runoff having high dissolved iron and colouration.	No further action, apply for waiver.
Dissolved Iron: 1995	As above.	As above.
Total Phenols: 1993	Cause unknown.	The concentration recorded was < 0.4 ug/l; this may reflect the natural levels for these waters or could result from pollution (WHO 1984). This exceedence is considered 'marginal' and is not thought to be environmentally significant.
Dissolved and emulsified hydrocarbons: 1993, 1994, 1995	Thought to be due to problems with the reliability of the analytical method. See footnote.	Advice is being sought from Head Office on appropriate methodology for the determination and reporting of hydrocarbons.

**Note:** Phenols and Dissolved & Emulsified Hydrocarbons (D&E Hydrocarbons) - We are currently concerned about the suitability of the methods for analysis of phenols and D&E hydrocarbons as specified in the EC Surface Water Abstraction Directive. Exceedences of the Directive's Standards cannot always be attributed to polluting discharges, and we suspect that some exceedences may be due to natural compounds resulting from the breakdown of vegetation. We are involved in discussions with the Department of the Environment, with a view to reviewing the analytical methods used. We will continue to report exceedences of the EC Surface Water Abstraction Directive standards. However, as there are no obvious sources of these compounds we are not planning to undertake any further studies until we receive direction from the DoE.

#### 5.9.5 EC Dangerous Substances Directive

The EC Directive *on pollution caused by certain substances discharged in the aquatic environment of the community* <sup>33</sup> protects the water environment by controlling discharges to rivers, estuaries and coastal waters (see Appendix A5). This Directive identifies two classes of substances to be monitored: List I contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate; List II substances are less dangerous but can still have a harmful effect on the water environment.

Monitoring for **List I** substances is carried out in the receiving waters downstream of two discharges in the catchment; Buckfastleigh (Kilbury) STW for cadmium and HCH, and Totnes STW for mercury and cadmium. There have been no List I EQS exceedences of these substances in the receiving waters downstream of these discharges in the period 1990 to 1995.

There are National Network sites on the River Dart at Totnes Weir and the Dart Estuary at One Gun Point. These sites are used for background monitoring purposes for List I substances. Since 1990, at both sites, concentrations of the 19 List I substances monitored were below EQS.

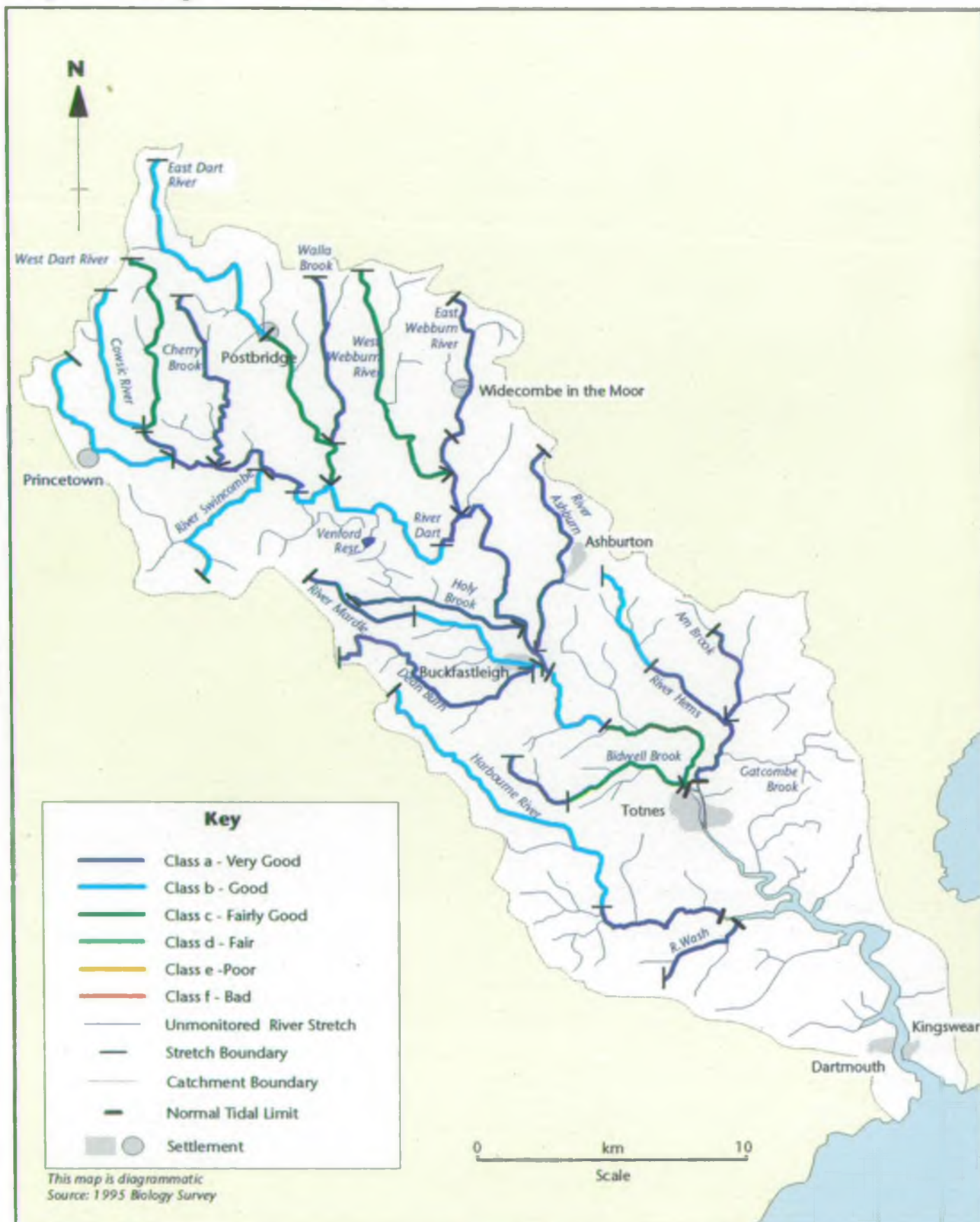
**List II** substances are monitored in the receiving waters downstream of Buckfastleigh (Kilbury) STW and Totnes STW.

At the receiving water site downstream of Buckfastleigh, in 1994 and 1995, the copper, zinc and lead standards were exceeded. A low hardness band results in borderline exceedences for zinc and lead. Upstream metal levels tend to be naturally elevated result of catchment geology. No further action is proposed.

At Totnes STW all List II substances monitored met their EQS for the period 1990 - 1995.



## Map 22 Biological Classification



#### 5.9.6 EC Urban Waste Water Treatment Directive (UWWTD)

The Directive *concerning urban wastewater treatment*<sup>7</sup> specifies minimum standards for levels of sewage treatment and sewage collection systems (see Appendix A6).

This Directive specifies that secondary treatment must be provided for all discharges serving population equivalents greater than 2,000 to inland waters and estuaries, and greater than 10,000 to coastal waters. Discharges below these population equivalents receive appropriate treatment. The calculation of population equivalents takes into account seasonal influx of visitors.

In the Dart Catchment there are five UWWTD scheme, four of which are Appropriate Treatment schemes. Details of these schemes are shown in Table 33, and Section 4.5.

The Directive allows for the designation of Sensitive Areas (SA) (Eutrophic) and Less Sensitive Areas, or High Natural Dispersion Areas (HNDAs).

There are currently no HNDAs or SAs proposed in the Dart Catchment.

#### 5.9.7 EC Freshwater Fisheries Directive

The EC Directive *on the quality of waters needing protection or improvement in order to support fish life*<sup>14</sup> ensures that water quality in designated stretches of water is suitable for supporting certain types of fish (see Appendix A8).

Map 21 shows the designated salmonid fishery stretches in the Dart Catchment, all of which met with the imperative standards of the Directive for the period 1993 to 1995. There are no designated cyprinid fishery stretches in the Dart Catchment.

Three sites in the Dart Catchment were derogated for pH in 1995:

- East Dart River (SX672 732);
- West Dart River (SX6588 7292);
- River Swincombe (SX6475 7370).

#### 5.9.8 Biological assessment of water quality

Biological river quality is based on the diversity of aquatic macro invertebrate life, the small animals present in the river. They are unable to move far and respond to long term conditions within the watercourse. In addition, they are affected by pollutants that are not measured by our chemical monitoring programme (see Appendix A2). Macroinvertebrates provide a good indication of the biological condition of the river. In order to present biological river quality, a biological classification has been devised (see Appendix A7).

Map 22 depicts the biological data of the catchment. Very good or good biological quality was found at most of the sites monitored in the Dart Catchment in 1995. Some moorland sites on the East and West Dart and West Webburn were classified as Band C (fairly good biological quality). This is probably a reflection of the low diversity of invertebrates at these sites. This is often typical of such moorland rivers with a fast flow and boulder dominant substrate. No indications of water quality problems were found.

The River Dart at Totnes Weir shows fairly good biological quality. Due to the nature of this site samples are collected using dredge sampling, this method is less effective than the method used at other sites in the catchment. In order to obtain a representative picture of biological quality in this stretch of the Dart, new sites have been set up at Staverton and Dartington. Monitoring will continue at Totnes Weir.

The Bidwell Brook at Dartington shows fairly good biological quality (see Impact of Farming and Forestry on Rivers and Wetlands, Section 4.9).

## **5.10 Air Quality**

### **5.10.1 National Air Quality Strategy**

Under Part 4 of the Environment Act 1995 the Government was required to publish a national strategy for air quality including:

- a framework of standards and objectives for the pollutants of most concern;
- a timetable for achieving objectives;
- the steps the Government is taking and the measures it expects others to take to see that objectives are met.

The strategy was published for consultation in August 1996. We will be working closely with local authorities to help achieve the objectives of the National Air Quality Strategy.

### **5.10.2 Local Air Quality Management Areas**

Local authorities took on the new responsibilities for assessing and managing air quality under the Environment Act<sup>1</sup> from 1 April 1997. They will be conducting a review of air quality in their areas, and are required to produce Air Quality Management Plans in areas where air quality exceeds certain standards and guidelines.

### **5.10.3 Local Perspective**

With the exception of ground level ozone (see below), ambient levels of pollutants such as sulphur dioxide, nitrogen oxides and lead, are generally lower in the South West of England than in many other parts of England and Wales. However, there is a need for a better understanding of air quality in the catchment (see Section 4.1, Problems Associated with Development).

The Agency has published 'The Environment of England and Wales - a Snapshot'<sup>35</sup> which describes the state of the environment, including air, in the UK.

### **5.10.4 Ground Level Ozone**

Ozone in the upper atmosphere shields the earth from harmful ultraviolet radiation. However, at ground level, ozone can be a harmful pollutant damaging crops and building materials and causing respiratory difficulties amongst sensitive people. Ground level ozone is formed by a chemical reaction between the mixed emissions of nitrogen oxides and hydrocarbons, derived mainly from vehicle exhausts, in the presence of sunlight. These chemical reactions do not take place instantaneously, but over several hours or even days, and once ozone is produced it may persist for several days. In consequence, ozone produced at one site may be carried for considerable distances in the air, and maximum concentrations usually occur away from the source of the primary pollutants. The highest concentrations of ozone generally occur during hot, sunny and relatively windless days in summer.

In common with other parts of Southern England, ozone levels in the catchment are generally above those at which damage to vegetation may occur<sup>29</sup>.

## **5.11 Contaminated Land**

The Environment Act 1995<sup>1</sup> contains new provisions for dealing with contaminated land; local authorities are the key regulators under the Act with the Agency acting as a consultee and advisor. The new provisions will be enacted in 1997 and will define contaminated land as any land which appears to a local



authority to be in such a condition - because of the substances it contains - that either water pollution or significant harm is being, or is likely to be caused. This interpretation is subject to guidance issued by the Secretary of State. Local authorities will be required to carry out a survey to identify contaminated land in its area. When these surveys have been carried out we have a duty to prepare and publish a report on the state of contaminated land from time to time, or if specifically requested to do so by the Secretary of State. Some sites may be designated as 'special sites'; these will become our responsibility. Special sites include those which are, or are likely to, cause serious water pollution, because of the substances in or under them. It is made clear in the draft Statutory Guidance that contaminated sites should continue to be remediated wherever possible on a voluntary basis or through the normal development planning process and existing pollution legislation, whereby we can prosecute if pollution is actually occurring, or take action to effect clean-up or pollution prevention, with cost recovery from the polluter or landowner. For those sites not meeting the more rigid new definition in the Guidance, these will be the only routes for clean-up that remain available.

#### 5.11.1 Catchment Status

The precise nature and full extent of contaminated land as defined within this catchment is not yet known, since the contamination of many sites is only realised when they are redeveloped or when pollution actually occurs. There is a need to clarify the status of contaminated land sites in the catchment (see Section 4.1, Problems Associated with Development).

### 5.12 Conservation of the Natural Environment

#### Nature Conservation

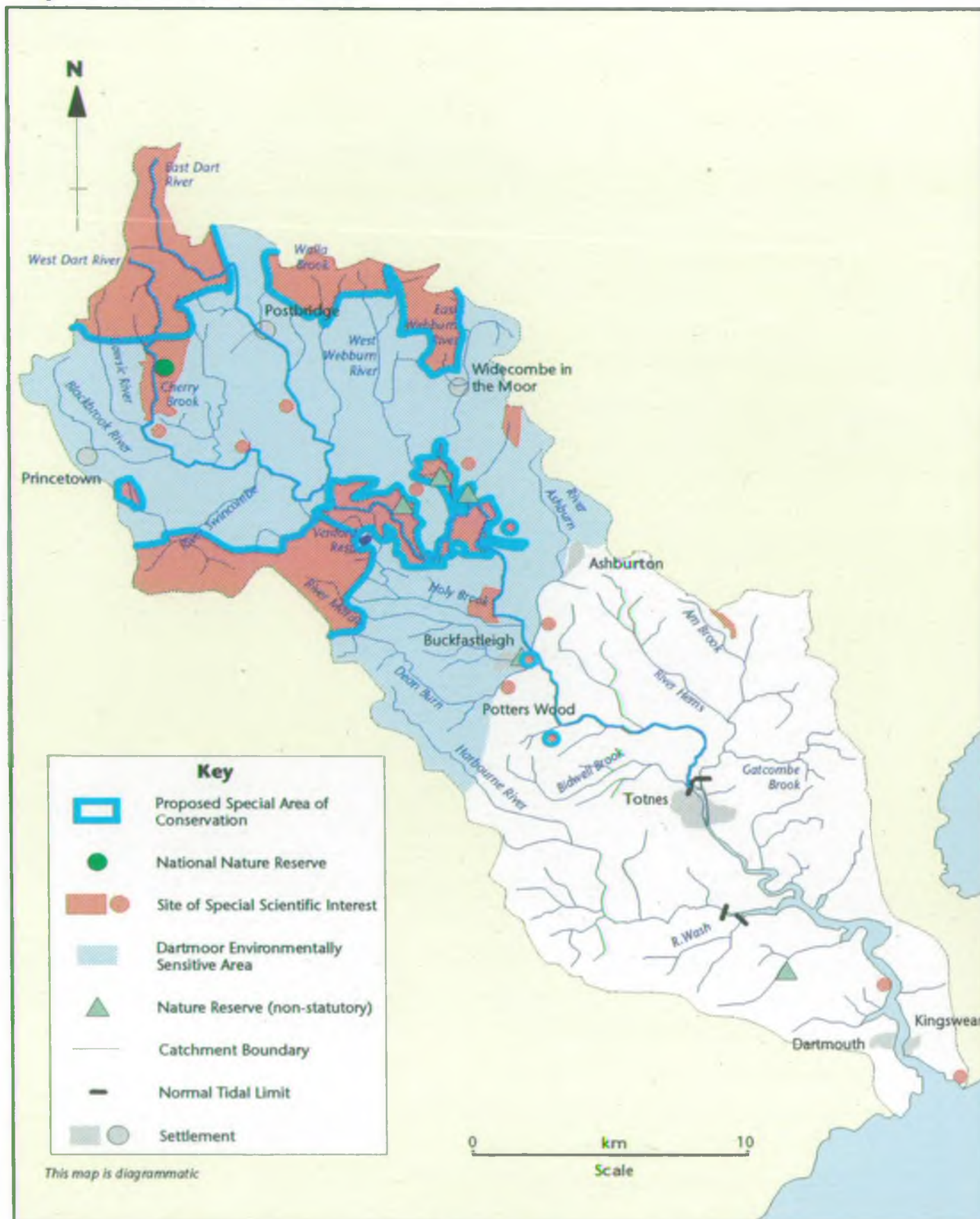
The upper half of this catchment, which falls within the Dartmoor National Park boundary, contains large areas of major nature conservation importance; in contrast, the lower half, although also of national importance for its outstanding landscape, has relatively few sites of equivalent wildlife conservation value (see Map 23 and Appendix B).

The Dartmoor Environmentally Sensitive Area (ESA) covers all of the moor which falls within the Dart Catchment.

There are three candidate Special Areas of Conservation (SACs) under the terms of the EC Directive 92/43/EEC, on the Conservation of Habitats and Wild Fauna and Flora. These internationally important areas are; Dartmoor, for blanket bog; South Dartmoor Woods, for oak woodland; and South Hams, for caves which support important bat populations. The extent of these sites is shown on Map 23. The Habitats Directive, and the legislation which implements it in this country, place additional responsibilities on the Environment Agency, in addition to our normal conservation duties. We will need to review consents and other authorizations which may adversely affect these sites.

Areas which are considered nationally important for their biological or geological conservation interest are designated Sites of Special Scientific Interest (SSSI). There are 20 of these SSSI's in the catchment, seven of which are included in the SAC's above. In addition to these sites are a large number of sites of lesser importance; Devon Wildlife Trust have carried out survey programmes in Teignbridge and South Hams to identify sites which qualify as County or Local Wildlife Sites. County wildlife sites are not identified within Dartmoor National Park, as the whole area is considered to be at least of this standard. Generally, these sites do not have any statutory protection, but they are recognised as being important at a local level and are subject to various local plan policies protecting them from damage or disturbance. There are too many of these sites to map them at the scale used in this plan. Other sites elsewhere in the catchment have been also identified as non-statutory nature reserves. (see Map 23).

## Map 23 Nature Conservation



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River Dart Local Environment Agency Plan



We have signed a memorandum of understanding with English Nature which sets out how we will jointly achieve conservation of river SSSI's; the same principle will be extended to cover SAC's such as the South Dartmoor Woods.

Conservation in this country is now largely being directed through biodiversity action plans (BAP's), which use a prioritisation process to agree, among all involved parties, which key features, habitats and species should be targeted and where to concentrate efforts. These plans are derived from the UK BAP, via a regional stage, to county and more local plans, where actions are implemented. The objectives, targets and actions are refined so that not only are national priorities included where appropriate, but also so that locally important issues are included.

Two other initiatives are in progress to help define priorities and objectives for wildlife and earth science conservation. The Natural Areas programme, which English Nature are developing, will divide England on the basis of natural boundaries. Key conservation objectives will then be set for these areas, to provide a framework for local biodiversity and geology action plans. The Countryside Commission's Character Areas are combined with Natural Areas to give a more local separation where appropriate.

The Dart Catchment falls within the Dartmoor and South Devon Natural Areas. The coast and sea is all within the Lyme Bay Marine Natural Area. Draft profiles are being produced for these areas which will identify key features, habitats and species. The process is well advanced for Dartmoor; English Nature and the Dartmoor National Park Authority (DNPA) have jointly produced "The Nature of Dartmoor: A Biodiversity Profile". A BAP for Dartmoor will follow, produced by DNPA in consultation with other partners. The Dart Catchment (within the Dartmoor Natural Area) has been confirmed as a Prime Biodiversity Area, where those resources available to achieve conservation can most effectively be targeted. The River Dart links the three most important areas of conservation value, and so ties in with the recommendation, in the Habitats Directive, for management of such features.

We show here those earth science features, habitats and species which are key elements of the natural environment in this catchment and which are also linked to our regulatory or operational activities. This means that we consider all aspects of the water environment, together with matters influenced by waste disposal and regulation, and air pollution where it relates to authorised processes.

There are various criteria which must be met for key status to apply: Earth science features must be recognised as nationally important a significant proportion of the county resource. We include habitats or species which are under threat in the catchment or globally present in the catchment as more than a trivial area or population a significant proportion of the county area or population and in order to cover all interests we also include some habitats and species which have high popular appeal or concern

**Table 35 Key Habitats in the River Dart Catchment**

<b>Blanket bog</b>	most southerly example in Britain; Tor Royal only raised bog in South West; rare plant communities and breeding birds.
<b>Upland heath</b>	rare plant communities; breeding birds; uncommon invertebrates.
<b>Valley mires</b>	unusually high quality wetlands; diverse plant communities; important for dragonflies; breeding waders.
<b>Caves and mines</b>	supports largest colony of greater horseshoe bats in Britain; also used by other bat species; endemic freshwater shrimp present.
<b>Torrent rivers and streams</b>	otters; salmon; lower plant communities.
<b>Reservoirs and ponds</b>	uncommon aquatic plants.



Table 36 Key Species in the River Dart Catchment

<b>Otter</b>	not uncommon in middle section of catchment; Devon populations nationally important.
<b>Water vole</b>	recorded from upper catchment in 1989/90; major decline nationally.
<b>Greater horseshoe bat</b>	largest colony in Britain; major decline nationally.
<b>Golden plover</b>	small numbers breed; only site in southern England; declining.
<b>Dunlin</b>	critically small breeding population; extreme edge of range.
<b>Curlew</b>	small breeding population; declining nationally.
<b>Skylark</b>	important part of Devon population; declining rapidly nationally.
<b>Goosander</b>	northern species on edge of range; new colonist; main regional population.
<b>Dipper</b>	western distribution in UK; needs clean rivers; high densities in some sections.
<b>Kingfisher</b>	good numbers in lower catchment; some breeding in upper catchment; vulnerable to hard winters.
<b>Salmon</b>	regionally important catchment; present almost throughout; threatened nationally.
<b><i>Niphargellus glenniei</i> (a freshwater shrimp)</b>	UK endemic species; known only from caves in Devon; status unclear.
<b>Keeled skimmer dragonfly</b>	Dartmoor nationally important for this species; south western distribution; nationally scarce.
<b>Marsh fritillary butterfly</b>	declining throughout Europe; Dartmoor nationally important; several colonies in Dart Catchment.
<b>Blue ground beetle</b>	now limited to only four sites in UK, all in Dartmoor woodlands; endangered.
<b>Three-lobed water-crowfoot</b>	very specific habitat requirements; declining throughout range.
<b>Heather</b>	typical species of upland part of catchment; declining.
<b>Lichen communities</b>	several rare and declining species present both in woodlands and on tors and quarry faces.

Table 37 Key geological features in the catchment, with particular links to our activities

<b>Tors and clitter slopes</b>	evidence for periglacial activity; quarry sites show how tors have formed.
<b>Extensive peat deposits</b>	particularly important for preserved record of past ecology.
<b>Caves and vertebrate fossils</b>	limestone cave features illustrate formation processes and contain very important fossil record.

We mention here those habitats and species which are not covered in the issues section of this report, but are nonetheless important for the conservation value of the catchment.

Cave systems and, to a lesser extent, mines are important habitats for two main species of concern. Most bats have declined in abundance, but greater horseshoe bats in particular have suffered a drastic decline throughout their range. The south Devon colony is therefore particularly important, containing around 30% of the British population. The bats are known to use river culverts as flyways. The other species is the endemic cave shrimp, *Niphargellus glenniei*. Little is known about its requirements but it is likely to be vulnerable to changes to water quality or hydrology.

There is little seasonally inundated grassland in the lower Dart Catchment; a few fields around the head of the estuary do flood fairly regularly in winter and provide habitat for feeding birds and typical plants. There may be opportunities to re-establish three-lobed water-crowfoot at sites where it was previously recorded but is now extinct.

The oak woodlands in the middle reaches of the catchment support the only UK populations of the endangered blue ground beetle; its requirements are not fully understood.

Several key bird species are only present in small numbers, but reflect the conservation value of Dartmoor as upland habitat. Golden plover and dunlin breed in blanket bogs, while a small number of curlew use valley mires; both are therefore vulnerable to changes to those habitats. Skylarks are still fairly common and breed on heather moorland; nationally, however, their numbers are declining

steeply and this makes the populations here more important than ever. Again, good management practices need to be followed if this very popular species is to thrive.

Dippers nest under bridges and feed in riffles; although relatively common here, they have a strong western distribution. A few pairs of mandarin duck also breed on the river; these attractive birds are endangered in their native country.

## Fisheries

### Salmonid Species

The River Dart sustains an important salmon, sea trout and brown trout fishery. For status of these fisheries see Map 24 and Map 25. Atlantic salmon are an internationally important species for conservation and, are listed under the EC Habitats Directive. The majority of salmon enter the river in the summer months, principally August, and then make their way upstream to the spawning grounds in the upper reaches of the catchment. The sea trout migration follow a similar pattern although the peak of the run tends to be earlier, generally in May and June. Brown trout are widespread throughout the system.

The principal spawning areas for salmon and sea trout are the main River Dart and its tributaries on Dartmoor (see Map 26). The majority of migratory fish spawning takes place in November and December, and in the Dart Catchment, gaining access to spawning areas by this time does not usually present a problem for salmon and sea trout ascending the river, the exception being prolonged periods of low flow. The main spawning areas and juvenile nursery areas are surveyed every 3 years to assess the production of juveniles. The Dart was most recently surveyed in 1996.

The run of salmon is dominated by grilse of around 3 kg weight which are fish are returning to the river having spent a single year at sea. The proportion of fish running the river in the spring months is small, although historically, this was not the case. This decline in runs of spring fish, which are often much larger having spent several years at sea, is characteristic of many rivers in the country, particularly in the South West.

### Coarse Species and Eels

There are no significant coarse fish populations on the river other than minor species (see Map 27), viz. minnows, stone loach and bullheads, all of which are relatively common. Lampreys have been recorded on the Holy Brook, Ashburn and Harbourne rivers, although which of the three species are present is not known. Bullheads are noticeably absent from the moorland, which is in keeping with other Dartmoor rivers. It is known that this species is not tolerant of low pH which is characteristic of many moorland streams in the area.

Bullheads and all three species of Lamprey are listed under the EC Habitats Directive.

### Estuarine Species

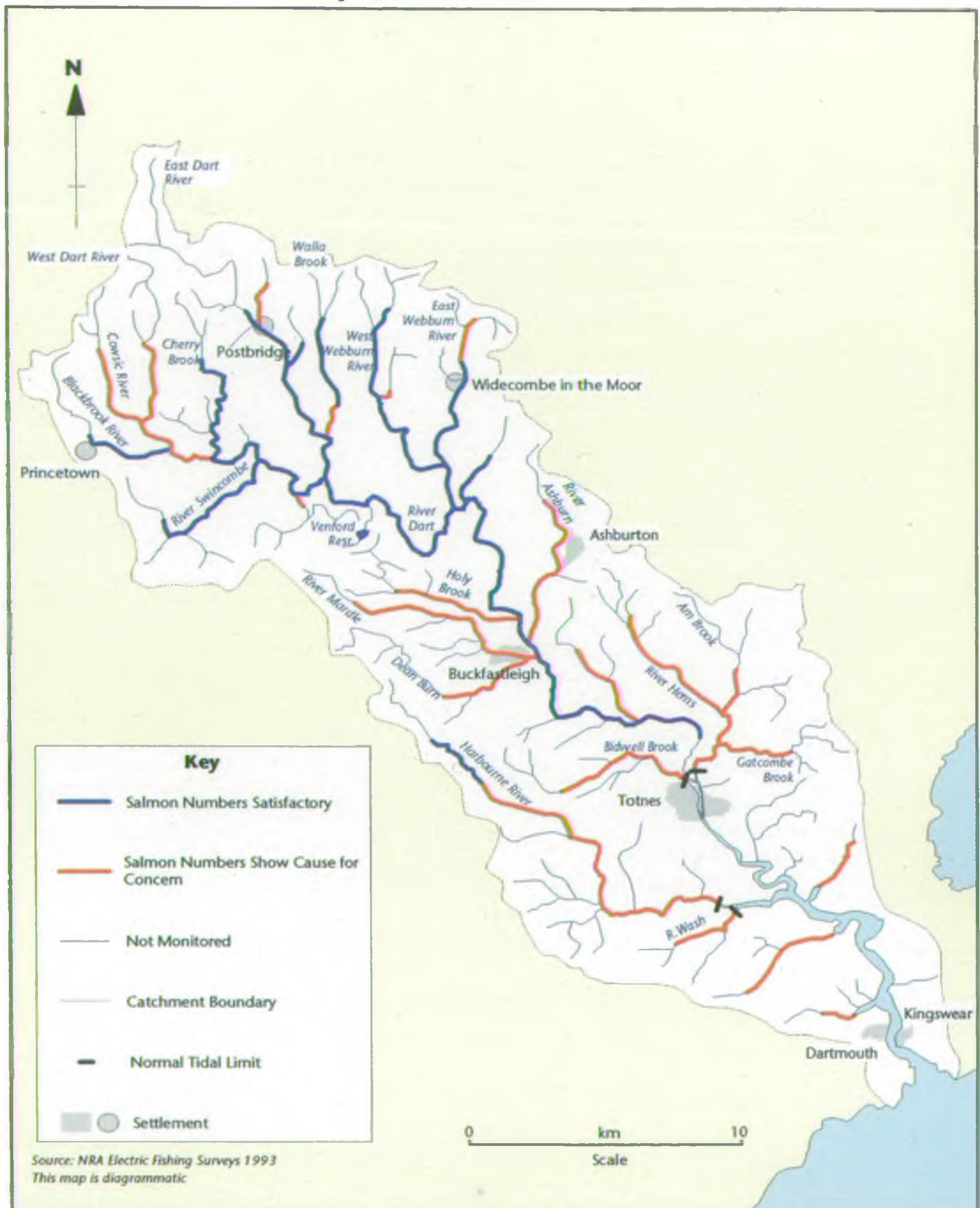
The Dart Estuary is a designated bass nursery area, and fishing for this species from a boat is prohibited from 1 May - 31 December. This affords protection for juvenile bass which proliferate in the tidal reaches at certain times of the year. Mullet are common throughout the estuary, and often penetrate upstream to the tidal limit. It is quite normal for this species to move well into the freshwater reaches although on the Dart, the weir at Totnes all but prevents this. Flounders and other flatfish are taken in the estuary, the former also being found as far upstream as Totnes.

### Commercial Fisheries

There are 18 licences issued for seine netting of salmon and migratory trout in the Dart Estuary. Licensed nets are allowed to operate in the period 15 March - 16 August. The minimum mesh size which may be used on the Dart is smaller than on other Devon rivers (1.5" knot to knot as opposed to

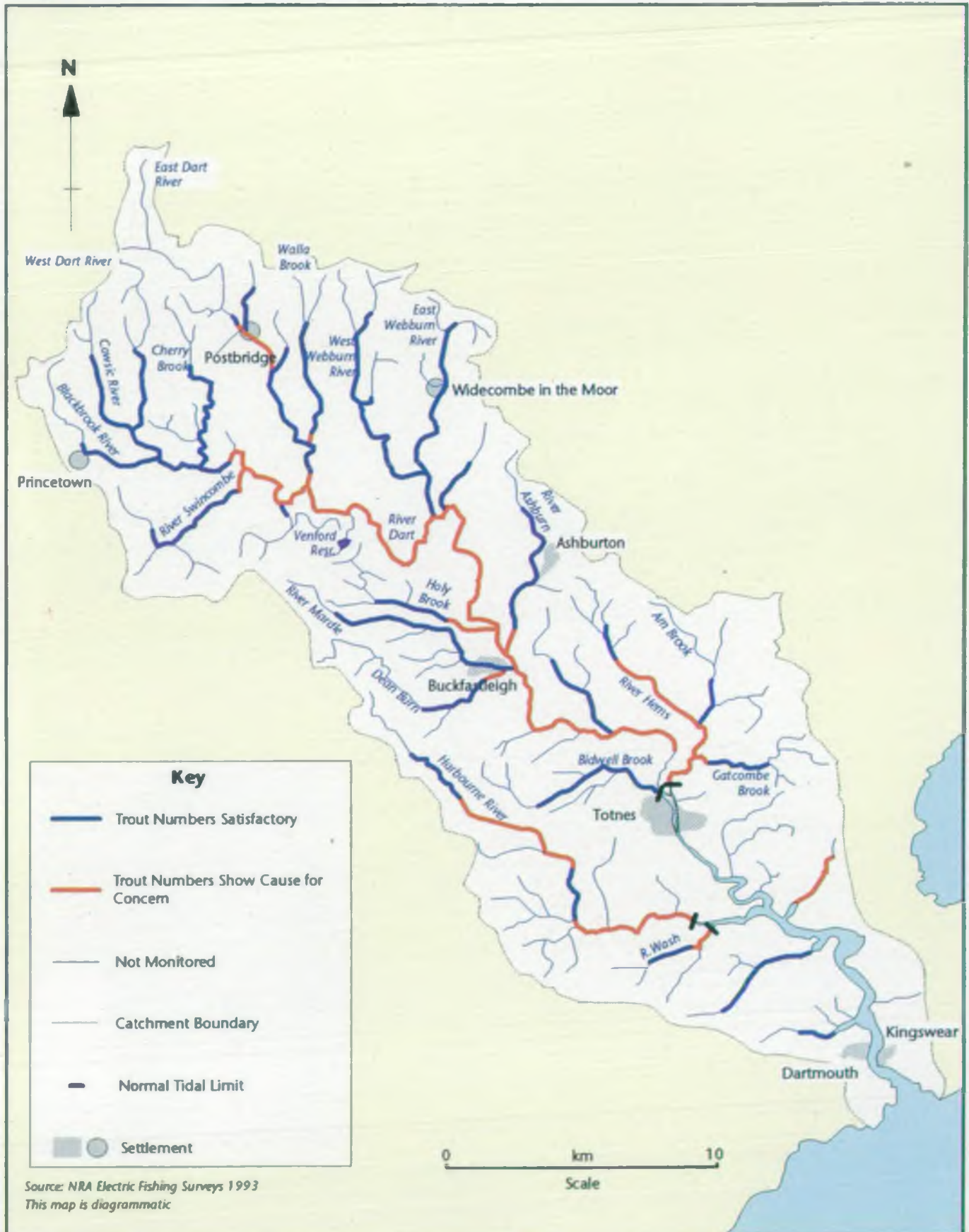


**Map 24 State of the Fishery - Juvenile Salmon**





**Map 25 State of the Fishery - Juvenile Trout**



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**Map 26 Spawning Gravels**



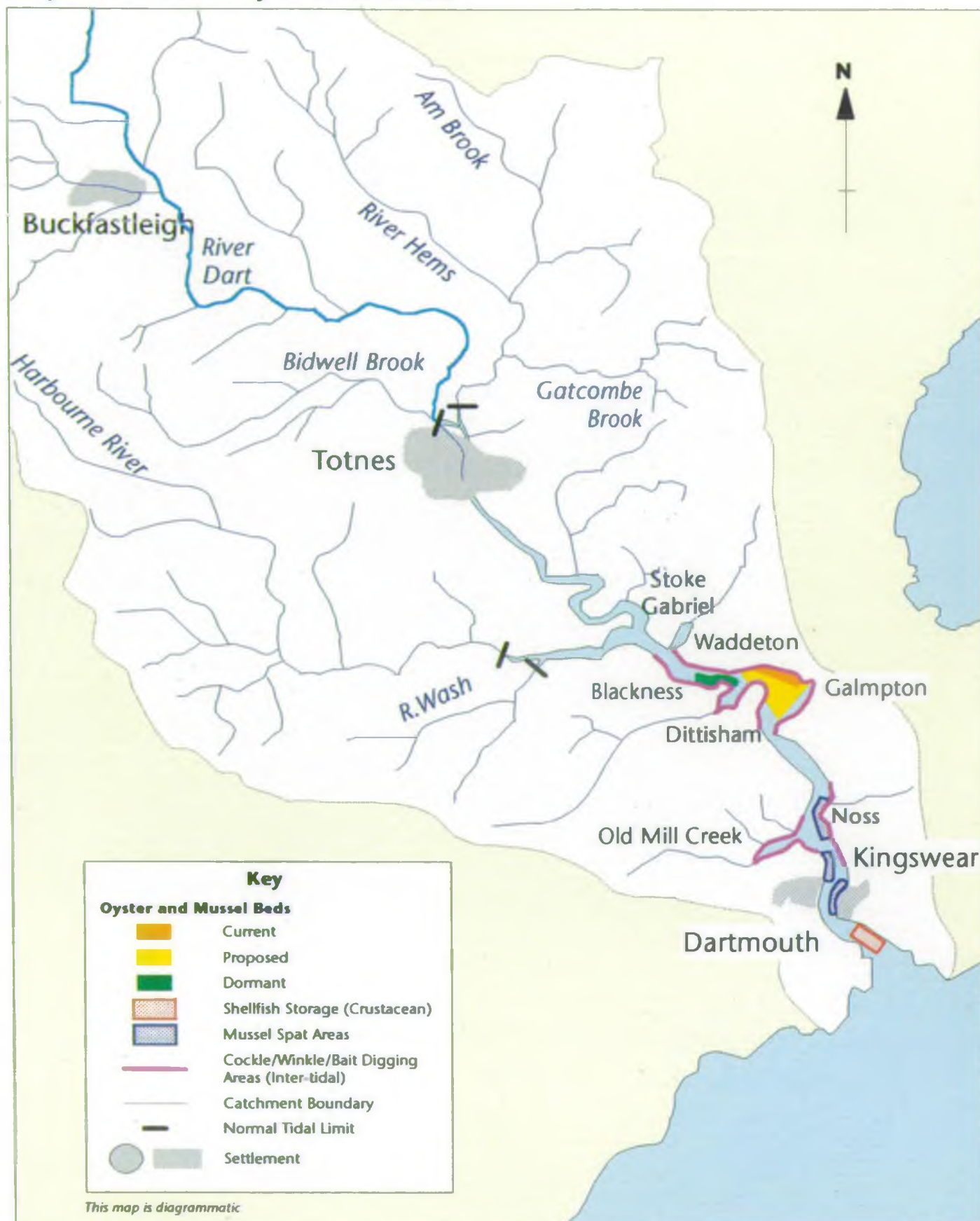


**Map 27 Coarse Freshwater Fish and Eel Distribution**





**Map 28 Dart Estuary Shellfish Areas**



2"). The demand for salmon netting licences has fallen off in recent years due primarily to increased netting licence charges and a fall in the relative value of salmon. Seventeen of the 18 licences were issued for the 1996 season but only 13 were subsequently taken out and operated. Most salmon are taken in the period between early June, and the end of the season, and the majority of sea trout in May and June. The long term average net catch is 1151 salmon and 538 sea trout.

Outside of the bass nursery area closed period, there is a rod and line fishery targeting bass. This is permitted provided that all bass landed are of 36 cm or greater. In the closed period, rod and line fishing is permitted from the shore only. The Agency assist MAFF in the enforcement of the bass nursery area, and several Agency staff have limited British Sea Fishery Officer powers for this purpose. These measures are part of a national bass conservation programme.

Occasional drift net fishing for mullet is carried out at various locations in the estuary albeit on a limited scale only. Thornback rays are caught by rod and line in the estuary up as far as Stoke Gabriel. Fixed nets have in the past been illegally set in the estuary for the capture of this species.

The principal area for shellfish cultivation in the Dart Estuary is around Galmpton and Waddeton. The most important species harvested is oysters, both Pacific and Flat, although some mussels are also grown. The Devon Sea Fisheries Committee is currently applying for a Regulatory Order for the area which would allow them to establish a commercial shellfishery, and provide the Committee with sufficient powers to manage the fishery properly.

Cockles and winkles are collected in the inter-tidal areas shown on Map 28. Bait digging for ragworm and moulted shore crabs also takes place within these areas. The extent of the Oyster and Mussel fishery is also shown on Map 28, see Concerns Over Effluent Discharges in the Vicinity of the Dart Estuary Shellfishery, Section 4.6 for more detail.

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- <sup>5</sup> The UK National Air Quality Strategy, DOE, Scottish Office, HMSO, 1997.
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- <sup>8</sup> The Implications of Climate Change for the National Rivers Authority, N W Arnell, A Jenkins, DG George, Institute of Hydrology R&D Report 12, NRA 1994.
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## **Appendix A: Our Environmental Standards**

There is a great deal of legislation that determines the way we operate and carry out our enforcement duties. The Environment Act 1995 provides some harmonisation of powers, but we also rely on existing legislation, including the Control of Pollution Act (1974), the Control of Pollution (amendment) Act (1989), the Environmental Protection Act (1990), the Radioactive Substances Act (1993), the Salmon and Freshwater Fisheries Act (1975), the Water Resources Act (1991), and the Land Drainage Act (1991).

We are the competent Authority for over 25 European Community environmental Directives whilst a further 70 Directives affect our policies and activities. These include the Quality of Bathing Waters, Dangerous Substances, Industrial Plant Emissions, Waste Management Framework, Quality of Water to Protect Freshwater Fisheries, and the Urban Waste Water Treatment Directives.

Operational Standards are the technical, scientific and engineering procedures which are necessary to put legislation and our policy into practice. These take many forms, including policy statements, procedural manuals, and a suite of quantitative output and performance measures that we monitor quarterly or annually. Details of our operational standards are published in technical handbooks, research & development reports, and information leaflets. Further details are available from our local offices.

### **A1: Public Registers and Access to Environmental Information**

We maintain several public registers which can be inspected at most Environment Agency offices. Information is usually provided free of charge, but for large and complex requests we may charge for staff time and materials. There are also standard charges for some specific searches. Confidential information, incomplete or draft reports, and information where disclosure may lead to environmental damage are generally not available.

Further details about our public registers and the types of information we hold are available in our leaflet, *A Guide to Information Available to the Public*. Copies are available at our Exeter office, or you can telephone and we will send one to you in the post.

At present, offices may have information relevant only to their local area; please call before you visit to ensure that the information you want is available at your local office. Our staff will be happy to help you with any queries you may have, and if you call before you visit we will ensure that they are on hand to help you with your query.

Some environmental details and information about our public registers are available on the Internet on <http://www.environment-agency.gov.uk>.

### **A2: The RQO Classification**

The water quality targets that we use in all rivers are known as River Quality Objectives (RQOs). RQOs are used for managing water quality and are based on the River Ecosystem (RE) classification scheme (NRA 1994), which replaces the former NWC scheme. We eventually plan to introduce Statutory Water Quality Objectives to supersede these River Quality Objectives.

These classes reflect the chemical quality needed by different types of river ecosystem including the types of fishery they can support. We set RQOs based on the need to protect current water quality and future use.

### Standards for the Five River Ecosystem Use Classes

Use Class	DO % sat 10%ile	BOD (ATU) mg/l 90%ile	Total Ammonia mgN/l 90%ile	Un-ionised Ammonia mgN/l 95%ile	pH 5%ile & 95%ile	Hardness mg/l CaCO <sub>3</sub>	Dissolved Copper µg/l 95%ile	Total Zinc µg/l 95%ile	Class Description
1	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	Water of very good quality suitable for all fish species.
2	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	Water of good quality suitable for all fish species.
3	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 1,000 2,000	Water of fair quality suitable for high class coarse fish populations.
4	50	8.0	2.5		6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1,000 2,000	Water of fair quality suitable for coarse fish populations.
5	20	15.0	9.0						Water of poor quality which is likely to limit coarse fish populations.

### A3: EC Bathing Waters Directive

The EC Directive concerning the quality of bathing water (76/160/EEC) seeks to protect public health and the amenity value of popular bathing waters by reducing pollution. The Directive contains standards for 19 microbiological, physical and chemical parameters to assess bathing water quality. Compliance is assessed mainly by standards for bacteria (total and faecal coliforms) found in sewage.

We are responsible for monitoring the quality of identified, popular bathing waters and providing the results to DoE who decide whether the standards in the Directive have been met. Where identified bathing waters fail to meet the Directive, we are responsible for identifying sources of pollution that are causing failures, and making sure that improvements are made.

#### Microbiological Standards

Parameter	Units	Value		Status	
		I	G	I	G
Total coliforms	no/100ml	10,000	500	95 % of samples	80 % of samples
Faecal coliforms	no/100ml	2,000	100	95 % of samples	80 % of samples
Faecal streptococci	no/100ml	-	100	-	95 % of samples
Salmonella	no/l	0	-	95% of samples	-
Enterovirus	PFU/10l	0	-	95% of samples	-

Notes : PFU = Plaque Forming Units      I = Imperative or Mandatory standard.      G = Guideline standard

There is currently no imperative standard for faecal streptococci, however, it has been proposed that the Directive should be revised and should include an imperative standard for faecal streptococci of 400/100 ml.



## Aesthetic Criteria

Parameter	Analysis Method	Description/Standard
Colour	Visual inspection	No abnormal change
Mineral oils	Visual inspection	No visible surface film
	Olfactory inspection	No odour
	mg/l after extraction and weighing dried residue	≤ 0.3
Surface-active substances (methylene-blue active)	Visual inspection	No lasting foam
	mg/l as lauryl sulphate	≤ 0.3
Phenols	Olfactory inspection	No specific odour
	mg/l	≤ 0.05
Transparency	m	1
Tarry residues, solid floating material, effluent slicks	Visual inspection	Absent

## A4: EC Surface Water Abstraction Directive

The EC Directive concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (75/440/EEC), protects the quality of surface water used for public supply. This Directive ensures that water abstracted for public supply meets certain quality standards and is given adequate treatment before entering public water supplies.

The Directive sets out imperative standards that must be achieved, and guideline standards that Member States should aim to achieve, for water for public supply which is to be given different levels of treatment.

We are responsible for monitoring the quality of designated surface water abstractions and reporting the results to DoE who decide whether the standards in the Directive have been met. Where standards are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

Definition of the Standard Methods of Treatment for Transforming Surface Water of Categories A1, A2 and A3 into Drinking Water	
Category A1	Simple physical treatment and disinfection, e.g. rapid filtration and disinfection.
Category A2	Normal physical treatment, chemical treatment and disinfection, e.g. pre-chlorination, coagulation, flocculation, decantation, filtration, disinfection (final chlorination).
Category A3	Intensive physical and chemical treatment, extended treatment and disinfection, e.g. chlorination to break-point, coagulation, flocculation, decantation, filtration, absorption (activated carbon), disinfection (ozone, final chlorination).

Characteristics of Surface Waters Intended for the Abstraction of Drinking Water			Categories					
Parameters			A1		A2		A3	
			G	I	G	I	G	I
1	pH		6.5 to 8.5	-	5.5 to 9	-	5.5 to 9	-
2	Coloration (after simple filtration)	mg/l Pt scale	10	20 (0)	50	100 (0)	50	200 (0)
3	Total suspended solids	mg/l SS	25	-	-	-	-	-
4	Temperature	°C	22	25 (0)	22	25 (0)	22	25 (0)
5	Conductivity	µs/cm <sup>-1</sup> at 20°C	1000	-	1000	-	1000	-
6	Odour	(dilution factor at 5°C)	3	-	10	-	20	-
7	Nitrates	mg/l NO <sub>3</sub>	25	50 (0)	-	50 (0)	-	50 (0)
8	Fluorides	mg/l F	0.7 to 1.0	1.5	0.7 to 1.7	-	0.7 to 1.7	-
9	Total extractable organic chlorine	mg/l Cl	-	-	-	-	-	-
10	Dissolved Iron	mg/l Fe	0.1	0.3	1	2	1	-
11	Manganese	mg/l Mn	0.05	-	0.1	-	1	-
12	Copper	mg/l Cu	0.02	0.05 (0)	0.05	-	1	-
13	Zinc	mg/l Zn	0.5	3	1	5	1	5
14	Boron	mg/l B	1	-	1	-	1	-
15	Beryllium	mg/l Be	-	-	-	-	-	-
16	Cobalt	mg/l Co	-	-	-	-	-	-
17	Nickel	mg/l Ni	-	-	-	-	-	-
18	Vanadium	mg/l V	-	-	-	-	-	-
19	Arsenic	mg/l As	0.01	0.05	-	0.05	0.05	0.1

Characteristics of Surface Waters Intended for the Abstraction of Drinking Water			Categories					
			A1		A2		A3	
Parameters			G	I	G	I	G	I
20	Cadmium	mg/l Cd	0.001	0.005	0.001	0.005	0.001	0.005
21	Total Chromium	mg/l Cr	-	0.05	-	0.05	-	0.05
22	Lead	mg/l Pb	-	0.05	-	0.05	-	0.05
23	Selenium	mg/l Se	-	0.01	-	0.01	-	0.01
24	Mercury	mg/l Hg	0.0005	0.001	0.0005	0.001	0.0005	0.001
25	Barium	mg/l Ba	-	0.1	-	1	-	1
26	Cyanide	mg/l Cn	-	0.05	-	0.05	-	0.05
27	Sulphates	mg/l SO <sub>4</sub>	150	250	150	250 (0)	150	250 (0)
28	Chlorides	mg/l Cl	200	-	200	-	200	-
29	Surfactants (reacting with methyl blue)	mg/l (laurylsulphate)	0.2	-	0.2	-	0.5	-
30	Phosphates	mg/l P <sub>2</sub> O <sub>5</sub>	0.4	-	0.7	-	0.7	-
31	Phenols (phenol index) paranitraniline 4 aminoantipyrine	mg/l C <sub>6</sub> H <sub>5</sub> OH	-	0.001	0.001	0.005	0.01	0.1
32	Dissolved or emulsified hydrocarbons (after extraction by petroleum ether)	mg/l	-	0.05	-	0.2	0.5	1
33	Polycyclic aromatic hydrocarbons	mg/l	-	0.0002	-	0.0002	-	0.001
34	Total pesticides (parathion, BHC, dieldrin)	mg/l	-	0.001	-	0.0025	-	0.005
35	Chemical oxygen demand (COD)	mg/l O <sub>2</sub>	-	-	-	-	30	-
36	Dissolved oxygen saturation rate	% O <sub>2</sub>	> 70	-	> 50	-	> 30	-
37	Biochemical oxygen demand (BOD <sub>5</sub> ) (at 20°C with nitrification)	mg/l O <sub>2</sub>	< 3	-	< 5	-	< 7	-
38	Nitrogen by Kjeldahl method (except NO <sub>3</sub> )	mg/l N	1	-	2	-	3	-
39	Ammonia	mg/l NH <sub>3</sub>	0.05	-	1	1.5	2	4 (0)
40	Substances extractable with chloroform	mg/l SEC	0.1	-	0.2	-	0.5	-
41	Total organic carbon	mg/l C	-	-	-	-	-	-
42	Residual organic carbon after flocculation and membrane filtrations (5 µ) TOC	mg/l C	-	-	-	-	-	-
43	Total coliforms 37°C	/100 ml	50	-	5,000	-	50,000	-
44	Faecal coliforms	/100 ml	20	-	2,000	-	20,000	-
45	Faecal streptococci	/100 ml	20	-	1,000	-	10,000	-
46	Salmonella		Not present in 5000 ml	-	Not present in 1000 ml	-	-	-

- I mandatory  
 G guide  
 0 exceptional climatic or geographical conditions

## A5: EC Dangerous Substances Directive

The EC Dangerous Substances Directive *on pollution caused by certain substances discharged in the aquatic environment of the community* (76/464/EEC) protects the water environment by controlling discharges to rivers, estuaries and coastal waters.

This Directive describes two lists of compounds. List I contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate. Discharges containing List I substances must be controlled by Environmental Quality Standards (EQSs) issued through Daughter Directives. List II contains substances which are considered to be less dangerous but which still can have a harmful effect on the water environment. Discharges of List II substances are controlled by EQSs set by the individual Member States.

We are responsible for authorising, limiting and monitoring dangerous substances in discharges. We are also responsible for monitoring the quality of waters receiving discharges which contain dangerous substances and reporting the results to DoE who decide whether the standards in the Directive have been met. Where the requirements of this Directive are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.



## EQSs for List I Substances (Inland Waters)

Parameter	Units	Value	Status <sup>(1)</sup>
Mercury	µg Hg/l	1.0	AA,T
Cadmium <sup>(2)</sup>	µg Cd/l	5.0	AA,T
		1.0	AA,T,B <sup>(4)</sup>
Hexachlorocyclohexane (HCH) <sup>(2)</sup>	µg/l	0.1	AA,T
		0.05	AA,T,B <sup>(4)</sup>
Tetrachloromethane (CTC)	µg/l	12	AA,T
DDT (para-para DDT isomer) <sup>(2)</sup>	µg/l	0.01	AA,T
Total DDT <sup>(2)</sup>	µg/l	0.025	AA,T
Pentachlorophenol (PCP) <sup>(2)</sup>	µg/l	2	AA,T
'The Drins' (from 1 Jan 1989)	µg/l	0.03 <sup>(3)</sup>	AA,T
Aldrin (from 1 Jan 1994)	µg/l	0.01	AA,T
Dieldrin (from 1 Jan 1994)	µg/l	0.01	AA,T
Endrin (from 1 Jan 1994)	µg/l	0.005	AA,T
Isodrin (from 1 Jan 1994)	µg/l	0.005	AA,T
Hexachlorobenzene (HCB) <sup>(2)</sup>	µg/l	0.03	AA,T
Hexachlorobutadiene (HCBD) <sup>(2)</sup>	µg/l	0.1	AA,T
Chloroform	µg/l	12	AA,T
1,2-dichloroethane	µg/l	10	AA,T
Trichloroethylene	µg/l	10	AA,T
Perchloroethylene	µg/l	10	AA,T
Trichlorobenzene (TCB)	µg/l	0.4	AA,T

## EQSs for List I Substances (Tidal Waters)

Parameter	Units	Value	Status <sup>(1)</sup>
Mercury <sup>(2)</sup>	µg Hg/l	0.3	AA,D
Cadmium <sup>(2)</sup>	µg Cd/l	2.5	AA,D
Hexachlorocyclohexane (HCH) <sup>(2)</sup>	µg/l	0.02	AA,T
Tetrachloromethane (CTC)	µg/l	12	AA
DDT (para-para DDT isomer) <sup>(2)</sup>	µg/l	0.01	AA
Total DDT <sup>(2)</sup>	µg/l	0.025	AA
Pentachlorophenol (PCP) <sup>(2)</sup>	µg/l	2	AA
'The Drins' (from 1 Jan 1989)	µg/l	0.03 <sup>(3)</sup>	AA,T
Aldrin (from 1 Jan 1994)	µg/l	0.01	AA
Dieldrin (from 1 Jan 1994)	µg/l	0.01	AA
Endrin (from 1 Jan 1994)	µg/l	0.005	AA
Isodrin (from 1 Jan 1994)	µg/l	0.005	AA
Hexachlorobenzene (HCB) <sup>(2)</sup>	µg/l	0.03	AA
Hexachlorobutadiene (HCBD) <sup>(2)</sup>	µg/l	0.1	AA
Chloroform	µg/l	12	AA
1,2-dichloroethane	µg/l	10	AA
Trichloroethylene	µg/l	10	AA
Perchloroethylene	µg/l	10	AA
Trichlorobenzene (TCB)	µg/l	0.4	AA

- Notes:** 1. AA = Annual Average      T = Total      B = Background Monitoring  
2. A 'standstill' provision exists for concentrations in sediments and/or shellfish and/or fish.  
3. Maximum of 0.005 for Endrin.  
4. B = Background Monitoring: only applies at designated end of catchment sites.

Proposals have been published for the following List I substances but these have not, so far, been adopted: trifluralin, endosulphan, simazine, triorganotin compounds (tributyltin oxide, triphenyltin acetate, triphenyltin oxide, triphenyltin hydroxide), atrazine, organophosphorus substances (azinphos-methyl, azinphos-ethyl, fenitrothion, fenthion, malathion, parathion and parathion-methyl, dichlorvos).

# EQSs for List II Substances (Inland Waters)

Parameter	Units	Value <sup>(1)</sup>		Hardness (mg CaCO <sub>3</sub> /l)	Status <sup>(2)</sup>
		A Std	B Std		
Lead	µg Pb/l	4 10 10 20	50 125 125 250	0 to 50 50 to 100 100 to 150 150 to > 250	AA,D
Chromium	µg Cr/l	5 10 20 20 50	150 175 200 200 250	0 to 50 50 to 100 100 to 150 150 to 200 200 to > 250	AA,D
Zinc	µg Zn/l	8 50 75 75 75 125	75 175 250 250 250 500	0 to 50 50 to 100 100 to 150 150 to 200 200 to 250 >250	AA,T
Copper	µg Cu/l	1 6 10 28	1 6 10 28	0 to 50 50 to 100 100 to 250 150 to >250	AA,D
Nickel	µg Ni/l	50 100 150 200	50 100 150 200	0 to 50 50 to 100 100 to 200 200 to > 250	AA,D
Arsenic	µg As/l	50		All	AA,D
Boron	µg B/l	2000		All	AA,T
Iron	µg Fe/l	1000		All	AA,D
pH	pH values	6 to 9		All	95 % of samples
Vanadium	µg V/l	20 60	20 60	0 to 200 200+	AA,T
Tributyltin	µg/l	0.02		All	M,T
Triphenyltin	µg/l	0.02		All	M,T
Polychlorochlormethyl-sulphonamidodiphenyl ether (PCSDs)	µg/l	0.05		All	T, 95 % of samples
Sulcofuron	µg/l	25		All	T, 95 % of samples
Flucofuron	µg/l	1.0		All	T, 95 % of samples
Permethrin	µg/l	0.01		All	T, 95 % of samples
Cyfluthrin	µg/l	0.001		All	T, 95 % of samples

# EQSs for List II Substances (Tidal Waters)

Parameter	Units	Value <sup>(1)</sup>	Status <sup>(2)</sup>
Lead	µg Pb/l	25	AA,D
Chromium	µg Cr/l	15	AA,D
Zinc	µg Zn/l	40	AA,D
Copper	µg Cu/l	5	AA,D
Nickel	µg Ni/l	30	AA,D
Arsenic	µg As/l	25	AA,D
Boron	µg B/l	7000	AA,D
Iron	µg Fe/l	1000	AA,D
pH	pH values	6 to 8.5 <sup>(3)</sup>	95% of samples
Vanadium	µg V/l	100	AA,T
Tributyltin	µg/l	0.002	M,T
Triphenyltin	µg/l	0.008	M,T
Polychlorochlormethyl-sulphonamidodiphenyl ether (PCSDs)	µg/l	0.05	T, 95% of samples
Sulcofuron	µg/l	25	T, 95% of samples
Flucofuron	µg/l	1.0	T, 95% of samples
Permethrin	µg/l	0.01	T, 95% of samples
Cyfluthrin	µg/l	0.001	T, 95% of samples

- Notes:** 1. National environmental quality standards recommended for the UK.  
2. AA = Annual Average; D = Dissolved; T = Total; M = Maximum Allowable Concentration.  
3. A Std denotes standards for the protection of sensitive aquatic life.  
B Std denotes standards for the protection of other aquatic life.

## A6: EC Urban Wastewater Treatment Directive

The EC Directive *concerning urban wastewater treatment* (91/271/EEC) specifies minimum standards for sewage treatment and sewage collection systems.

This Directive specifies secondary treatment for all discharges serving population equivalents greater than 2,000 to inland waters and estuaries, and greater than 10,000 to coastal waters. Discharges below these population equivalents receive appropriate treatment as defined in the AMP2 guidance note (see Effluent Disposal). We are responsible for making sure that discharges receive the level of treatment specified in this Directive.

This Directive also allows higher standards of treatment for discharges to *sensitive* areas, and/or lower standards of treatment to *less sensitive* areas. Sensitive areas are those waters that receive discharges from population equivalents of greater than 10,000, and are or may become eutrophic in the future.

We carry out monitoring to find out whether a watercourse is a sensitive area. We present this information to DoE who decide whether the watercourse is sensitive. We then ensure that discharges to the sensitive area receive a higher level of treatment.

Less Sensitive Areas or *High Natural Dispersion Areas* (HNDAs) are those estuarine or coastal waters which are naturally very dispersive. In these areas a lower level of sewage treatment is required. However, dischargers must demonstrate that no harm will be caused to the environment by the lower level of treatment. We are responsible for ensuring that these studies are carried out correctly.

At the Third North Sea Conference, the UK Government undertook to reduce loadings (flow x concentration) of the 'Annex 1A' list of substances except dioxins (\*) entering UK tidal waters from rivers and direct discharges by 50% (70% for Hg, Cd, Pb) by 1995, against a 1985 baseline.

## A7: The GQA Classification

The GQA Scheme is our classification system designed to provide an absolute measure and show trends in water quality over time (NRA 1994); it has replaced the earlier National Water Council (NWC) Scheme for this purpose.

### Biological GQA

The GQA Biology sampling programme is carried out every 5 years. Each river stretch to be classified is then assigned the site that most accurately represents its biological status; the system is unsuitable for lakes, reservoirs and canals.

Biology is linked to water quality by biotic indices; we use the Biological Monitoring Working Party (BMWP) score (NRA 1994) for this purpose. Different watercourses, and different sites on the same watercourse, will support different invertebrates because of the differences in their geography, climate, geology, and the habitats that occur. The values of biotic indices derived from different sites will therefore vary, even when their water is of similarly good quality. Biotic indices cannot be used to compare the water quality of different sites, unless the sites are very similar morphologically and geographically. This suggests that it is best to describe biology in terms of a shortfall from that expected under conditions of good water quality.

To overcome the problem as detailed above, the GQA Biological classifications are based on Ecological Quality Indices (EQI):



Biological Class	Class Description	Lower class limits	
		EQI ASPT	EQI N-taxa
a	Very Good	1.00	0.85
b	Good	0.90	0.70
c	Fairly Good	0.77	0.55
d	Fair	0.65	0.45
e	Poor	0.50	0.30
f	Bad	0.00	0.00

The RIVPACS III computer program was used to predict the composition of the fauna, and hence the values of biotic indices, expected at any site under natural, unpolluted conditions, based on its physical and geographical characteristics. The EQIs of ASPT (Average Score Per Taxon) and number of taxa (N-taxa) are used to classify rivers into bands, the worst predictor determining the GQA classification.

#### A8: EC Freshwater Fish Directive

The EC Directive on the quality of waters needing protection or improvement in order to support fish life (78/659/EEC) ensures that water quality in designated stretches of water is suitable for supporting certain types of fish.

This Directive contains two sets of quality standards. One set of standards protects cyprinid or coarse fish populations. The other set of standards that are stricter, protects salmonid fish populations for example, salmon and trout. There are two sets of standards for each fishery type: imperative standards (I) which must be achieved, and guideline standards (G) that Member States should aim to achieve.

We are responsible for monitoring the quality of identified fisheries and reporting the results to DoE who decide whether the standards in the Directive have been met. Where the requirements of this Directive are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

Determinand	Salmonid Waters	Cyprinid Waters	Lower class limits	
	G	I	G	I
Dissolved Oxygen as mg/l O <sub>2</sub>	100 % > 7	50 % > 9	100 % > 5	50 % > 7
pH as pH units	-	6.0-9.0	-	6.0-9.0
Suspended Solids at mg/l	25	-	25	-
BOD (Total) as mg/l O <sub>2</sub>	5	-	8	-
Nitrite as mg/l N	0.15	-	0.46	-
Non-ionised Ammonia as mg/l N	0.004	0.021	0.004	0.021
Ammonia (Total) as mg/l N	0.03	0.78	0.16	0.78
Total Residual Chlorine as mg/l HOCl	-	0.005	-	0.005
Zinc (Total) as mg/l Zn	Hardness (mg/l CaCO <sub>3</sub> )			
	0-50	-	0.03	-
	50-100	-	0.20	-
	100-250	-	0.30	-
	>250	-	0.50	-
Copper (Dissolved) as mg/l Cu	0-50	0.005	-	0.005
	50-100	0.022	-	0.022
	100-250	0.040	-	0.040
	>250	0.112	-	0.112

For dissolved oxygen, 50 % median and 100 % minimum standard.

For suspended solids, the 'G' value is an annual average concentration.

#### **A9: EC Shellfish Hygiene Directive**

The EC Shellfish Hygiene Directive *laying down the health conditions for the production and the placing on the market of live bivalve molluscs* (91/492/EC) protects the health of consumers of live bivalve molluscs such as mussels and oysters. This Directive defines standards for shellfish quality required in the end product. It also classifies bivalve mollusc shellfish harvesting areas into four categories according to the concentrations of bacteria found in the shellfish flesh.

The Ministry of Agriculture, Fisheries and Food (MAFF) and the Department of Health (DoH) share responsibility for this Directive in England and Wales. We have only a minor role in implementing this Directive. Although we provide information on the location of discharges that may affect harvesting areas, we cannot control the quality of polluting discharges under this Directive.

#### **A10: EC Shellfish Waters Directive**

The Shellfish Waters Directive *on the quality required of shellfish waters* (79/923/EEC) protects shellfish populations (defined as bivalve and gastropod molluscs) from harm caused by pollution. We are responsible for monitoring the quality of designated shellfish waters and reporting the results to DoE who decide whether the standards in the Directive have been met. Where standards are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

Designated sites in South West Region are in the Fal Estuary (three sites), Portland Harbour and Poole Harbour; there are none in this catchment.

## Appendix B: List of Nature Conservation Designations

### Environmentally Sensitive Areas

#### National Nature Reserves

Wistmans Wood (see below)

#### Proposed Special Areas of Conservation

South Hams proposed SAC	Faunal interest - includes Bulkamore Iron Mine (SX749 632) & Buckfastleigh Caves SSSIs (SX 742 665)								
South Dartmoor Woods pSAC	Western acidic oak woodlands - includes Holne Woodlands SSSI (SX 720 715 & SX 735 717)								
Dartmoor pSAC	Blanket Bog - includes all or part of: <table> <tr> <td>South Dartmoor SSSI</td><td>SX 630 690</td></tr> <tr> <td>Tor Royal Bog SSSI</td><td>SX 605 722</td></tr> <tr> <td>East Dartmoor SSSI</td><td>SX 695 815</td></tr> <tr> <td>North Dartmoor SSSI</td><td>SX 580 850.</td></tr> </table>	South Dartmoor SSSI	SX 630 690	Tor Royal Bog SSSI	SX 605 722	East Dartmoor SSSI	SX 695 815	North Dartmoor SSSI	SX 580 850.
South Dartmoor SSSI	SX 630 690								
Tor Royal Bog SSSI	SX 605 722								
East Dartmoor SSSI	SX 695 815								
North Dartmoor SSSI	SX 580 850.								

#### Sites of Special Scientific Interest

- 1 Froward Point (SX 905 497) Coastal plant communities especially maritime heath and grassland, plus several local and rare species.
- 2 Lord's Wood (SX 874 539) Very good example of oak-hazel-ash woodland on loamy soils.
- 3 Bulkamore Iron Mine (SX 749 632) Faunal interest.
- 4 Potters Wood (SX 735 652) Geological, paleontological and faunal interest.
- 5 Buckfastleigh Caves (SX 742 665) Geological, paleontological and faunal interest.
- 6 Pridhamsleigh Caves (SX 749 679) Geological, paleontological and faunal interest.
- 7 Torbryan Caves (SX 815 675) Paleontological and faunal interest.
- 8 Hembury Woods (SX 725 685) Semi-natural oak woodland with valley alderwood and heathy grassland. Entomological interest.
- 9 Holne Woodlands (SX 720 715 & 735 717) Ancient semi-natural oak woodland with lichen and bird interest.
- 10 Buckland-in-the-Moor (SX 720 733) Lichen interest.
- 11 Leusdon Common (SX 705 729) Geological.
- 12 South Dartmoor (SX 630 690) Blanket bog, mixed valley mire and unimproved acid grassland/heathland mosaic. Also geological interest in parts.
- 13 Tor Royal Bog (SX 605 722) Blanket mire.
- 14 Two Bridges Quarry (SX 609 751) Geological.
- 15 Dunnabridge Meadows (SX 640 741) Herb-rich hay meadows
- 16 Blackslade Mire (SX 737 756) Mixed valley mire grading through wet heath to dry unimproved grassland.
- 17 East Dartmoor (SX 695 815) Heather moorland with valley mire, acidic grassland and geological interest.
- 18 Laughter Quarry (SX 657 765) Geomorphological.
- 19 Wistmans Wood (SX 613 770) Relict of ancient high-level Dartmoor woodland plus acid grassland, heath and mire.
- 20 North Dartmoor (SX 580 850) Blanket bog and mixed valley mire with bird interest.



#### Non-statutory Nature Reserves

Blackadon	DWT	SX 714 733	Sessile oak wood and acid grassland (SSSI).
Dart Valley	DWT	SX 680 727	Moorland, woodland and river (SSSI).
Grey Park Wood	WT	SX 723 730	Sessile oak woodland.
Higher Kiln Quarry	VWT & WPCST	SX 743 664	Caves with fossil & faunal interest in wooded quarry floor.
Clapton Wood	WT	SX 835 539	Woodland.

DWT = Devon Wildlife Trust, WT = Woodland Trust, VWT = Vincent Wildlife Trust, WPCST = William Pengelly Cave Studies Trust

## Glossary

**Abstraction** - removal of water from surface or groundwater.

**Abstraction licence** - licence issued by the Environment Agency under S.38 of the Water Resources Act 1991 to permit removal of water from a source of supply. It can limit the quantity of water taken daily.

**Above Ordnance Datum (AOD)** - land levels are measured relative to the average sea level at Newlyn in Cornwall. This average level is referred to as 'Ordnance Datum'. Contours on Ordnance Survey maps of the UK show heights in metres above Ordnance Datum.

**Acidification** - the detrimental effect of acid rain on soils and freshwater.

**Algae** - a diverse group of simple aquatic plants, some microscopic, which can grow in rivers and the sea in great profusion (blooms).

**Ammonia** - a chemical found in water often as the result of discharge of sewage effluents. High levels of ammonia affect fisheries and abstractions for potable water supply.

**Annex 1A substance** - substance which has been selected for monitoring on the basis of its persistency, toxicity and ability to bioaccumulate.

**Annual licensed total** - the volume of water which an abstractor is allowed to abstract over the period of a year under the terms of each Abstraction Licence.

**Aquatic plants** - a term given to plants that grow entirely covered by water, like water-milfoil, or at the surface, such as yellow water-lily. Some plants have both aquatic and emergent forms.

**Aquifer** - a sub-surface zone or formation of rock which contains exploitable resources of groundwater. Aquifers are classed as either major, minor or non-aquifers depending upon the availability of the groundwater sources. Major aquifers provide large yields and are usually used for public water supply, minor aquifers have smaller yields and are usually used only for local water supply, non-aquifers yield little water and have very few, if any, abstractions.

**Asset Management Plan 2 (AMP2)** - the second Asset Management Plan produced by the Water Companies for the Office of Water Services (OFWAT). It sets out the water industry investment programme for the period 1995 to 2005.

**Baseflow** - the flow in a river derived from groundwater sources.

**Bioaccumulation** - concentration of pollutants, such as metals, within the tissues of organisms.

**Biochemical Oxygen Demand (BOD)** - a standard test which measures over 5 days the amount of oxygen taken up by aerobic bacterial to oxidise organic (and some inorganic) matter.

**Biodiversity** - the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and ecosystems. (Article II of the Biodiversity Convention).

**Blanket Bog** - *Sphagnum* (moss) rich vegetation which occurs on thick layers of peat (>0.5 m), where the water table is at or just below the surface and fed by direct precipitation.

**Buffer zone** - strip of land, 10-100 m wide, alongside rivers which is removed from intensive agricultural use.

**Catchment** - the total area from which a single river collects surface runoff.

**Civic Amenity Site C/A** - facility provided by a local authority for householders to use to take bulky household waste, garden wastes and other household wastes which are not normally taken by vehicles on domestic waste collection rounds. Typically a modern C/A has containers for the segregated collection of recyclable materials and for vegetation for composting.

**Coarse fish** - this is a lay-man's term for cyprinid fish and other commonly associated species such as pike, perch and eels of angling significance. The term does not normally refer to minor species such as bullhead, stone loach, minnow and stickleback.

**Coliforms** - a group of bacteria distinguished by their ability to degrade lactose to produce acid and gas. They are used as indicators of possible contamination of water by sewage. The faecal coliforms, a subgroup of the coliforms, are normally found only in faeces and are therefore a more reliable indicator of contamination by sewage.

**Compensation flow** - water released from a reservoir to compensate for the impact of the impoundment.

**Confluence** - the point at which two rivers meet.

**Consent (discharge)** - a statutory document issued by the Environment Agency under Schedule 10 of the Water Resources Act 1991 as amended by the Environment Act 1995 to indicate any limits and conditions on the discharge of an effluent to a controlled water.

**Controlled waste** - defined by the UK EPA 1990 Section 75 as household, industrial and commercial waste.

**Countryside Stewardship Scheme** - a grant scheme piloted by the Countryside Commission to enhance and conserve important English landscapes, wildlife habitats and history; run by MAFF from April 1996.

**Critical load** - the annual quantity of acidity, in hydrogen ion equivalents per hectare per year, which can be neutralised by soil or freshwater's natural buffering capacity.

**Culverts** - drain or covered channel carrying water across or under a road, canal etc.

**Cumecs** - cubic metres per second. A measurement of flow.

**Cyprinid fish** - fish of the family Cyprinidae (e.g. roach, bream, carp and chub). Pike, perch, eel and some other fish species are not cyprinids.

**Demand management** - activities to manage the amount of water required from a source of supply; includes measures to control waste and/or discourage use.

**Descriptive Consent** - a consent which qualitatively describes the type of treatment or polluting effect rather than setting numerical limits, normally used for small sewage works.

**Diffuse pollution** - pollution without a single point source e.g. acid rain, pesticides, urban runoff etc.

**Dissolved oxygen (DO)** - the amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of 'health' of a water. It is used to classify waters.

**Drought Order** - orders made by the Secretary of State upon application by the Environment Agency or a water undertaker, under powers conferred by Act of Parliament, to meet deficiencies in the supply of water due to exceptional shortages of rain. Drought Orders are sub-divided into 'ordinary' and 'emergency'. An 'ordinary' Drought Order could contain provisions such as to authorise abstraction from an unlicensed source, override the conditions pertaining to an abstraction licence, limit the amount of water which may be taken from a source or vary discharge conditions. An emergency drought order might allow the prohibition of use of water for particular purposes to allow a ban on non-essential use of water, for example in car washes or to introduce the use of stand-pipes.

**Ecosystem** - a functioning, interacting system composed of one or more living organisms and their effective environment, in a biological, chemical and physical sense.

**Environmental Quality Standards (EQS)** - the concentration of a substance found in the environment which should not be exceeded in order to protect the environment or human health. An EQS is set by the EC through EC Directives and also by the government.

**Environmentally Sensitive Area (ESA)** - an area designated by MAFF where grant aid is available to support traditional farming methods.

**Fissure** - an opening, usually long and narrow, made especially by cracking, splitting or separation of parts.

**Geomorphology** - the study of earth surface features and their formation.

**Groundwater** - all the water contained in the void spaces in pervious rocks and that held within the soil, mainly derived from surface sources.

**Hydrogeology** - branch of geology concerned with water within the earth's crust.

**Hydrology** - the study of water and its dynamics.

**Landfill** - a process whereby areas such as disused quarries are used to dispose of solid wastes in a controlled manner prior to being capped and revegetated.

**Leaching** - the washing out of a soluble constituent.

**Macroinvertebrate** - a large invertebrate, e.g. jellyfish, snail, fly.

**Main river** - rivers designated as 'Main' on a map held by MAFF; generally defined as a watercourse of strategic nature, carrying flows from an upland catchment of significant size to the sea.

**Outfall** - the point where a river or pipe discharges.

**pH** - a measure of the concentration of hydrogen ions which cause acidity. Acid solutions have a pH of less than 7, alkalis of more than 7 and neutral solutions a pH of 7 (e.g. pure water).

**Phenols** - a class of aromatic organic compounds derived from a benzene ring structure. Toxic by inhalation and skin absorption.

**Primary treatment** - the physical treatment of sewage effluent, usually settlement, to remove gross solids, reduce suspended solids by about 50%, and BOD by about 20%.

**Q95** - the flow that on average is equalled or exceeded for 95% of the time.

**Riparian owner** - owner of riverbank and/or land adjacent to a river. Normally owns river bed and rights to mid-line of channel.



**Runoff** - rainwater which does not soak into the ground but which runs over the surface in a downhill direction.

**Salmonid fish** - game fish of the salmon family e.g. salmon, trout and sea trout.

**Secondary treatment** - biological treatment and secondary settlement of sewage effluent, normally following primary treatment, capable of producing a substantial reduction in BOD and suspended solids.

**Section 105 Surveys** - Section 105 of the Water Resources Act 1991 allows for Standards of Service Assets and Flood Risk Surveys.

**Septic tank** - an underground tank used to treat sewage from properties without mains drainage. The sewage is settled and some bacterial treatment occurs. Discharge of effluent is usually to a soakaway system.

**Set-aside** - the EC set-aside scheme was first introduced for the crop year 1991/92 as part of the reform to allow farmers to remove land from production by receiving compensation. Eligible crops are a wide range of arable crops, principally cereals.

**Sewage** - liquid waste from cities, towns and villages which is normally collected and conveyed in sewers for treatment and/or discharge to the environment.

**Sewerage** - a system of underground pipes designed to carry sewage to Sewage Treatment Works.

**Siltation** - the deposit of material carried in suspension.

**Site of Special Scientific Interest (SSSI)** - sites of national importance designated under the Wildlife and Countryside Act 1981 by English Nature in England. Sites may be designated to protect wildlife, geology or land forms.

**Spoil** - material removed during dredging or excavation.

**Spring fish** - adult salmon which return to freshwater, mostly in late winter/early spring, after two or more winters.

**Substrate** - material making up the bed of a river.

**Surface water** - general term used to describe all the water features such as rivers, streams, springs, ponds and lakes.

**Tectonic** - deformation within the Earth's crust, and its consequent structural effects.

**Transfer station** - premises used for the temporary storage of waste not produced at that location, pending movement elsewhere. A transfer station is often used to store waste collected in a locality and from there it is "bulked up" and taken to a final disposal/management point. Sorting and segregation of waste is also sometimes carried out at transfer stations where an element of the waste can be recycled or re-used.

**Tributary** - a stream or river which feeds into a larger one.

**Valley mire** - habitat which occurs along the lower slopes and floors of small valleys, usually around a central watercourse which is fed from springs and seepages on the valley sides. Valley mire is typically dominated by wetland plants, often moss-rich and usually occurs over a thick layer of peat (> 0.5 m).

## Abbreviations & Units

### Abbreviations

Agency	Environment Agency
AGLV	Area of Great Landscape
Value	
AMP2	Asset Management Plan 2
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BATNEEC	Best Available Technique Not Entailing Excessive Cost
BAP	Biodiversity Action Plan
BCU	British Canoe Union
BOD	Biochemical Oxygen Demand
CAP	Common Agricultural Policy
CSG	Catchment Steering Group
DAS	Devon Archaeological Society
DBWPS	Devon Bird Watching and Preservation Society
DCC	Devon County Council
DMP	Drought Management Plan
DNPA	Dartmoor National Park Authority
DO	Dissolved Oxygen
DoE	Department of the Environment
DWT	Devon Wildlife Trust
EC	European Council
EH	English Heritage
EN	English Nature
EQI	Environmental Quality Indices
EQS	Environment Quality Standard
ESA	Environmentally Sensitive Area
FA	Forestry Authority
FE	Forestry Enterprise
GATT	General Agreement on Trade and Tariffs
GQA	General Quality Assessment
HA	Highways Agency
HCH	Hexachlorocyclohexane
HMIP	Her Majesty's Inspectorate of Pollution
HNDA	High Natural Dispersion Area
IoH	Institute of Hydrology
IPC	Integrated Pollution Control
LA	Local Authority
LEAP	Local Environment Agency Plan
MAFF	Ministry of Agriculture, Fisheries & Food
NII	Nuclear Installations Inspectorate
NRA	National Rivers Authority

NT	National Trust
NWC	National Water Classification
RCHME	Royal Commission on the Historical Monuments of England
RE	River Ecosystem
RIGS	Regionally Important Geological Site
RQO	River Quality Objective
RSPB	Royal Society for the Protection of Birds
R&W BAP	Rivers and Wetlands Biodiversity Action Plan
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SHDC	South Hams District Council
SMP	Shoreline Management Plan
SoS	Standards of Service
SSA	Strategic Supply Area
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWWSL	South West Water Services Limited
TBC	Torbay Borough Council
TDC	Teignbridge District Council
UK	United Kingdom

### Units

°C	degrees centigrade
g	grams
ha	hectare
km	kilometres
km <sup>2</sup>	square kilometres
l	litres
m <sup>3</sup> /s	cumecs; cubic metres per second
mg	milligrams
MI	megalitre
MI/d	megalitres per day
mm	millimetre
ng/l	nanogram per litre
<	less than
>	greater than
≥	greater than or equal to
%	percentage

## MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including Government.

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For general enquiries please call your local Environment Agency office. If you are unsure who to contact, or which is your local office, please call our general enquiry line.

### ENVIRONMENT AGENCY GENERAL ENQUIRY LINE

**0645 333 111**

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

### ENVIRONMENT AGENCY EMERGENCY HOTLINE

**0800 80 70 60**



**ENVIRONMENT  
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