local environment agency plan

RIVER TEIGN

CONSULTATION REPORT

MARCH 1997

ENVIRONMENT AGENCY

Foreword

The River Teign 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 Teign and Torbay Streams.

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 and its objectives.

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 and that good progress is made towards the vision.

Geoff. Bateman.

GEOFF BATEMAN

Area Manager (Devon)

Your Views

We hope that this report will be read by everyone who has an interest in the environment of the River Teign 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 **31st May 1997** to:

Richard Parker
Environment Planner - Devon Area
Manley House
Kestrel Way
EXETER
Devon EX2 7LQ

We will not republish this Consultation Report.

Published March 1997.

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Part 1

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.

Our Principal Aim

Our aim, as set out in the Environment Act 1995[1], 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" (Brundtland Report, 1987).

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.

Our Role

Our work is divided into seven main functions:

- Flood Defence
- Water Resources
- Pollution Control
- Fisheries
- Navigation
- Recreation
- Conservation.

These roles are explained in further detail in Appendix A.

1.2 The Environment Planning Process

Local Environment Agency Plans are published by us to draw together aspects of environmental management and planning; the plans that we publish 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, the catchment steering group and a range of organisations and individuals involved with the environment. We will encourage this dialogue to continue. Following the consultation period, we will publish an Action Plan that will contain details of the main actions that we and other organisations will be carrying out over the next few years.

The Consultation Report

This Local Environment Agency Plan (LEAP) Consultation Report gives you the opportunity to comment on environmental problems or our work, it:

- describes the environmental resources of the area;
- explains how these resources are affected by human uses or pressures;
- outlines issues where we, or others, need to take action to address problems in the environment.

The following sections are included:

Part 1

- ***The Catchment Area*** - provides an introduction to the area, describing its key environmental resources.
- ***Issues and Options*** - highlights the environmental issues in the catchment and proposes draft actions to help resolve them.

Part 2 - Supporting Information

- ***Uses, Activities and Pressures*** - We all place increasing demands on the environment but expect it to be protected from harm. This section looks at the main environmental pressures that are put on the catchment.

State of the Local Environment - In this section we look at the current information on the state of the environmental resources of the catchment. Where information is available we assess the state of these resources against certain standards or targets.

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 October 1997. Each year we will review the progress that has been made with the actions identified in the Action Plan and publish a brief up-date. 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.

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 adapt 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 making our own decisions. LEAPs are one way we aim to influence the content of Local Authority plans.

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 are used to cover the same topics as Catchment Management Plans but they also deal with new topics to cover the full range of our responsibilities.

Local Environment Agency Plans and the Catchment Steering Group

This steering group represents a range of commercial, local authority and environmental interests who endorse 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 are:

Name	*Representing*
Mr G Bond	Teignmouth Harbour Commission
Mr J Briggs	Local Industry
Mr J Collins	Torbay Borough Council - Environmental Health Dept.
Mr H Ellard	Waste Disposal Interests
Mr B Foster	Coarse Fishing
Mr T Gameson	South West Water Services Ltd.
Mr J Getliff	Upper Teign Fishing Association
Ms S Goodfellow	Dartmoor National Park
Mr W Highgate	Teign Fishermen and Watermen Association
Mr P Knibbs	Lower Teign Fishing Association
Mr T Page	Teignbridge District Council - Environmental Health Dept.
Mr D Smallshire	Agriculture - ADAS
Mr C Stanyon	Teignbridge Association of Local Councils
Mr P Watson	Conservation - National Trust
Mr W Watts	Teign Riparian Owners Association
Mr M Weaver	Upper Teign Fishing Association

2. The Catchment Area

2.1 General Description

This plan covers the River Teign and Torbay Streams Catchment, an area of approximately 570 km², and includes a 40 km stretch of the South Devon coast (see Map 1).

The River Teign rises on Dartmoor (SX 614 840) at a height of 520 Above Ordnance Datum (AOD). The length of 'main river' for the River Teign is 42 km. The catchment comprises several subcatchments of varied topography (see Map 2) and geology (see Map 3) which in turn dictate a variety of land uses. The principle subcatchments are the Aller Brook and Rivers Lemon and Bovey. Of these, the Aller Brook subcatchment is the most heavily urbanised.

Torbay is the principal settlement, with a population of 119,660 (1991 census). Torbay comprises the towns of Torquay, Paignton and Brixham, as well as a number of smaller villages. Other major settlements are Newton Abbot, Teignmouth, Bovey Tracey, Kingsteignton and Kingskerswell. The total population of the catchment is estimated at around 208,500 (1991 census).

The principal industries are tourism, agriculture and ball clay extraction. The coastal resorts of Torbay and Teignmouth cater for many visitors during the summer months, when the population can rise by as much as 50%. Agriculture is varied in the catchment with mainly grassland on higher and steeper slopes, arable on gentler slopes, with some horticulture (especially on the urban fringes). The ball clay deposit, centred in the Lower Teign Valley, is of international importance and hence is very significant to the economy of the area. Wholesale and retail distribution and manufacturing industries are also present in the catchment.

There are two major public water supply reservoirs; Fernworthy and Kennick, Tottiford and Trenchford (KTT).

2.2 Geology

The geology of this catchment is complex (see Map 3). However, on a broad scale, the strata can be broken down into four divisions: Dartmoor granite in the north-west of the catchment; a broad swathe of lower Carboniferous and Upper Devonian rocks sweeping around the granite's eastern perimeter; Permian strata (mainly breccias) bordering the coast; and finally the Middle and Lower Devonian slates, shales, sandstones and limestones in the far south.

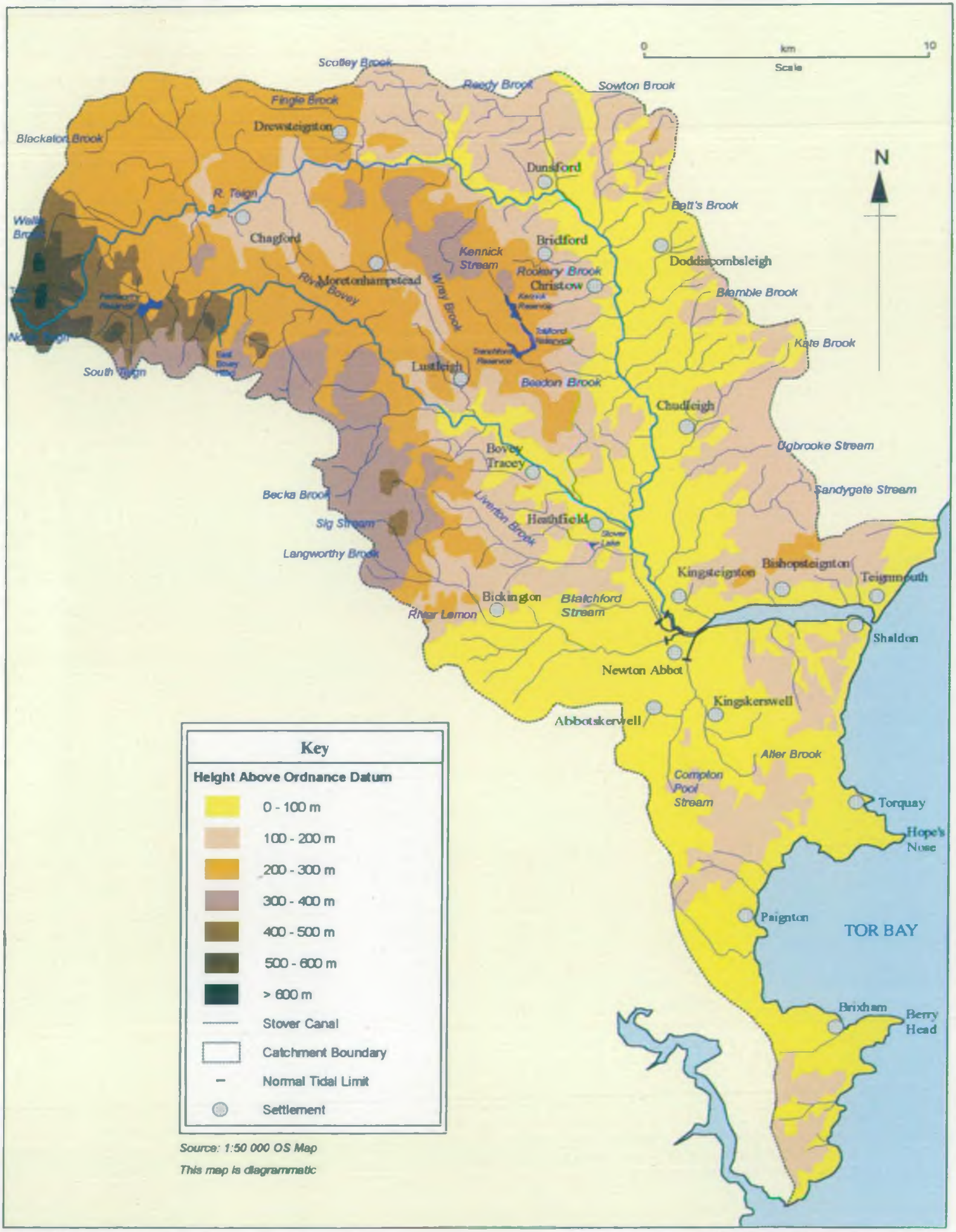
The Dartmoor upland rises from 200 m to over 500 m AOD. The sources of the River Teign and its major tributary, the River Bovey, are found here. The River Teign flows from the granite onto mainly Carboniferous shales and sandstones, via an impressive tree-clad gorge.

The highly variable topography to the west of Newton Abbot reflects the contrasting resistance to weathering of the massive limestones and soft slates of the Middle and Upper Devonian. The slates have been worn down to what is now a low plain broken by many isolated hillocks marking more resistant igneous intrusions.

The Bovey Basin extends south-eastwards from the edge of the granite to Aller, south of Newton Abbot, having developed along the Sticklepath-Lustleigh Fault Zone. The greater part of this area is a well-defined plain floored by clays, sands and lignite.

Map 1 - River Teign Catchment

Map 2 - Topography



Source: 1:50 000 OS Map

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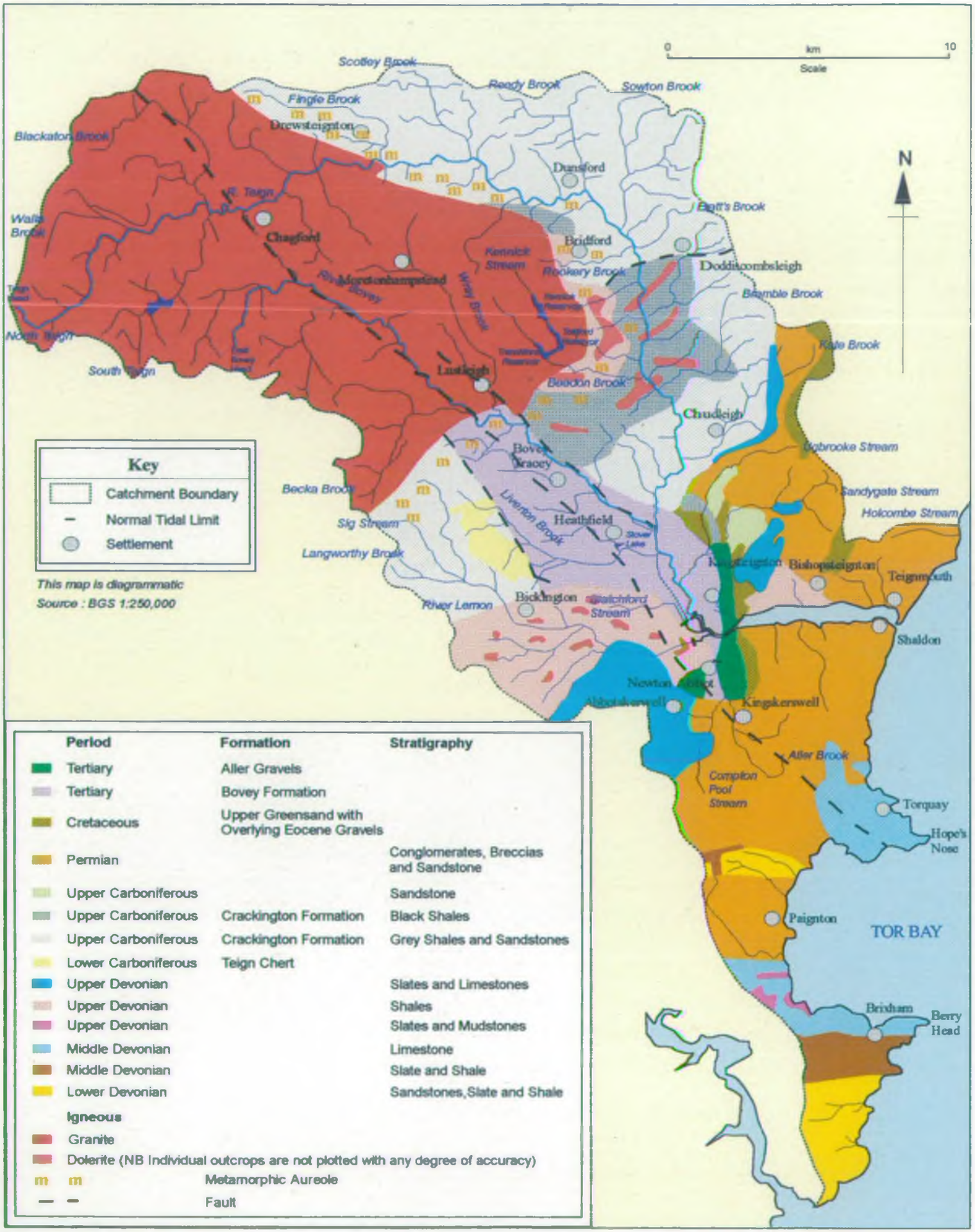
Map 3 - Simplified Geology



Information correct as of July 1996

Thick breccia formations make up most of the lower part of the Permian strata in Devon. Between Torquay and Teignmouth these breccias are well cemented and form prominent coastal cliffs and escarpments.

In common with much of Devon and Cornwall, the Teign Catchment has seen its share of tin-copper-lead-zinc exploitation, although no mining of these ores is taking place at present. See Section 5.3 for further information regarding mining and quarrying within the catchment.

2.3 Hydrogeology

We have classified all rock types within England and Wales as either major, minor or non aquifers, depending on their permeability. Major aquifers are highly permeable with significant fracturing likely; they are highly productive and regionally important for water supply. The only formation within the River Teign Catchment to fulfil these criteria is the Permian Teignmouth Breccia. Although classified as a major aquifer, the water-bearing capability of the breccia is highly variable. No groundwater is abstracted from the breccia within the catchment for public supply, but there are many private licensed sources, some for relatively large quantities. These licences are for industrial, commercial and agricultural use (see Section 5.7).

The remainder of the rock types within the catchment are classified as minor aquifers. This means that they are only considered able to support locally important abstractions for small-scale private supplies.

In addition to supplying water for abstraction, groundwater forms the baseflow for rivers. During droughts the baseflow may be the only water in a watercourse.

We monitor groundwater levels at a single site in this catchment, Stoneycombe Quarry (see Map 4); data has been collected twice monthly from February 1984 to date.

2.4 Climate

Dartmoor occupies a large part of the River Teign Catchment and has a marked effect on the local rainfall and temperature.

Table 1 shows that there is a large variation in average rainfall over the catchment. Average annual totals exceed 2200 mm in the upper, moorland reaches of the river, while in the lower reaches the average annual rainfall is 818 mm.

The isohyets, shown on Map 4, reflect data collected from the 25 rainfall stations in the catchment between 1961 and 1990 inclusive; 16 of these sites are measured daily, the rest are measured monthly.

Map 4 - Hydrometric Network

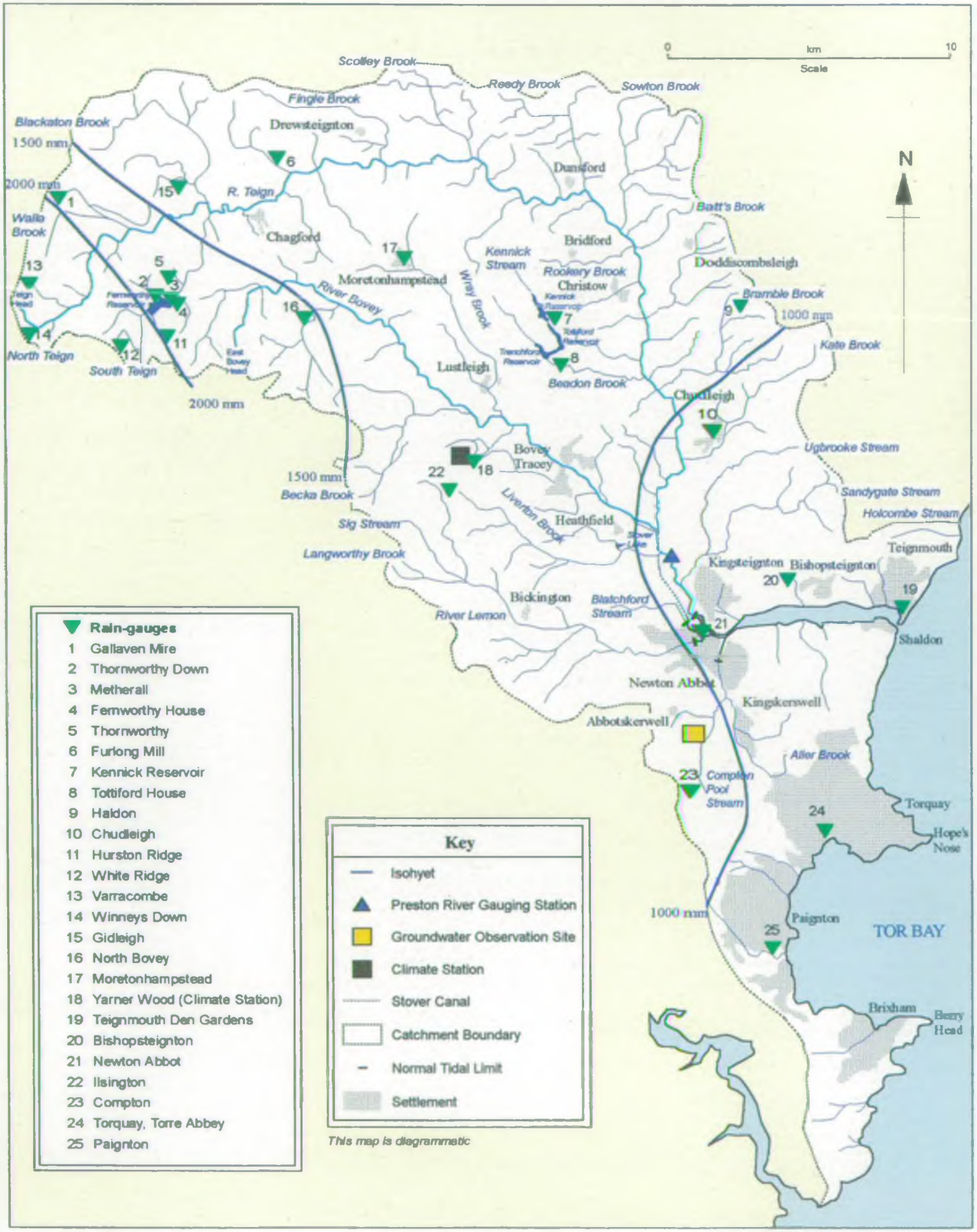


Table 1: Long Term Average Annual Rainfall at Specific Sites in the Catchment

Position in Catchment	NGR	Long Term Average Rainfall (1961 - 1990) (mm)
1. Varracombe, Nr. Teign Head	SX 619 849	2273
2. Furlong Mill, Nr. Chagford, Upper Teign	SX 709 895	1091
3. Kennick Reservoir No.2, Mid Teign	SX 808 839	1119
4. Chudleigh, Lower Teign	SX 866 793	988
5. Teignmouth Den Gardens, Teign Estuary	SX 941 728	818

Temperature also shows a marked variation between the highlands of Dartmoor and the lower Teign Valley. The average summer temperature around the River Teign Estuary is 16°C, falling to 6°C during the winter. Temperatures in the upper Teign Catchment on Dartmoor are generally about 1.5°C lower throughout the year.

There is one climate station in the catchment, at Yarner Wood, see Map 4. This records daily values of the full suite of climatological data, such as maximum and minimum temperature for grass cover, soil temperatures at 10, 20 and 50 cm, run of wind, daily rainfall and sunshine hours.

2.5 River Flow

The River Teign is formed from two tributaries which rise on North Dartmoor; the North and South Teign Rivers. The headwaters of the South Teign River are intercepted by Fernworthy Reservoir which has a net capacity of 1638 Ml.

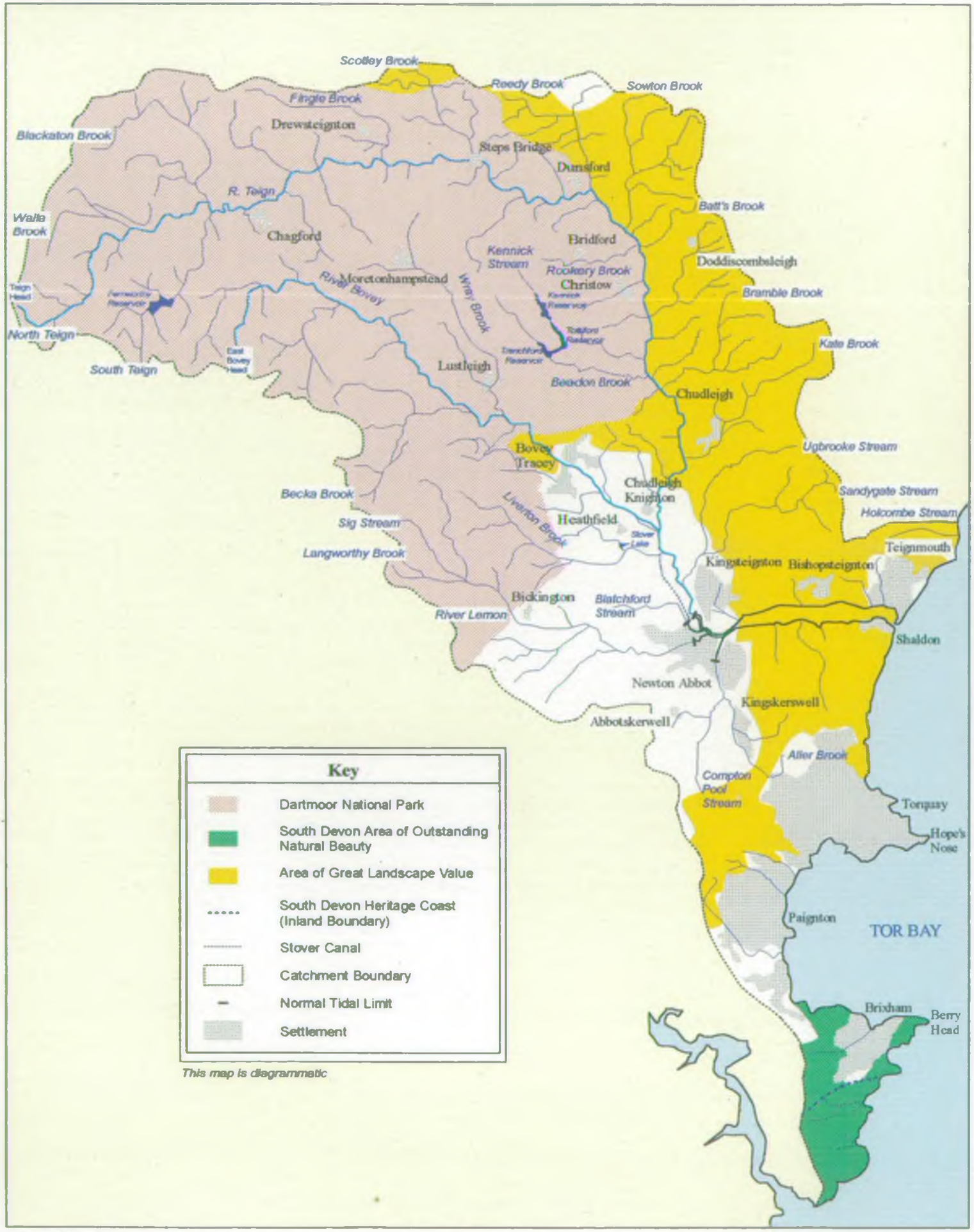
The River Bovey is a major tributary of the Teign, rising on Dartmoor at a level of 420 metres AOD at SX 677 815; the river flows through Bovey Tracy before joining the River Teign. The River Lemon rises on Dartmoor at SX 764 775 and joins the River Teign in its tidal reach.

The only permanent river gauging station on the River Teign is at Preston (see Map 4). Flow has been measured at this site since 1956; data indicates a daily mean flow of 9.507 m^3/s (cumecs) and a Q95 flow of 1.14 m^3/s. The Q95 represents the river flow that is exceeded, on average, 95 % of the time or 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 Preston the Q95 represents only 8.3 % of the daily mean flow, indicating that groundwater contributes very little to the River Teign.

The maximum daily mean flow recorded at Preston is 243.175 m^3/s which occurred on 27 December 1979. A maximum instantaneous flow of 312.850 m^3/s was recorded on 30 September 1960; the minimum recorded instantaneous flow of 0.325 m^3/s was measured on 28 August 1976.

The theoretical Q95 in the South Teign River downstream of Fernworthy reservoir (at SX 6710 8433) has been calculated to be 0.092 m^3/s. This estimate is based on the natural characteristics of the catchment. A compensation flow of 0.066 m^3/s is released from the reservoir (see Section 4.6 for more details). Water from the reservoir is also fed by gravity to the Kennick, Tottiford and Trenchford (KTT) Reservoir complex to maintain storage levels.

Map 5 - Landscape



This map is diagrammatic

2.6 Landscape

Designations

Much of the River Teign Catchment bears some designation for its landscape value. The source of the River Teign and its major tributary the River Bovey are found in Dartmoor National Park. The southernmost part of the catchment is included in the South Devon Area of Outstanding Natural Beauty (AONB) and Heritage Coast. These designations indicate the national importance of these areas.

At a county level, part of the eastern side of the catchment has been designated an Area of Great Landscape Value (AGLV) (see Map 5), while the Devon County Structure Plan[2] designation of Coastal Preservation Area applies to two stretches (again, see Map 5). For a description of other designated areas within the catchment, including Sites of Special Scientific Interest (SSSI) and Nature Reserves, see Section 6.4.

Landscape assessments are available for the South Devon AONB and Dartmoor Environmentally Sensitive Area (ESA). The Countryside Commission's report 'The New Map of England'[3] and Devon County Council's Consultation Report 'The Devon Landscape'[4] are also useful references.

Character

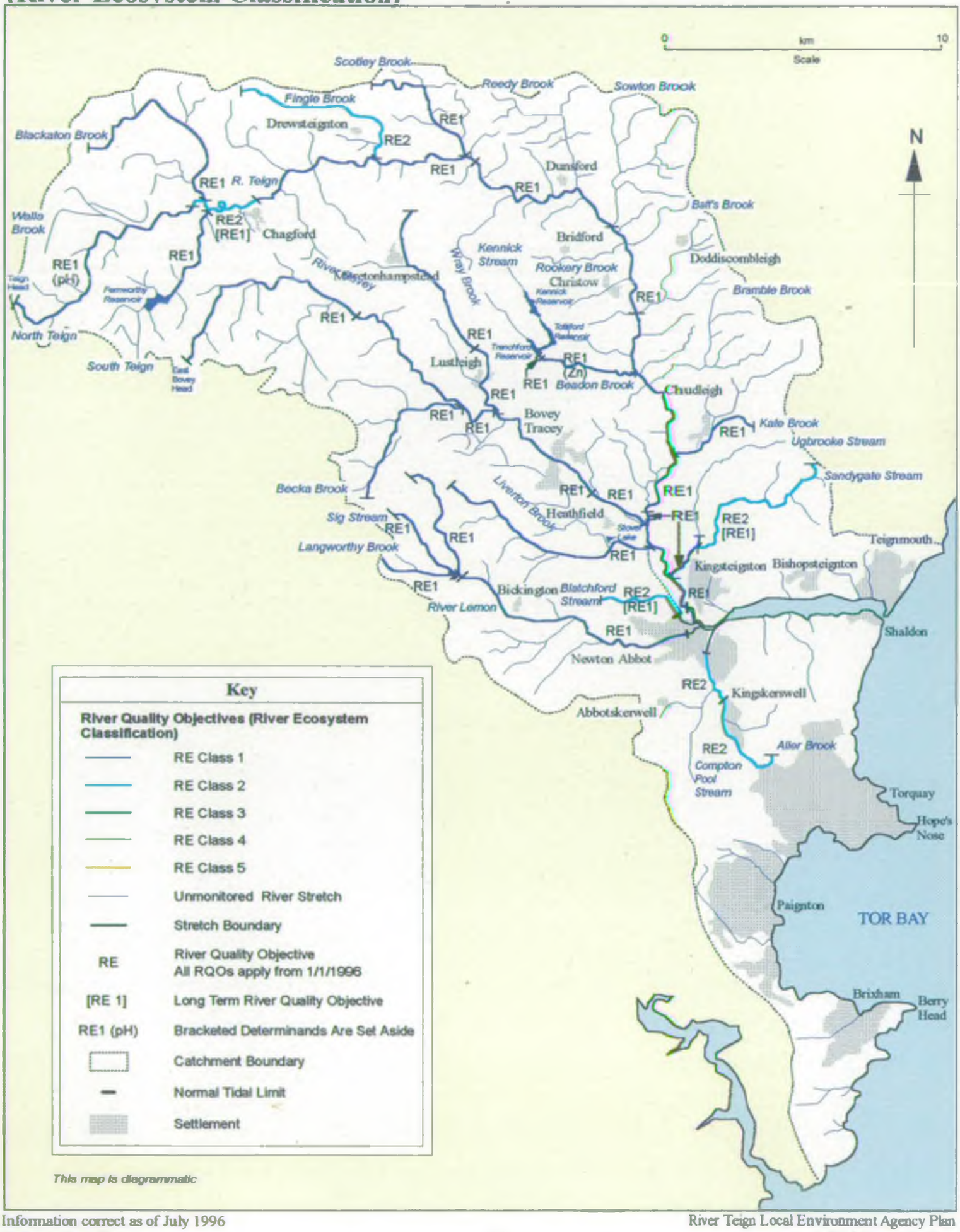
The River Teign rises on North Dartmoor, forming a fast flowing watercourse which has a narrow, steeply falling valley with heavily wooded oak flanks. Below Steps Bridge the valley widens a little and the woodland is gradually replaced by improved pasture. After Chudleigh Knighton the river enters a wide gentle valley and human influences become more apparent, with the landscape heavily modified by mineral workings and the urbanised areas around Heathfield, Newton Abbot and Kingsteignton. At Newton Abbot the Teign enters a long narrow estuary which is the eastern most of Devon's rias (drowned river valleys); the estuary is unusual in being largely filled with sediments and therefore has many of the attributes of a bar built estuary.

The River Bovey rises on Dartmoor and flows in a narrow, steep channel with rapids and small waterfalls through a wooded valley to the meadows of the Parke Estate. Below Parke, the river becomes slower flowing, meandering through farmland. At the point where the Rivers Teign and the Bovey meet, the river basin forms a relatively flat area, ringed with hills. This is the Bovey Basin, the most dominant features of which are the open cast ball clay quarries, with their spoil heaps and settling lakes. There are remnants of a once extensive area of heathland, and a number of ponds which are mostly associated with past workings.

The source of the River Lemon is on Haytor Down. In the upper reaches it is surrounded by moorland, pasture and arable land, with a number of mill leats. Lower down, the River Lemon runs through woods and parkland until it reaches Newton Abbot where it is, in part, culverted.

The coastal landscape is varied, ranging from red sandstone cliffs at Teignmouth and Shaldon, to the massive limestone headland of Berry Head. The rural coastal sections, where secluded coves are linked to the hinterland by steep and narrow lanes, contrast with the Torbay conurbation which, with its palm trees and hotels, forms the 'English Riviera'. The coastal towns which form Torbay are surrounded by a hilly, small scale landscape of farmland and woods, threatened by expanding urban fringes.

Map 6 - 1995 Proposed River Quality Objectives (River Ecosystem Classification)



Key

River Quality Objectives (River Ecosystem Classification)

	RE Class 1
	RE Class 2
	RE Class 3
	RE Class 4
	RE Class 5
	Unmonitored River Stretch
	Stretch Boundary
RE	River Quality Objective All RQOs apply from 1/1/1996
[RE 1]	Long Term River Quality Objective
RE1 (pH)	Bracketed Determinands Are Set Aside
	Catchment Boundary
	Normal Tidal Limit
	Settlement

This map is diagrammatic

3. Our Proposed Targets for River Water Quality

We manage water quality by setting targets called River Quality Objectives (RQOs). These 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 have proposed our RQOs using a classification scheme known as River Ecosystem (RE) (see Appendix B2) which was introduced in 1994, by the National Rivers Authority, following public consultation. It replaces a former scheme introduced by the Water Authorities in the late 1970s, and used by the NRA until 1994. The RE classification has five classes, as summarised in Table 2.

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 set a visionary or Long Term RQO; we will test compliance against proposed 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 Teign Catchment have been divided into classified reaches and the RQOs that we intend to set are outlined on Map 6. Please comment on these proposed River Quality Objectives.

Section 6.1 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 Section 4.

4. Issues and Options

4.1 Problems Associated with Development

Background

The Teign Catchment is predominantly rural, however it does contain the major urban areas of Torbay and Newton Abbot/Kingsteignton/Kingskerswell. Development in the catchment will be concentrated in Newton Abbot Sub-Regional Centre and Torquay/Paignton with 125 ha proposed for major employment development during the period 1991 - 2011, together with significant residential development[5]. This proposed development will put increasing pressure on the environment.

A number of water pollution problems can be attributed to development throughout the area. Problems can occur during the construction phase, for example, increased siltation and contaminated runoff to the surface water drainage systems. Tracing the source of such incidents is particularly difficult. The pollution risk associated with industry and industrial estates is recognised, and programmes of risk assessment and contingency planning are under way.

Increasing population pressure inevitably puts an extra load on the water supply and 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, they also generate significant quantities of methane, a 'greenhouse gas'.

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

Effects

Impacts of industry on water quality - Discharges from Coventry Farm Industrial Estate have affected biological water quality in the upper and middle reaches of the Aller Brook; these stretches are classified as Class D biological quality (see Section 6.1). A number of remedial measures have now taken place which should result in a biological improvement. Other industrial estates in the catchment pose an unknown risk to water quality.

Low concentrations of dissolved chlorinated solvents are present in the springs feeding the Yalberton Brook, which lies to the west, in the River Dart Catchment. One exceedence of the Environmental Quality Standard (EQS) for trichloroethene has been identified at a single spring within the Clennon Valley; monitoring of this spring is continuing. Otherwise, the data shows surface water complies with the relevant EQSs.

Historic pollution of groundwater by chlorinated solvents has been detected at a manufacturing plant near Paignton on the Waddeton (Brixham Road) Industrial Estate. Subsequent investigation boreholes drilled at the site confirmed the groundwater contamination, however no evidence of impact on other groundwater users or of continuing release of contaminants to ground has been found.

Impact of road runoff (on spawning gravels and pond ecology) - During construction of the A30 trunk road, large quantities of sediment were allowed to enter the Scotley and Fingle Brooks. There are concems that the current drainage of the road system into these two watercourses has totally altered the flow regime, and still results in erosion and sedimentation. There are also concerns about soil erosion from agricultural activities, these are highlighted in Section 4.9. This sedimentation is likely to affect the ecology of these

watercourses and salmonid spawning in these stretches is severely limited (see Map 28, Section 6.5). Runoff from roads can affect the Bovey Basin ponds; the most notable is Stover Lake SSSI which is just downstream of the A38.

Impact on air quality - 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. The impact may be local, especially with regard to particulate matter which will often settle on nearby land or water, or may be global, for example affecting the ozone layer or the concentrations of greenhouse gases such as carbon dioxide. There is a need for a better understanding of air quality and its effect in the catchment.

Contaminated land - The precise nature of contaminated land in the catchment is not fully known. New statutory guidance[6] to be enacted in 1997 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. Further issues and actions will be reported in the River Teign Action Plan or Annual Reviews.

Managing public water supplies to meet increased demand - See Section 4.4.

Pollution of stream from Broadmeadow closed landfill - This site was operating prior to 1974 when formal records began, and tipping ceased in 1993. During its life household, commercial and industrial wastes were tipped there. Landfill gas is still being generated by the site and pollution of the Broadmeadow Stream by leachate has been reported on various occasions since 1979; the stream drains directly to the Teign Estuary, just upstream of Shaldon Bridge. Analysis of water samples show increases of ammoniacal nitrogen, nitrite, chloride and of several metals, attributable to the landfill. Responsibility for the site currently rests with Devon County Council, the Waste Disposal Authority; they are in discussion with us over the remediation work that is required. For further information on waste management and regulation in the catchment see Section 5.4.

Impact of litter in the catchment - Litter in and alongside rivers is not only unsightly but can also encourage pests (such as rats), increase flood risk, cause pollution, create a danger to wildlife and be a public health hazard. In some areas litter causes a significant problem for agriculture, particularly as a health hazard for livestock or damaging machinery. It is also an offence to litter any public open space, including amenity beaches.

Increased risk of flooding - There are many areas in the catchment where we have concerns that proposed developments will increase flood risk (see Section 5.1, Development Sites and Flood Risk in the Catchment). We need to ensure that development does not reduce the standard of flood defence and that opportunities for environmental enhancement are taken.

Loss of sites of conservation value due to development - for example, loss of wetland in vicinity of residential development at Homer's Lane, Kingsteignton.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Poor biology in Aller Brook.	• Survey in 1998 to see if expected improvements occurr.	• Agency
Risk of Pollution from Industrial Estates in the Catchment.	• Continue Risk Assessments of industrial estates.	• Agency
Pollution of ground and surface waters from Waddeton Industrial Estate.	• Review current data and monitoring programme.	• Agency
Impact of road runoff (on spawning gravels and pond ecology).	• Investigate sources of sediment and introduce mitigation methods where appropriate. • Consider measures required to avoid pollution from road drainage and seek to promote implementation.	• Agency • Agency, DCC
Need for a better understanding of air quality and its effect in the catchment.	• Review air quality in the area.	• LAs
Need for a better understanding of contaminated land in the catchment.	• Produce database on contaminated land sites in the catchment. • Ensure there is effective consultation with Local Authorities (LAs). NB: Further actions on remedial work requirements will be added once sites have been identified.	• LAs • Agency *LAs*
Pollution of stream by Broadmeadow closed landfill.	• Establish an effective plan of remediation to stop pollution being caused by the site.	• WDA *Agency*
Impact of litter in the catchment (particularly on the River Lemon, Aller Brook, Teign Estuary and coastal stretch).	• Investigate sources of litter and collate information to encourage clean up and preventive measures. NB: County and District Councils are designated as 'principal litter authorities' under the Environmental Protection Act 1990 [4].	• Teign CSG, Agency, LAs *Volunteer Groups*
Inappropriate development, particularly in floodplain, may affect standards of flood defence and damage environmental interest.	• Provide floodplain mapping information to the planning authorities.	• Agency *LAs*
Loss/damage of sites of conservation value due to development.	• Ensure sites of conservation value are identified and protected. • Encourage positive incorporation of natural features as part of new development. • Oppose further development in the vicinity of Homer's Lane.	• Agency • Agency • Agency

4.2 Impact of Abandoned Mines

Background

Devon has a metal mining heritage as diverse and ancient as that of Cornwall, but on a much smaller scale; Section 5.3 provides further information on mining in the catchment. This has resulted in long term, irreversible impacts upon the environment, in particular on water quality. Streams draining shale and slate areas flanking Dartmoor are particularly badly affected as the mineralisation here includes sulphide ores. When these ores are exposed to the oxidising action of air, water and chemoautotrophic 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, zinc, aluminium,

copper, arsenic, iron precipitates, and possibly cadmium. Discharge 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.

Examples

Impact on water quality - Zinc concentrations in the bottom stretch of the Beadon Brook (Tottiford House to the Teign confluence), exceed its Environmental Quality Standard. Two abandoned mines have an impact on this watercourse: Great Rock Mine, worked for tin and iron; and the much larger and more significant Frankmills Mine, worked for lead, iron and barytes. Mineral waste tips and tailings ponds at Frankmills Mine are in close proximity to the Beadon Brook.

Bridford Mine impacts on the water quality of the Rookery Brook. Minewater containing quantities of dissolved metals runs from the mineshaft entrance and across neighbouring land before entering the Rookery Brook. The dissolved metals, particularly iron, precipitate out covering the stream bed. We are concerned that if minewater runs over spoil heaps then the pollution will increase, either as a result of greater concentrations of dissolved metals entering the watercourse, or through the erosion of spoil heaps.

Mine sites cause localised impacts on the Sig Stream and Langworthy Brook as a result of dissolved metals, again, particularly iron, precipitating out and covering the stream beds.

The chemical and biological effects of localised metal precipitation in the Rookery Brook, Sig Stream and Langworthy Brook have not been determined. The Rookery Brook is not monitored under our routine programme. The Sig Stream and Langworthy Brook are monitored further downstream for chemistry and biology from a site on the River Lemon, below the confluence with the Sig Stream. Biological quality here is Class A (see Map 22), and both watercourses comply with their RQO of RE1.

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. 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 this mining area is extremely limited (see Section 5.7); most private domestic supplies will be from shallow strata, above the deeper waters affected by mining activity. 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 (see above).

Impact on Fisheries - There are many historic mines in the Teign Valley which give rise to continual problems with the quality of the water in many of the right bank feeder streams, such as the Hyner Brook at Hennock and the Owlacombe Brook at Sigford. The effect of this on fish populations in these streams is quite dramatic; many areas are devoid of fish life as a direct result. Salmon numbers in the Rookery Brook show cause for concern; Bridford Mine impacts on this watercourse.

In terms of the overall productivity of the catchment, the length of streams affected by abandoned mines is quite small and localised. Although a solution would be highly desirable, the high cost associated may preclude action in the near future.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Impact of abandoned mines.	• Set aside zinc data for the Beadon Brook; Tottiford House to Teign confluence stretch.	• Agency
	• Assess effects of abandoned mine workings on the catchment.	• Agency

Note: When setting RQOs we can 'set aside' metals and/or low pH values in certain circumstances, that is we will not take into account some or all of the results for a particular determinand when we assess compliance with an RQO. The 'set aside' of data allows us to protect good water quality shown by other determinands in the RE classification (see Appendix B2). If we 'set aside' data for zinc the Tottiford House to Teign confluence stretch of the Beadon Brook achieves RE1.

4.3 The Impact of Mineral Extraction

Background

The Teign Catchment has been an important centre for mineral extraction in Devon for centuries; Section 5.3 details existing active quarries in the catchment. The largest quarry is for ball clay, found within the Bovey Basin, between Newton Abbot and Bovey Tracey. The ball clay industry in Devon employs significant numbers of people, both directly and indirectly, through associated work such as manufacturing. Quarrying can have a considerable impact on the environment, especially on water quality, generating high loads of suspended solids in nearby watercourses. It can also alter groundwater, and hence surface water, flow.

Effects

Impact on Salmonid Fisheries - Discharges and land runoff from mineral extractors in the catchment create sedimentation and discoloration problems on a number of watercourses, in particular the Adbrook and Ugbrook Streams. Salmonid spawning in these areas is limited as gravels have become infilled with sediments originating from quarry sites upstream. The streams affected tend to be of importance to local brown trout stocks only, as they are seldom used by migratory salmonids. The most important spawning areas remain unaffected by quarrying activity.

Impact on Water Quality - The washing of sand and gravel at Royal Aller Vale and Zig Zag Quarries produces an effluent with a high suspended solids content. During normal operations and weather conditions the current silt pond system is capable of handling this effluent. However, sporadic discharge of this process water has occurred in the past, causing pollution of the Aller Brook. These discharges have largely been due to heavy rainfall events and the problems associated with controlling a large volume of surface runoff which bypasses the current silt settlement system. We have been working with the quarry owners to resolve this problem. It has been proposed by ARC and Harleyford Aggregates that additional silt lagoon capacity could be developed at Royal Aller Vale to provide treatment for effluent from Zig Zag Quarry. This proposal is subject to planning permission since the closure of Royal Aller Vale is required within the next five years under the current planning permission.

Discharges from Royal Aller Vale and Zig Zag Quarries also affect the biological quality of the middle reaches of the Aller Brook. Discharges from Ringslade Quarry may be affecting the biological quality of Blatchford Stream.

Impact on Groundwater - The planning permission in place for Stoneycombe Quarry does not impose a depth restriction limestone extraction. The presence of sinkholes and fissuring within the limestone means that deep working is likely to alter groundwater flow. This may lead to Compton Pool and Dainton Stream, both minor watercourses, becoming dry.

Impact of River Diversion - WBB are proposing to extend Southacre Quarry in order to continue working the deposit of ball clay. This extension will require the diversion of both the Rivers Teign and Bovey up to 400 m westwards of their present courses. In addition, 17 ha of agricultural land will be taken out of production and used for the tipping of clay waste. These proposals will have long-term impacts upon the wildlife and landscape features within, and adjacent to, the river corridors. Where the rivers flow through the clay belt, significant changes to their character and ecology have already resulted in many places, although some largely unaltered sections remain. The continued development of the ball clay industry may threaten the remaining high quality areas of river and floodplain.

We have advised the Local Planning Authority of our concerns about the proposed river diversion; a decision is expected in Spring 1997.

Loss or deterioration of Bovey Basin ponds - The Bovey Basin has a large number of ponds which support important dragonfly communities. These ponds originate from old ball clay quarry workings, many of which remain an integral part of current operations, because of this they are often at risk. There may be opportunities to create new ponds to replace those that are lost. In addition the water quality of the ponds can be a problem, with high suspended solid loads reducing their wildlife value; this may arise from use as settling ponds. Many of these ponds are also stocked with fish by angling clubs; this can reduce both the number and diversity of invertebrates.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Impact on salmonid fisheries.	• Seek long term solutions to achieve improvements to water quality - see below.	• Agency
Impact on water quality.	• Ongoing improvements to the treatment of processing effluent from Zig Zag quarry through disposal at Royal Aller Vale.	• Agency, ARC, Harleyford Aggregates
	• Ongoing improvements to the treatment of surface water runoff during heavy rainfall events at Royal Aller Vale quarries.	• Agency, ARC
	• Review discharge consent for Royal Aller Vale.	• Agency
	• Seek long term solution of a discharge via a consented outfall.	• Agency, ARC, Harleyford Aggregates
	• Review ball clay consented discharges to ensure appropriate control.	• Agency
Impact on groundwater.	• Seek to work with owner of Stoneycombe Quarry to maintain flows in nearby watercourses as the quarry is worked.	• Agency, CAMAS UK
Impact of river diversion.	• Continue to fully consider implications of proposed Teign/Bovey diversion and maintain objection unless all conservation concerns are properly addressed.	• Agency
Loss or deterioration of Bovey Basin ponds.	• Support production of Bovey Basin Strategy (see Section 5.1, Local Waste and Minerals Plans), dealing with all issues.	• Agency
	• Facilitate discussions to ensure protection of important species in ponds managed for fishing.	• Agency, angling associations, landowners

4.4 Forecast Deficit in Public Water Supply

Our aim is to ensure that there is enough water available for public and private water supply now and in the future; ensuring an appropriate balance between the needs of the environment and those of the abstractors. Here we discuss the forecast deficit in public water supply; see Section 5.7 for a detailed discussion of the water resources in the catchment.

Background

Forecasts have been made of public and private demand for water up to the year 2021 [7]. However, these demand forecasts are only available at a Strategic Supply Area (SSA) level and do not directly relate to individual catchments. The catchment falls within South West Water Services Limited's (SWWSL's) Roadford SSA.

The extent to which demand for potable supply will increase over the next 25 years will depend upon a number of factors including population growth, numbers of new dwellings, personal use of water, level of economic activity, measures to reduce demand, and climate change.

In forecasting demand we have used two scenarios. Under the "high" scenario of a high growth rate in domestic, industrial and commercial consumption and current levels of demand management (i.e. no improvements to current leakage levels), demand in the Roadford SSA is forecast to increase to 347 Ml/d by 2021. However, under the "low" scenario of low growth in domestic, industrial and commercial consumption coupled with a reduction in water company leakage to 200 litres per property per day, demand will only increase to 291 Ml/d.

Effect

Compared with the current reliable yield for the Roadford Zone (326 Ml/d) under the high scenario there will be a deficit of 21 Ml/d whereas under the low scenario, there will be a surplus of 35 Ml/d in 2021.

Options for Action

Under the low scenario, which reflects our policy of encouraging water company demand management and leakage control, there should be no need for any major new sources in the Roadford SSA until after 2021. Even if future growth in demand takes place according to the high scenario, it is unlikely that there would be any major implications for the catchment as any new resource developments would occur in other catchments, for example a pumped storage scheme for Roadford Reservoir. Further details of the options for meeting future demand in the Roadford SSA are provided in the Tamar Estuary and Tributaries LEAP [8].

Issue	Options/Actions	Action by Lead *Other*
Forecast deficits in public water supply.	• Encourage water company demand management and leakage control.	• Agency/ SWWSL

4.5 Concern Over Low Flows

Background

Low flows in watercourses can affect wildlife, fisheries and exacerbate water quality problems due to reduced dilution.

Flows in the catchment are known to drop markedly in dry summers. Many small feeder streams and tributaries dry out completely or leave isolated pools. The catchment is particularly vulnerable during dry periods as most of the flow is derived from surface water, as mentioned in Section 2.5.

Moorland watercourses naturally rise and fall quickly in response to rainfall. However, there is some concern that they have become even more 'flashy' in recent years, giving rise to lower flows during dry periods and higher flows during wet periods. 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. It is possible that a change in vegetative cover could affect the hydrology of the moorland watercourses, although there is currently no data available to support this.

Effects

Due to the exceptional dry summer in 1995, and resulting low river flows, the Scotley Brook (source to the Teign confluence) significantly failed its proposed RQO of RE1 because of low dissolved oxygen concentrations. Levels of dissolved oxygen in the River Lemon did not comply with the minimum standards of the EC Freshwater Fish Directive [37], also due to the low flows.

Algal blooms have been recorded in the lower reaches of the catchment. These blooms are associated with low summer flows and high water temperatures. This can be a serious threat to fish and other aquatic life as dissolved oxygen levels drop at night when algal respiration removes oxygen from the water.

Fish mortalities are likely during low flows as fish become trapped in water of deteriorating quality and increasing temperature. At times, the problem can become so widespread that fish rescues become unrealistic, and there is little that can be done to alleviate the problem.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Changes in moorland vegetation.	• Gather and assess data on moorland vegetation changes and river hydrology.	• DNP, Agency, Universities, *MAFF*
Algal blooms.	• Investigate algal blooms in the catchment.	• Agency

4.6 The Effect of River Regulation by Fernworthy Reservoir

Background

The regulation of rivers by reservoirs is known to cause changes to the river ecology. River regulation causes flow to become more even and the river less 'flashy'; this in turn affects the plants and animals which live there.

Fernworthy Reservoir has a compensation release of 0.066 m^3/s which was set at the time the reservoir was commissioned in 1913. The natural flow downstream of the reservoir has been estimated to have a Q95 of 0.092 m^3/s (assuming the reservoir was not there). This compensation release is generally smaller than other reservoirs in the South West when compared to the estimated 'natural' Q95.

More information is required in order to assess whether the ecology of the South Teign River is affected due to this regulation of flow.

Map 7 - Effluent Disposal > 5 m³/day

Effects

The South Teign River's ecology may be affected by the regulation of Fernworthy Reservoir. There are concerns that fish productivity downstream of Fernworthy is limited as a result of low flows.

Options for Action

Issue	Options/Actions	Action by Lead *Other*
Effects of River Regulation.	• Conduct a study to compare ecology of South and North Teign Rivers.	• Universities, *Agency*

4.7 Impact of Sewage Discharges

Background

We regulate the disposal of effluent by issuing consents to control discharges, including treated sewage, industrial and farm wastes. We also take action if a river is affected by a pollution incident; a summary of pollution incidents for this catchment is provided in Appendix C. 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.

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 international commitments to reduce the amount of Annex 1A substances entering tidal waters. See Section 6.1 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 over the next 10 to 15 years are 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 early in 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.

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

Map 7 shows effluent discharges greater than 5 m^3/day from SWWSL and private owned STWs, and trade discharges in the catchment.

Effects

Failure of RQO - The River Bovey from Little Bovey to the Teign confluence significantly failed the proposed RQO of RE1 because of three high BOD results recorded between 1994 and 1995. These all occurred following periods of heavy rainfall. Storm discharges from Heathfield STW may be a cause of, or contribute to this pollution (see Section 4.9).

Failure of RQO - The Scotley Brook significantly failed the proposed RQO of RE1 because of low DO concentrations. Low river flows are the cause of this failure (see Section 4.9) but discharges from Crockernwell STW contribute to the problem due to insufficient dilution of the effluent. We have recommended that development is restricted at this site (see Section 5.1). Crockernwell STW will be improved under the base service provision of AMP2.

Failure of RQO - The River Teign from Spara Bridge to above Heathfield landfill site marginally failed its RQO of RE1 as a result of a single high BOD result in 1995. This may be due to a storm overflow which discharges to this stretch.

Failure of Long-term RQO - A stretch of the River Teign (from Gidleigh Park Hotel to below Chagford STW) fails to comply with its long term RQO, in some years, because of high BOD and total ammonia levels; these are thought to be due to discharges of storm sewage from the works. Investigation work found that while final effluent quality at Chagford can be very poor (the final effluent outfall is combined with the storm sewer overflow) the downstream monitoring point was too close to the discharge point to be representative of water quality in this stretch. This monitoring point has now been moved further downstream to Rushford Bridge.

Identified Bathing Waters non-compliance - The bathing waters at Teignmouth (Holcombe) did not comply with the EC Bathing Waters Directive[10] in 1989 and 1994. The main cause of non-compliance has been attributed to contamination of the stream which flows onto Holcombe beach, and overflows from a SWWSL pumping station at Smugglers Lane, while a combined sewer overflow (CSO) discharges onto the beach. The continuous discharge from Holcombe at SX 9608 7535 can impact on the bathing water quality at Teignmouth (Holcombe) and also that at Dawlish (Coryton Cove). We have recommended that development is restricted at this site (see Section 5.1).

Bathing Water non-compliance at Torre Abbey (1992), Hollicombe (1986), Paignton (Paignton Sands) (1988, 1994), Paignton (Preston Sands) (1988) and Goodrington (1987) is probably caused by unsatisfactory discharges of storm sewage.

Hopes Nose and Sharkham Point discharges also pose a risk of failure to bathing water quality in this catchment although they have not been directly responsible for failures to meet the 'Imperative' standards of the Bathing Waters Directive. These discharges will be improved as part of the of South West Water's Torbay Scheme. The first part of this scheme, which aims to secure compliance with the Bathing Waters Directive, will improve the unsatisfactory storm sewage discharges; improvements to sewerage at Torre Abbey are already complete, with the exception of screening on the CSO. In addition, a new 900 m outfall will be constructed at Sharkham Point. The second phase of the scheme, to meet the requirements of the EC Urban Wastewater Treatment Directive [11] will provide improved treatment for the Hope's Nose and Sharkham Point discharges; see Section 6.1, EC Urban Waste Water Treatment Directive.

In 1996 all identified bathing waters in the catchment complied with the Bathing Waters Directive.

Non-Identified Bathing Water non-compliance - The Bathing Waters at Scabbacombe and Man Sands, which are not designated under the EC Bathing Water Directive, exceeded the coliform standards of the Directive in 1995. The reason for this exceedence is thought to be sewage discharges at Sharkham Point, near Torbay; see previous page.

Further impacts on water quality - Water quality in the Doddiscombsleigh Stream is impacted by the discharge from Doddiscombsleigh STW; we have recommended that development is restricted at this site (see Section 5.1). Doddiscombsleigh STW will be improved under the base service provision of AMP2.

Water quality in the River Lemon is impacted by the discharge from South Knighton STW. This is another site where we have recommended that development is restricted (see Section 5.1). South Knighton STW will also be improved under the base service provision of AMP2.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
RQO non-compliance, River Bovey (Little Bovey to Teign confluence).	• Install flow monitors at Heathfield STW to dete.mine frequency of operation of storm discharges.	• Agency
RQO non-compliance, River Teign Spara Bridge to above Heathfield Landfill.	• Investigate frequency of operation of storm overflow.	• Agency *SWWSL*
RQO non-compliance, Scotley Brook.	• Carry out improvements to Crockernwell STW by 2005.	• SWWSL
Long term RQO non-compliance, River Teign (Gidleigh Park Hotel to below Chagford STW).	• Consider improvements to storm sewage discharges at Chagford STW, if found to be necessary now monitoring point has been relocated.	• SWWSL *Agency*
Identified and non-identified Bathing Waters non-compliance. Also see Section 4.16 on problems of sewage from boats, affecting bathing water quality.	• Holcombe discharge to receive screening as an interim measure prior to the flows being transferred to a new STW at Dawlish by the end of 2000. • Improve sewerage infrastructure by the end of 1997. • Complete Phase 1 and 2 of the Torbay Scheme.	• SWWSL *Agency* • SWWSL • SWWSL

4.8 Concerns Over the use of Antifouling Paints on Boats

Background

Paints to prevent fouling of boats with various marine organisms, such as barnacles and algae, have been in existence since the 1960s. Until relatively recently, most paints have been based on the antifouling compound tributyltin (TBT). The use of these paints became widespread in the 1970s on both recreational and commercial boats, and at the same time British and French oyster growers were reporting poor growth and shell thickening, together with a general decline in the oyster fishery.

Following these concerns the French government banned the use of TBT on boats under 25 m in length in 1982. In the UK, field and laboratory studies showed that TBT was having an environmental impact in a number of locations around England and Wales, and 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, which covers most of the recreational market.

MAFF monitored a number of sites throughout the UK for TBT levels in water, oysters and mussels, including two sites in the Teign Estuary; Teignmouth Harbour and the oyster beds at Arch Brook further up the estuary. These were monitored between 1986 and 1992.

TBT levels in Teignmouth Harbour were 19-24 ng/l between 1986 and 1991; in 1992 the mean was 40 ng/l, due to one high result. Given that most of the craft using Teignmouth Harbour are commercial boats in excess of 25 m in length, the 1987 ban is unlikely to have had much impact on TBT levels in the Harbour. The Environmental Quality Standard for TBT is 2 ng/l, which is designed to protect aquatic life.

At Arch Brook levels of TBT in water, oysters and mussles have decreased since the 1987 ban (levels in water were 12 ng/l in 1986 and decreased to 3 ng/l in 1992). Since 1987 shell growth has been normal for oysters from Arch Brook.

Alternatives to TBT based paints are mainly based on copper and zinc oxides, some of which have the herbicide Irgarol added to them, there is some concern that Irgarol may have an adverse environmental effect.

Effects

The effect of TBT levels in Teignmouth Harbour is unknown and there is currently no monitoring for Irgarol in the Estuary.

Options for Action

Issue	Options/Actions	Action by Lead *Other*
Antifouling paints.	• Consider monitoring for Irgarol. • Continue to press UK Government for a wider ban on the use of TBT based paints.	• Agency • Agency

4.9 Impact of Farming and Forestry on Rivers and Wetlands

Background

Significant areas of the catchment are either farmed or forested (see Section 5.5) and the potential for damage to the environment is significant. Agriculture and forestry have, in some areas, caused environmental problems, such as acidification (see Section 4.10) soil erosion, water pollution, reduced water yield, increased flood risk and damage to wildlife habitats, as well as posing a threat to fish stocks. However, a sustainable farming system which conserves the soil, uses water wisely, minimises and recycles wastes and protects important wildlife habitats, together with well managed forestry in the right places, will reduce damage and can bring benefits.

Over the last ten years there have been significant improvements by farmers 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 cattle farms and contributed to an overall improvement in water quality. 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 Agriculture Practice for the Protection of Water' [30].

Effects

Impact on Water Quality - The River Bovey from Little Bovey to the Teign confluence significantly failed the proposed RQO of RE1 because of three high BOD results recorded in 1994 and 1995. These all occurred following periods of heavy rainfall. There are a number of farms in this area and diffuse runoff from farms is a likely cause of this pollution (also see Section 4.7).

Decline/Loss of Key Habitats and Species -

- **Purple moor-grass pasture** - These species rich grasslands, also known as 'Culm grasslands' in North Devon, have a very restricted distribution; about 90% of the resource remaining at the turn of the century has now been lost. They are a breeding site for curlew, but are particularly important for the marsh fritillary butterfly; almost 25 % of the English population of this butterfly is found on Dartmoor. In addition, the southern damselfly has recently been discovered in this catchment. Both species are protected under the EC Habitats Directive[12], Agricultural improvement or neglect is probably the single largest threat to this habitat and its associated species, but, as with many wetland habitats, changes of agricultural land use, such as the creation of ponds leading to loss of existing high quality habitat, is also a problem.

- **Blanket bog** - Dartmoor is internationally important for this wetland habitat, which is at one of its most southerly locations in Europe. Two key species, dunlin and golden plover, breed in very small numbers. Poor moorland management has allowed much blanket bog to become degraded; drainage, burning and grazing at inappropriate intensity has resulted in lost value (also see Section 4.10). Military use has also caused cratering and erosion in this area.

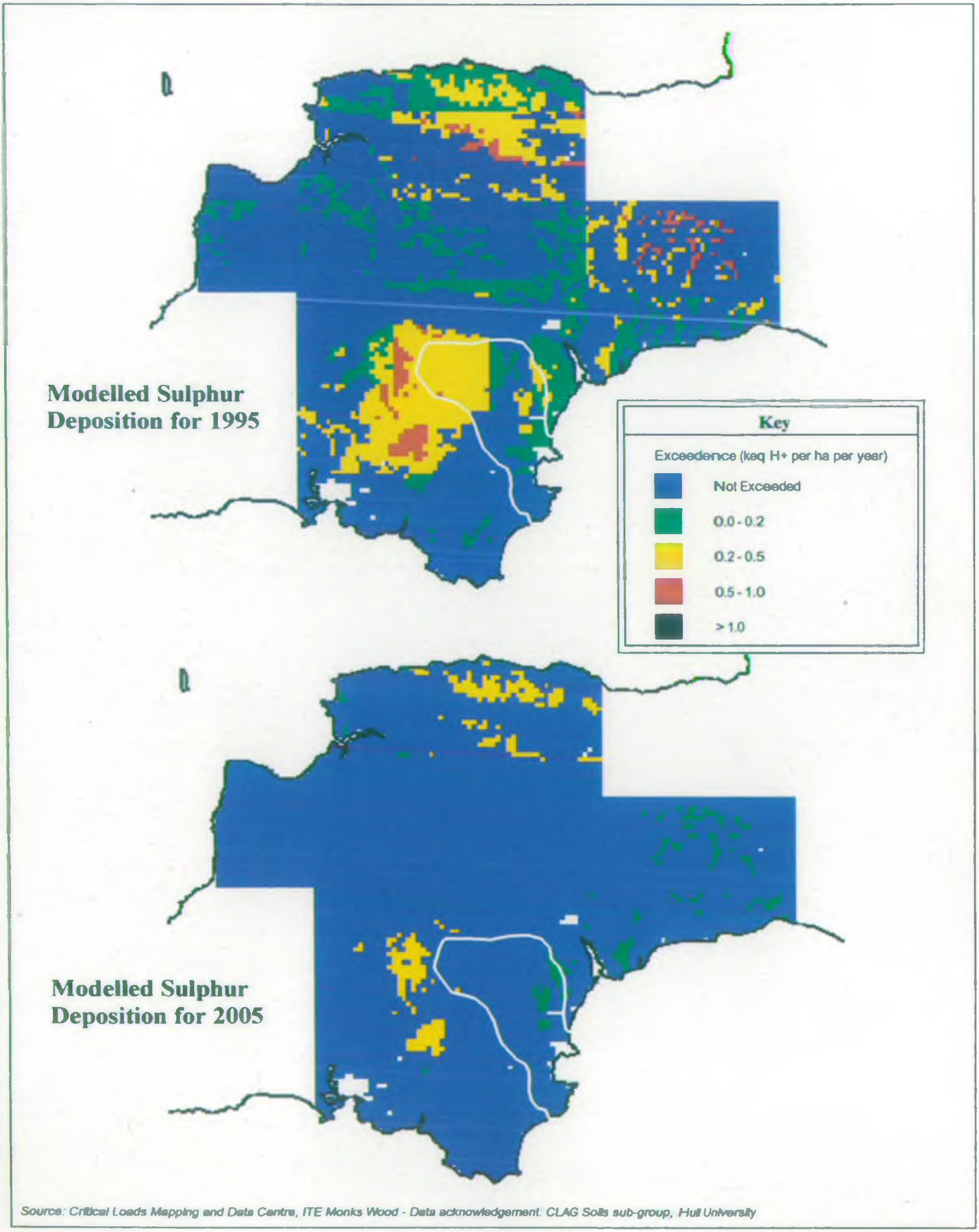
- **Valley mire** ***(linked species - curlew, keeled skimmer)*** - Heavy stocking of land adjacent to the mires and burning over mires have contributed to habitat deterioration (also see Sections 4.10 and 4.11).

Changes to ecology of fast-flowing acidic rivers - The rivers in the catchment support a diverse flora and fauna; the otter, salmon, freshwater pearl mussel, wild daffodil are particularly important species. On the higher parts of Dartmoor, cattle, ponies and sheep rearing predominate; these livestock cause some localised problems with erosion of river banks and wetlands adjacent to the river at drinking and crossing points. The soil in these areas is particularly unstable and prone to this type of erosion and the resulting siltation can lead to increased growth in aquatic vegetation. This growth, in turn, leads to further siltation and reduced flow velocity. The minor streams on the moorland contain some of the most important salmonid spawning areas in the catchment and there is growing concern over the effect of sedimentation on salmonid fisheries. A three year study has been carried out on the River Torridge Catchment to investigate the circumstantial evidence linking changes in agricultural land use to deterioration in both river water quality and salmonid populations [13]. The study compared agricultural and non-agricultural subcatchments and found that in the agricultural subcatchment fine sediment concentrations present in gravels were damaging to salmonid embryo survival. 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 Teign.

Forestry operations in the catchment do not generally cause problems, however where large deforested areas have been cut up by the wheels of heavy machinery, rainfall can wash this sediment into watercourses.

Further downstream, these watercourses flow through semi-natural woodlands, which are much visited by the public in the spring, when wild daffodils carpet areas close to the river. Insensitive woodland management can lead to a loss of this flora.

Map 8 - 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

Information correct as of July 1996

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
RQO non-compliance, River Bovey (Little Bovey to Teign confluence).	• Conduct farm inspections in the area.	• Agency
Deterioration/loss of key habitats and species - see list in text.	• Encourage uptake of ESA agreements.	• MAFF, Agency, DNP
	• Work with MAFF to ensure agri-environment schemes have appropriate prescriptions and that payments are set at correct level.	• Agency, DNP, EN
	• Implement actions from River & Wetlands BAP[14] for Culm grassland, curlew, marsh fritillary and southern damselfly.	• Agency, DNP
	• Discourage pond creation at inappropriate locations.	• Agency, MAFF, DNP, LAs, FWAG, AONB officer
	• Set targets for increasing breeding populations of golden plover and dunlin in the catchment.	• RSPB, Agency, DWT, EN, DNP
Changes to ecology of fast-flowing acidic rivers *(linked species - otter, salmon, freshwater pearl mussel, wild daffodil).*	• Encourage uptake of agri-environment schemes which allow less intensive agriculture.	• MAFF
	• Implement salmon management strategy [15].	• Agency
	• Consider whether establishment of buffer zones alongside rivers is a possibility to reduce damage to banks by stock.	• Agency, DNP
	• Seek to control erosion by encouraging the use of bankside fencing, where appropriate.	• Agency
	• Facilitate the securing of funding for bankside fencing.	• Agency
	• Consider 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.	• Agency
	• Liaise with forestry owners/operators to ensure Forest and Water Guidelines[16] are adhered to.	• Agency, *Forestry Owners, FE*
	• Ensure management of riverside woodland protects wild daffodil populations.	• DWT, DNP, *Land owners/managers*

4.10 Acidification of Moorland Headwaters

Background

Moorland streams are typically acid due to the underlying geology and soils. Many of the headwaters of the River Teign system have waters with a pH as low as 5. The natural acidity of Dartmoor, however, is exacerbated by atmospheric acid deposition, sulphur dioxide and oxides of nitrogen. In the northern hemisphere, these compounds come mainly from burning fossil fuels, but are also from natural sources such as organic decay, volcanic eruptions and lightening 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, this proportion appears to be increasing. Road vehicles are responsible for about half of the emissions of nitrogen dioxides 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 very low critical load. Current or predicted acid deposition over an area can be compared with its critical load to see if it has been exceeded.

Map 8 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. Under the terms of the protocol the UK is committed to reducing sulphur dioxide emissions by 80% by 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. For example forestry, particularly coniferous forests, can increase the level of acid deposition where they are present [17].

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)[18]. The deposition of compounds which contain nitrogen, which can act as a fertiliser, can change the make up of plant communities. Acid deposition can also corrode buildings.

Impact on Fish stocks - There are concerns that the acid conditions of the moorland headwaters of the catchment limit the productivity of juvenile salmonids. In other river systems, measures such as liming affected stretches have been carried out to reduce the acidity. 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.

Moorland Habitats - There are concerns that blanket bog and valley mire habitats, and their associated species may be being affected by acid deposition [19]; changes to freshwater ecology may also occur.

Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Acidification of moorland headwaters.	• Ensure Part A processes authorised under IPC legislation achieve planned emission reductions.	• Agency
	• Promote measures to reduce emission of nitrogen oxides from traffic.	• LAs
	• Examine performance of salmonid fishery as part of Salmon Action Plan, from Salmon Strategy [15].	• Agency
	• Conduct research and monitoring to improve understanding of acidification of Dartmoor and its effects.	• Exeter and Plymouth Uni's, DNP, Agency
	• Assess impact of any proposals for afforestation within the acid sensitive area.	• Agency, FA

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 Teign Catchment and we need to find out more about their value so that they can be properly managed.

Decline in sand martin and kingfisher populations - Both these species have high public appeal and are typical birds of lower reaches of rivers, where erosion creates high, vertical banks in which they can excavate nesting tunnels. Erosion control and other river management practices may not only directly destroy nest sites but can stabilise eroding faces, leading to subsequent abandonment. We need to have a better understanding of the numbers and distribution of these birds, which are also vulnerable to population fluctuations as a result of hard winters (kingfisher) or drought in wintering areas (sand martin). Quarries are also a potential nest site for sand martins.

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. Other factors contributing to this habitat deterioration were highlighted in Sections 4.9 and 4.10.

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 UK Biodiversity Action Plan (BAP) 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.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Lack of information on true value of wet woodland.	• Identify key sites. • Support survey to determine invertebrate interest.	• Agency, DNP, EN, NT • Agency, NT
Decline in sand martin and kingfisher populations.	• Support county-wide survey of nest sites. • Retain all known sites and seek to create suitable conditions for colonisation elsewhere.	• DBWPS *RSPB, Agency, NT* • Agency, NT
Deterioration of valley mire *(linked species - curlew, keeled skimmer).*	• Examine possibility of looking at hydrology and water quality of key sites.	• Agency, Universities
Lack of current information on the three-lobed water crowfoot.	• Resurvey former sites to determine suitability for re-establishment. • If appropriate, implement programme from the UK BAP.	• Agency, NT • Agency, NT
Lack of comprehensive information on earth science sites and features.	• Identify and document County Geological Sites. • Promote measures to prevent loss of earth science sites and features in rivers and floodplains.	• Devon RIGS Group *Agency, LAs, EN* • Agency

4.12 Further Threats to Key Catchment Habitats and Species

Examples

Changes to ecology of fast-flowing acidic rivers *(linked species - otter, salmon, freshwater pearl mussel, wild daffodil)* - Otters use much of the catchment, with good numbers on the Rivers Teign and Bovey. This species is listed in the EC Habitats Directive [12] and there are well developed plans to try to restore it fully to its former distribution and abundance. It is important that public access to rivers is not allowed to increase to a level where disturbance becomes a significant problem (see Sections 4.16 and 4.17). Salmon and freshwater pearl mussel are also listed in this legislation; we have developed a management strategy for Atlantic salmon. Pearl mussels have not been recorded for a number of years on the River Teign, but there is a plan for their conservation in the 'Rivers and Wetlands Biodiversity Action Plan' [14] and it may be possible to re-establish a population here if conditions are suitable.

Rural land use and river flow regulation by Fernworthy Reservoir are other causes of the changes to ecology of the streams (see Sections 4.6 and 4.9).

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Changes to ecology of fast-flowing acidic rivers *(linked species - otter, salmon, freshwater pearl mussel, wild daffodil).*	• Develop and implement action plans in Rivers and Wetland BAP for otter, salmon, freshwater pearl mussel. • Ensure suitable management of riverside woodland continues to protect wild daffodil populations.	• Agency, DWT • DWT, DNP, NT

4.13 Spread of Invasive Bankside Plants

Background

Several alien plant species are becoming increasingly widespread in or along the banks of our rivers, or in wetlands. These include *Crassula helmsii* (Australian swamp stonecrop or New Zealand pigmyweed) and *Myriophyllum aquaticum* (parrot's feather), both true aquatic plants which are often sold for planting in ponds by garden centres.

In addition, there are also three well known invasive species which are less restricted to the aquatic environment; these are Himalayan balsam, Japanese knotweed and its hybrids, and giant hogweed. The first two species are widely established in this catchment, while the Wray Brook, below Moretonhampstead, has many giant hogweed plants growing in and around it, including nearby road verges. We have produced a booklet covering control of these three species.

We are introducing a control programme for these plants where they occur on sites which we own or manage, but others, especially local authorities and landowners, will be most influential in controlling their spread in the wider countryside. Action now may prevent the widespread infestation seen in other regions.

Effects

Crassula helmsii and *Myriophyllum aquaticum* are extremely invasive species which can completely take over ponds at the expense of native plants and which are becoming established in the wild.

Himalayan balsam, Japanese knotweed and its hybrids, and giant hogweed are also very invasive species. Giant hogweed, in particular, produces large amounts of seed and is also a health hazard, causing severe irritation and blistering of the skin on contact.

Draft Actions/Options

Issue	Options/Actions	Action by Lead Other
Spread of invasive bankside plants.	• Encourage recording of Crassula and Myriophyllum by field staff and others.	• Agency
	• Raise awareness of problem of Crassula and Myriophyllum through garden centre trade associations.	• Agency
	• Encourage removal from ponds of Crassula and Myriophyllum where already established.	• Agency
	• Continue surveys for invasive bankside species by our wardens.	• Agency
	• Carry out control on any Agency owned or managed sites.	• Agency
	• Encourage control by riparian owners and other interested parties, once priority sites for control have been defined.	• Agency, DNP
	• Co-operate with owners and other bodies to achieve eradication of giant hogweed on Wray Brook.	• Agency, LA, DCC, HA
	• Make booklet widely available.	• Agency, DNP

Map 9 - Archaeology

This map is diagrammatic

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.

Nationally important archaeological sites are designated as Scheduled Ancient Monuments (SAMs); there are 112 of these, with many clustered around the South Teign and Fernworthy Reservoir. Eight Historic Parks and Gardens are recognised in the catchment: Castle Drogo, Drewsteignton; Castle Tor, Torquay; Colaton Fishacre, near Kingswear; Lindridge, Bishopsteignton; Lupton Park, Brixham; Ugbrook House, Chudleigh; Watcombe (Brunel) Park, Torquay and Stover Park. All except Castle Drogo, one of the most modern castles in England, are in the lower part of the catchment. Buildings and structures of national importance are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990[20]. Individual buildings are listed, while groups of buildings or whole areas of towns or villages are notified as Conservation Areas; 44 Conservation Areas have been declared in the catchment. Planning restrictions apply to both designations. See Map 9 for location of SAMs, Historic Parks and Gardens and Built Conservation Areas.

Dartmoor is the most important prehistoric landscape in Northwest Europe, with remains scattered all over. There is an abundance of hut circles, stone rows and circles, standing stones, cairns and enclosures over the eastern, southern and western margins of the moor.

Features of particular archaeological interest in the catchment include the Fernworthy Circle, with 27 standing stones nearly fifty feet in diameter, and the Haytor Granite Tramway. This tramway, along with the Stover Canal, forms part of the Templer Way footpath.

These features require continued protection if they are to survive. There is an absence of easily accessible, general information on the historic environment and a need has been identified for a simple assessment of the overall value of the catchment. Such an assessment would enable many bodies to share the same information.

Effects

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

Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Absence of general assessment of archaeological/historic value of catchment.	• Support production of document(s) covering entire area; investigate potential for collaboration. • Ensure effective liaison procedures between organisations on archaeological/historic matters.	• TDC, TBC, EH, DAS, Agency, RCHME, Uni. of Exeter, NT, DNP • As above.

4.15 Additional Threats to Fish Stocks

Background

There are a number of issues concerning fish stocks, particularly salmonid stocks, in the catchment, many of which are specific to the catchment, for example low summer flows (see Section 4.5), barriers to fish migration and acidification of moorland headwaters (see Section 4.10) while other issues are more general, and are a concern elsewhere, such as the

Map 10 - Barriers to Migratory Fish

1	Bradley Manor Weir
2	Newton Abbot Flood Gate
3	Holbeam Weir
4	Malland Bridge Weir (Mill Cross)
5	Chipley
6	A38 Crossing
7	Unnamed
8	Chudleigh Weir
9	Natural Obstruction
10	Parke Weir
11	Ashton Weir
12	Leigh Bridge Sill
13	Bridford Mill Weir
14	Sowton Weir
15	Steps Bridge Weir
16	Upperton Weir
17	Fingle Weir
18	Drogo Weir
19	Dogmarsh Weir
20	Chagford Weir
21	Gidleigh
22	Unnamed
23	Fernworthy Reservoir
24	Trenchford Reservoir
25	Becky Falls
26	Manga Falls

Key

- Barrier to Migratory Fish
- Weir Only Allowing Passage of Migratory Fish in High Flows
- Weir allowing Passage of Migratory Fish
- Stover Canal
- Catchment Boundary
- Normal Tidal Limit
- Settlement

This map is diagrammatic

presence of fish-eating birds. Other issues concerning fish stocks in the catchment can be found in Sections 4.1, 4.2, 4.3 and 4.9.

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. 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.

Analysis of current and historical catch returns from rivers across the country has shown a marked decline in the numbers of fish entering rivers between 1 January and 31 May. Returns from the River Teign indicate a similar decline where the percentage of these spring fish captured by both rods and nets has reduced to around 25% of this historic average.

There are 26 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 reservoir construction are 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; this is particularly true of those weirs on the River Lemon.

Weirs associated with hydro-generation have a serious effect on fish movement in periods of low flow. We have had some success in negotiating a cessation of generation at some sites where problems are known to occur. Such arrangements are often dependent upon the good will of the abstractor.

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 all abstractors to have screens installed to the satisfaction of the Agency by 1 January 1999, where a need is identified. Fish farms and abstractors also have to have continuous by-wash flowing at all times to allow downstream migration of smolts.

Examples

Barriers to Fish Migration - Natural obstructions in the river channel exist at Becky Falls, Manga Falls and at one site on the Kate Brook. In these cases, the obstructions are complete barriers, and would be extremely difficult to modify. Stepps weir is a problem for fish migration at low flows, and although there is a fish pass installed, it is very inefficient. The weir is gradually falling into a state of disrepair, and fish are able to negotiate the structure where it is partially collapsed. It will be important to ensure that a route for migration is maintained if the state of the weir worsens. Other barriers to fish migration in the catchment are highlighted on Map 10.

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.

Expiration of River Teign Limitation of Salmon and Trout Netting Licences Order 1991 - The current Net Limitation Order for the River Teign sets the maximum number of nets which may be licensed for the capture of migratory fish at ten; this expires in December 1997. When reviewing the number of nets which will be allowed to operate after this time, we will closely examine the current state of the fishery, by considering egg deposition, and associated spawning targets.

If these targets are not being achieved and the optimal spawning escapement is in jeopardy, we may decide that it would be beneficial to reduce the number of nets operating. We would also have to consider if a restriction was necessary on the rod fishery.

Fish-Eating Birds - In common with many rivers in the area, there has been a marked increase in the numbers of cormorants observed in the Teign Catchment. There is also some evidence to show that goosander are beginning to colonise the area. Both these species are fully protected under the Wildlife and Countryside Act [21]. Concerns are regularly expressed by various fishing interests that this increase in levels of predation is adversely affecting the fishery. The most significant impact is thought to 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. We shall not support licensed killing of fish-eating birds until and unless proof of serious damage has been established and that killing is proven 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.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Barriers to fish migration.	• Continue to remove temporary obstruction on moorland streams and seek to modify man-made barriers in the system to permit fish passage.	• Agency, fishing associations, riparian owners, other (for possible sources of funding)
Expiry of River Teign Limitation of Salmon and Trout Netting Licences. Order 1991.	• Assess performance of the fishery in relation to spawning targets. • Consider reducing number of nets operating after 12/97, if need identified.	• Agency • Agency
Impact of fish-eating birds on salmonid and coarse fish stocks.	• Co-operate with the licensing authority to progress further research into this issue. • Continue to work positively with owners and anglers to establish the full facts in each situation.	• Agency *MAFF, landowners, anglers* • Agency *MAFF, landowners, anglers*
Decline in runs of spring fish.	• Promote conservation measures, e.g. bag limits for anglers, and agreed restriction on netting.	• Agency, fishery interests
Declining brown trout catches in mid-lower reaches.	• Investigate whether a problem exists with stocks in this area.	• Agency

4.16 Impact of Recreation on the Environment

Background

Many people spend their spare time enjoying our rivers and coasts. Where we can, we try to improve facilities for these people, particularly if land is in our control, but we must always safeguard the environment from any adverse effects they might cause.

Tidal waters in the catchment are the main focus for water-based recreation as there is limited access to inland waters. The Teign Estuary is used for water-skiing, windsurfing and sailing, and Torbay, with its expanse of relatively sheltered open water, is a major

recreational site. It is very important that recreational use of these areas does not degrade the environment.

The Templer Way, linking Haytor to Teignmouth, is one of several footpaths which provide access to the water environment. It offers a useful insight to the historic use of rivers and canals as main transport routes, running alongside the Stover Canal and Teign Estuary for part of its length. There are also many riverside sites on Dartmoor which are very popular.

Torbay, Teignmouth and Shaldon are nationally recognised holiday destination and beach-based recreation forms a major part of this attraction. The failure of several areas to meet bathing water quality standards is a matter of concern. It is hoped that forthcoming infrastructure improvements will resolve this problem (see Section 4.7).

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

Examples

Footpath erosion - Some footpaths in the catchment are under pressure from people, for example Teign Gorge, particularly the stretch from Dogmarsh to Steps Bridge. Use of paths by mountain bikes, and even motorcycles, can also cause extensive damage; this is known to be the case at Fingle Bridge, Steps Bridge and on the Templer Way.

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. Our monitoring of EC and non-identified bathing waters provides information on water quality close to beaches. Non-compliance of bathing waters in the catchment are highlighted in Section 4.7.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Footpath erosion.	• Need for improved visitor management at Steps Bridge. NB: Further actions to be added when identified.	• DWT, NT *DNP*
Impact of sewage from boats on water quality and wildlife; also see Section 4.7.	• Encourage the Harbour Authorities to actively enforce the disposal of sewage waste at shore based facilities. • Monitor impact of recreational activities on conservation interests and water quality in the Teign Estuary and Torbay.	• Agency, Harbour Authorities • Agency

4.17 Lack of Recreational Facilities

Background

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 and the environment.

Examples

Access Agreements for Canoelsts - There is no existing access agreement for canoeing on any non-tidal section of the catchment, although some informal arrangements have been made on occasion. The river is not particularly suitable for canoeing, except at very high flows; the British Canoe Union (BCU) has done some work on a formal agreement.

Lack of 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 conservation interests. Public access to rivers is also inhibited by lack of up-keep of footpaths. In particular, part of the Templer Way, where it runs along the Estuary, is suffering from erosion, causing the path to be washed away. This erosion is possibly due to wave action and appears to be a relatively recent and poorly understood problem; consideration needs to be given to potential solutions.

Poor coarse fishing facilities in the Lower Teign - The coarse fish stocks in the lower Teign remain largely unexploited. To recognise the recreational value of this resource, fishery owners should be encouraged, where possible, to develop coarse fisheries. Often these can be managed so that there is no conflict with game fishery interests.

Summary of Issues and Draft Actions/Options

Issue	Options/Actions	Action by Lead *Other*
Lack of access for canoeists.	• Take part, as neutral party, in any discussions over canoe access.	• Agency, DNP, BCU, riparian owners
Lack of public access to rivers, especially for the less able.	• Discuss possibilities of improved access to, and interpretation of, the water environment. • Investigate proposals for footpaths/cycleways in the Teign Estuary, Rivers Teign, Bovey and Lemon areas. • Develop vehicular access and public transport links for the less able. • Determine likely causes of erosion (such as wave action) of the Templer Way and consider suitable solutions to problem.	• Agency, TDC, DNP • TDC • DNP • Agency, TDC
Poor coarse fishing facilities in the Lower Teign.	• Encourage fishery owners to allow coarse fishing in the Lower Teign.	• Agency, riparian owners, fishery owners, angling associations

Part 2

5. Human Activities and Pressures on the Environment

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.

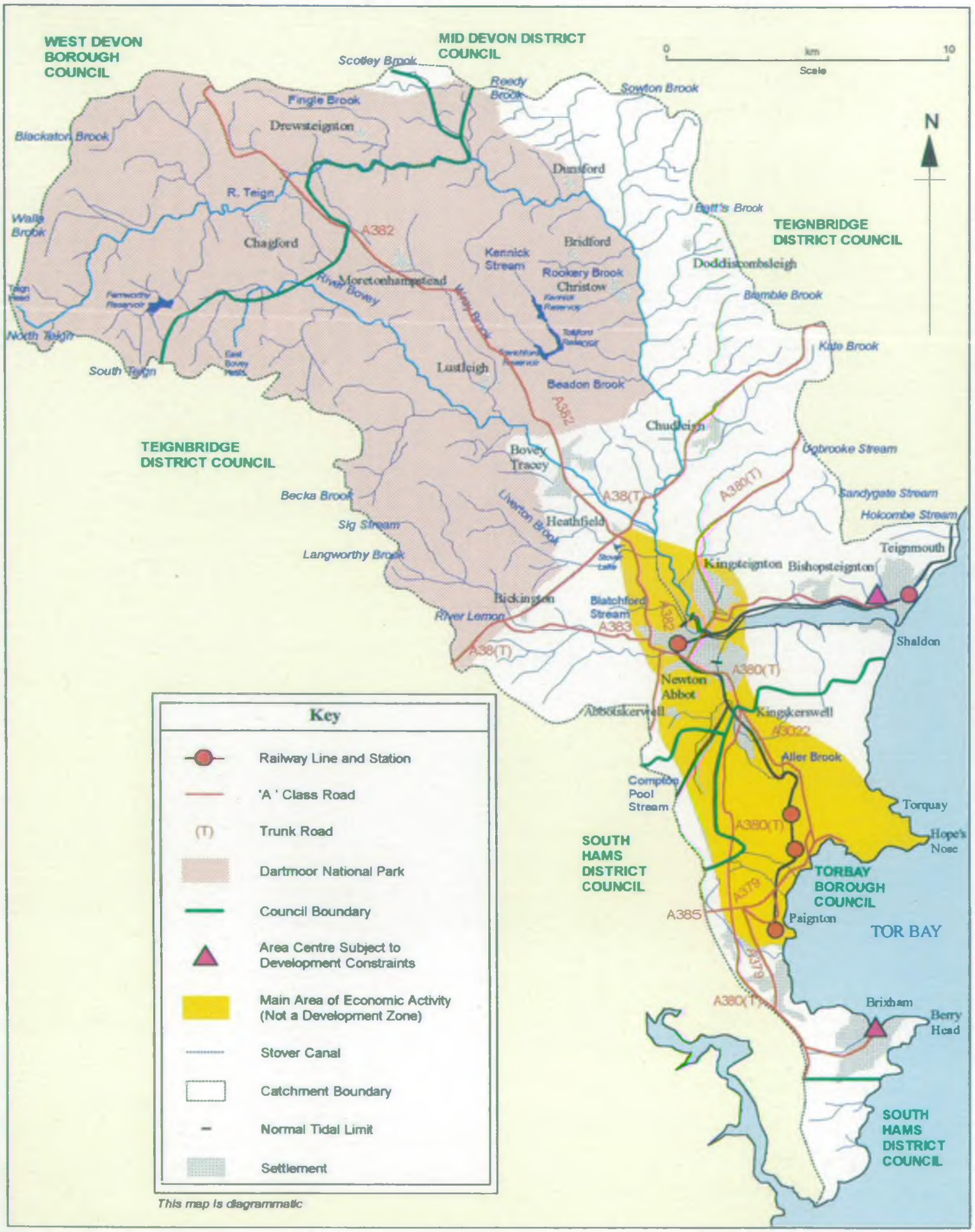
Land Use Planning

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 - ensuring; a sustainable form of development, that Policies reflecting the Agency's interests are incorporated appropriately, and that site designations will not be detrimental to the environment or compromise our position at a later date.
- **Development Control** - Responding to consultations on development proposals both as pre-application enquiries and planning applications to ensure that a comprehensive response is given reflecting the interests of the Agency, minimising detrimental development and gaining environmental enhancement.

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

Map 11 - Built Environment



This map is diagrammatic

an example of this advice. Issues relating to development in the catchment are found in Section 4.1.

Local Development Plans

The Regional Planning Guidance for the South West was published in July 1994 [22]. This guidance recognises the need to achieve sustainable development and aims to influence the policies of 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 [2], 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 has produced a draft review of the Structure Plan which takes the plan period forward to 2011 and embodies the principles of sustainable development; the Devon County Structure Plan First Review 1995 - 2011 [5]. We have commented on this plan.

The catchment lies predominantly within Teignbridge District Council and Torbay Borough Council with much of its area within Dartmoor National Park (a local planning authority) and a small part within West Devon, South Hams, and Mid-Devon District Councils (see Map 11). The existing statutory Local Plans and those currently in preparation are shown in Table 3. Local Plans are prepared in conjunction with the Devon County Structure Plan. Table 3 also shows the housing and employment land provision up to 2011. Development will be concentrated at Newton Abbot Sub Regional Centre and Torquay/Paignton. In the National Park the preservation and enhancement of the landscape will be given priority over other considerations in the determination of development proposals.

As shown on Map 11, Teignmouth and Brixham are subject to development constraint. However, limited economic, residential, commercial and infrastructure investment may be appropriate in some cases to meet the local needs of the area.

The Area of Economic Activity shown on Map 11 highlights an area where job growth within the office-service sector is encouraged as it offers greater flexibility in terms of location and is less demanding in terms of land needs; 125 ha has been proposed for the provision for major employment development in 1991 - 2011. Significant residential development is also planned for this area.

Table 3: Local Plans in the Catchment

Local Authority	Housing Provision (dwellings) to 2011 [5]	Employment Land Provision to 2011 [5]	Local Plan *Plan Status*
Teignbridge District Council	4000 within Newton Abbot/Torbay Area of Economic Activity. 4600 elsewhere. Total 8600 (NB: this includes some development outside the catchment).	45 ha within Newton Abbot/Torbay Area of Economic Activity 15 ha elsewhere. Total 60 ha (NB: this includes some development outside the catchment).	Teignbridge Local Plan (as modified). *Adopted October 1996.* NB: planning policies and proposals set up to 2001.
Torbay Borough Council NB: This will be a Shadow Unitary Authority from 1 April 1997.	5800 for Borough Council area (1995 - 2011).	Land proposed for light industry and warehousing [23]: 0.4 ha - Torquay. 50.6 ha - Paignton. 1.2 ha - Brixham. Total 52.2 ha. Land proposed for office development - 2.8 ha (total).	Torbay Borough Local Plan - Consultation Draft. *Consultation Review.*

Local Authority	Housing Provision (dwellings) to 2011[5]	Employment Land Provision to 2011[5]	Local Plan *Plan Status*
		Continued from previous page ....New sites proposed include the Ring Road in Paignton, at Yalberton and Long Road, including a new employment park at White Rock. Priority will be given to employment developments with ≥ 27 jobs/acre.	
Dartmoor National Park	800 for National Park area, including development at Moretonhampstead. (NB: this includes some development outside the catchment).	Insignificant in this catchment.	Dartmoor National Park Local Plan *Adopted December 1995.* NB: planning policies and proposals set up to 2001.
South Hams District Council	Insignificant in this catchment.	Insignificant in this catchment.	n/a
West Devon District Council	Covered by Dartmoor National Park planning policies.	Covered by Dartmoor National Park planning policies.	n/a
Mid Devon District Council	Covered by Dartmoor National Park planning policies.	Covered by Dartmoor National Park planning policies.	n/a

Notes: The stages in the preparation of local plans prior to their adoption are usually as follows: consultees and members of the public may initially comment upon a consultation draft of a local plan. A deposit draft is then available for a statutory six week period, after which all representations made are considered. A public inquiry is then held at which objections to the plan are raised verbally. An inspector considers all objections raised and produces a report which recommends changes to the plan. The planning authority may then accept the recommendations and adopt the plan or propose modifications, in which case there is a further period of public consultation. This process may be repeated with further modifications and a second public inquiry may be held in exceptional circumstances. Once it is satisfied that all objections have been accommodated, as far as possible, the planning authority will give notice of its intention to adopt the plan.

Infrastructure

The London to Penzance mainline rail link runs the coastal stretch of the catchment north of the estuary. It crosses the estuary at Newton Abbot and runs south towards Torbay paralleling the Aller Brook for much of its length (see Map 11).

The catchment has a comprehensive road network which is concentrated in the lower parts of the catchment around Newton Abbot, Teignmouth and Torbay. A number of important routes cross the catchment (see Map 11) including the A38 trunk road.

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 are involved throughout the process, from route choice and design, through to construction. Through consultation we seek to protect the environment from adverse impacts and secure enhancement where possible.

We have powers under the Water Resources Act, 1991[24], to control highway drainage through prohibition notices; these allow us to insist upon measures to alleviate pollution, for example, interceptors to contain accidental fuel spillage. During the planning of all new roads we also seek to minimise habitat destruction and safeguard important water resources or flood defence assets.

The road network is under increasing pressure from traffic, particularly in the holiday season. To help alleviate this problem it is proposed by Devon County Council [5] that the following schemes currently planned within the catchment (shown in Table 4) are carried out.

Table 4: Road Schemes Planned in the Catchment

Scheme	Status
A380 - Exeter to Torbay Trunking and Kingskerswell Bypass.	For completion by 2011.
Improvement to northern approach to Torquay - includes southern end of A380 Kingskerswell Bypass.	No programme for completion at present.
A381 Salcombe Dip to Inverteign Drive, Teignmouth.	Under construction.
Improvements to A380 Torbay Ring Road.	Scheme scheduled for completion in 1998/2001.
Improvements to A3022 Torbay Ring Road, Tweenaway Cross junction to White Rock.	Implementation programmed for 2001/2002 - 2002/2003.
Happaway Road improvements, Torquay.	For completion by 2011.
Jetty Marsh relief road Stage 2, Newton Abbot.	For substantial completion by April 1998.

Road schemes can also be proposed by District Councils. For example, the Teignbridge Local Plan proposes the Wolborough Street link road for completion by 2001; this scheme will run over the River Lemon.

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. The Planning and Compensation Act 1991 [25] requires the County Council as the Minerals Planning Authority and the Waste Management Authority to prepare strategic policies in a Structure Plan, and more detailed local policies in a Minerals Local Plan and a Waste Local Plan (which may be combined).

Devon Minerals Local Plan is currently in the Consultation Draft (1994) stage [26]. 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.

Of particular relevance to the River Teign Catchment is the preparation of a Strategy for the Bovey Basin by Devon County Council in consultation with Teignbridge District Council and Teigngrace Parish Council (see Section 4.3).

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 5.3 and 5.4 respectively.

Development Sites and Flood Risk in the Catchment

A brief summary of possible development sites in the catchment that are prone to flooding is given in Table 5. Significant development in the catchment is generally restricted to the existing urban areas.

Table 5: Summary of Flood Defence Related Issues in the Catchment

Location	Type of Development	Nature of Problem
Bovey Tracey	Residential/community centre development.	River Bovey floodplain constraints.
Heathfield	Commercial development.	Surface water runoff constraints.
Chudleigh	Residential developments.	Inadequate capacity of Kate Brook.
Bovey Basin clay pits	River engineering works and extension to clay tips.	River Teign flood risk.
Trago Mills/Polish camp	Retail/residential developments.	Inadequate capacity of Liverton Brook.

Kingsteignton	Commercial development. Residential development.	Rydon Stream storage capacity. Establishing commercial and residential floor levels of development.
Bishopsteighton	Residential developments.	Inadequate stream capacity.
Teignmouth	Residential developments.	Tidal flood risks and inadequate stream capacity.
Shaldon	Residential developments.	Tidal flood risk.
Stokeinteignhead	Residential developments.	Inadequate stream capacity.
Kingskerswell	Road/commercial/residential developments.	Inadequate stream capacity.
Abbotskerswell	Residential developments.	Inadequate stream capacity.
Torquay	Residential/commercial developments.	Inadequate stream/sewer capacity.
Paignton	Residential/commercial developments.	Inadequate stream capacity.
Brixham	Residential developments.	Inadequate stream/sewer capacity.
Yalberton	Commercial developments.	Inadequate stream capacity.

Bovey Tracey - Developments at Bovey Tracey are constrained largely by considerations of flood risk given its position astride the river. The town has extensive flood alleviation works and recent developments have been designed to avoid areas liable to flooding.

Heathfield - Flood alleviation works are being sought to mitigate the adverse effects of development and increased surface water runoff.

Newton Abbot/Kingsteignton/Kingskerswell - In 1979, a major flood resulted in the construction of a comprehensive flood alleviation scheme to defend these settlements from regular flooding. This defended urban area encompasses the confluences of the River Teign with the River Lemon and Aller Brook as well as its confluence with the tidal estuary regime. The continued success of this scheme depends upon efficient and effective development control. The Aller valley is heavily urbanised and development pressures are acute in this area linking, as it does, the Newton Abbot area with the Torbay conurbation. Many properties are at risk of flooding in this area, principally along the valley floor in the vicinity of Kingskerswell. This watercourse is an ordinary watercourse and as such we are unable, at present, to directly carry out any necessary flood alleviation works.

The River Lemon contributed significantly to the 1979 flood and as a consequence has been regulated by a major on-line flood control device, the Holbeam Dam, a part of the flood alleviation scheme. This regulates flood water and stores it until such time as it can drain safely away.

Teign Estuary - The tidal River Teign extends east from Newton Abbot to Teignmouth. Both Teignmouth and Shaldon abut the estuary and have large areas regarded as being at risk of flooding. Teignmouth has both tidal and sea defences that are our responsibility.

Torbay Area - Torquay, Paignton and Brixham drain to the sea via several minor river subcatchments; part of Torquay also drains into the Aller Brook. Streams in this area are almost all sewered through the urban areas with systems that have inadequacies or other factors that give rise to flooding concerns. Major developments in the vicinity of Torbay include the continued development of Barton Lands, the redevelopment of Paignton Zoo, 600 new dwellings in the vicinity of Great Parks and the Torbay Business Park near Yalberton. Also phase three of the Torbay Ring Road is currently being determined by the Secretary of State. This is likely to require the restoration of the Great Parks Reservoir.

Approximately 450 referred planning matters relating to flood defence interests are dealt with each year in this catchment area.

Development Sites and Sewerage

There are a number of settlements in the catchment served by STWs which the Agency judges to be unsatisfactory (see Table 6). 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 4.7.

Table 6: **Settlements with Development Restrictions in the Catchment**

Settlement	Reason for Development Restriction
Crockernwell	Current environmental effect caused by effluent discharge, any further increase in flow will cause deterioration of water quality.
Doddiscombsleigh	Current pollution of Doddiscombsleigh Stream.
Holcombe (Teignmouth)	Unsatisfactory sewage outfall contributes to EC Bathing Water failure.
South Knighton	Current environmental effect caused by effluent discharge, any further increase in flow will cause deterioration of water quality. Current pollution of tributary of the River Lemon.

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.

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.

Local Perspective

Part A processes found in the catchment are Nortel Ltd., manufacturer of semiconductors, and AVX Ltd., manufacturer of tantalium capacitors; both are in Paignton.

The registered Part B processes in the catchment include timber and mineral processes, abattoirs, paint sprayers and waste oil burners.

Radioactive Substances

We are the principal regulator in England and Wales under the Radioactive Substances Act 1993. This statute is concemed 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 EC 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.

Local Perspective

There are three sites in this area which are licensed under the Radioactive Substances Act:

- Bloxham Laboratories, Teignmouth;
- Torbay and South Devon Healthcare Trust, Torbay Hospital;
- Zeneca Ltd. (Brixham Environmental Laboratory), Brixham.

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.

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.

5.3 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, sometimes permanent; issues relating to mineral extraction, together with the effect of abandoned mines, in the catchment can be found in Section 4.

Mines

The Teign Catchment contains rocks from a number of geological periods, and thus a wide and diverse range of metalliferous minerals were commercially extracted. It includes several historically important areas of mineral extraction (see Map 12). Metalliferous mining is no longer economic in this area, but abandoned mines are a greater environmental problem than working mines.

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

Dartmoor Granite

The principal ore minerals encountered within the Dartmoor Granites are tin oxide (cassiterite) and iron oxide (haematite). Oxide ores are less prone to weathering than sulphide minerals and therefore the metals within the ore minerals are less mobile. Tin and iron mines within the Dartmoor Granite are frequently associated with iron precipitates and these may be encountered in drainage channels and watercourses in close proximity to the workings. Where this occurs, blanketing of river and stream beds with iron ochre can affect aquatic life and the potential for fish spawning.

Carboniferous Cherts

Two chert formations occur within the catchment. These are the Meldon Chert Formation to the north of the Dartmoor Granite outcrop, and the Teign Valley Chert Formation to the east.

Mineralisation within the Teign Valley Chert Formation is almost exclusively composed of manganese. Lead, zinc, copper, barite and silver occur where the cherts are in close proximity to the Upper Carboniferous Ashton Shales. Manganese mines within the cherts do not cause significant impact on water quality, although some manganese precipitates may be encountered within drainage channels in close proximity to the workings.

Copper, lead, manganese, silver and gold have been worked or reported in the cherts and associated limestones of the Meldon Chert Formation.

Three mines occur within the Meldon Chert Formation and twelve within or associated with the Teign Valley Chert Formation.

Devonian-Carboniferous Shales and Slates

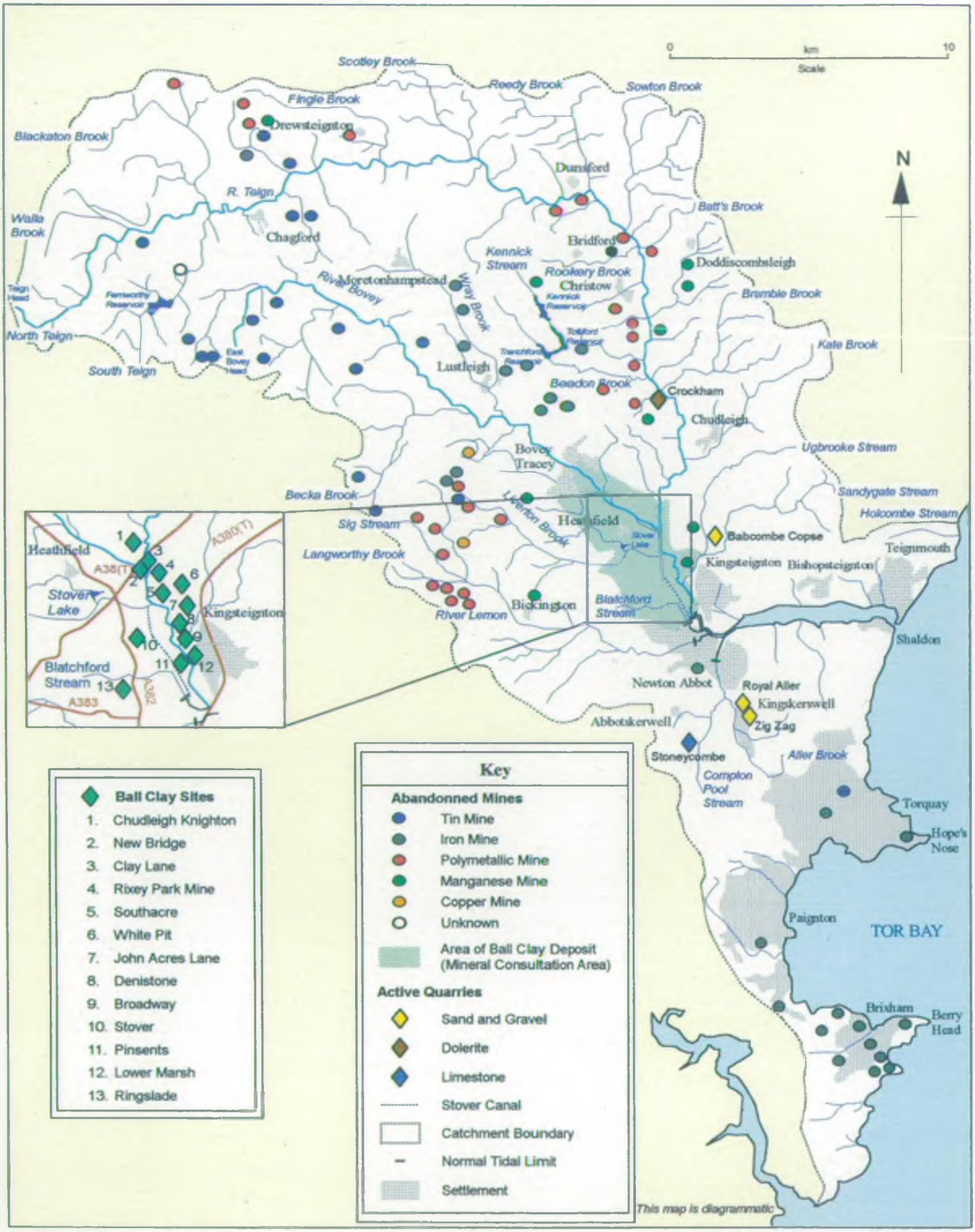
The majority of the metalliferous mines within the catchment have been developed within shales and slates on the south eastern flank of Dartmoor. Metalliferous mineralisation is concentrated within a belt extending 3-4 km from the granite margin.

The mineralisation is polymetallic and includes sulphide and oxide ores. Sulphide ore minerals include copper (chalcopyrite), lead (galena - also includes silver), zinc (sphalerite - can also include cadmium), arsenic (arsenopyrite) and iron (pyrite). Sulphide ore minerals pose the greatest risk to water quality with potential contaminants including copper, zinc, arsenic, iron precipitates and cadmium.

Oxide ores include tin (cassiterite), iron (haematite), ochre (hydrated iron oxide precipitates) and umber (precipitated manganese silicates). Other minerals of note include siderite (iron carbonate), barite (barium sulphate) and fluorite (calcium fluoride). In addition, bismuth, cobalt and gold have been recorded at one location each.

Twenty-eight mines have been worked within the shales, all but two are within 4 km of the granite margin.

Map 12 - Mining and Quarrying



Devonian Limestones and Volcanics

Thick beds of Devonian Limestone associated with volcanic rocks outcrop in the Torbay area. The predominant mineralisation type recorded in this area is iron. The mineral haematite appears to have been the principal economic ore.

Eleven iron mines are located in the Brixham/Paignton area. A further two iron mines and one tin mine are located close to and inland from Hopes Nose.

The impact of disused mines on the Teign Catchment is discussed in Section 4.2.

Quarries

The current active quarries within the catchment are shown on Map 12.

The largest concentration of minerals working within the catchment occurs within the Bovey Basin, a geological feature that lies between Newton Abbot and Bovey Tracey.

Ball Clay

The main deposit worked in the catchment is 'ball clay'. The term ball clay refers to a fine grained highly kaolinitic sedimentary clay which is valued for its high plasticity and dry strength. The clay is used extensively in the manufacture of ceramic whitewares, sanitary wares and electrical porcelain. Great Britain produces 25 % - 33 % of the worlds output of ball clay; some 66 % of this production is obtained from the Bovey Basin. About half of the ball clay extracted is exported through Teignmouth Docks.

The clay is removed by open-cast working and inclined adits. The rainfall runoff from the open cast working contains high levels of suspended particles. Historically, these waters were pumped from the open cast pit into nearby watercourses. The high solids content caused a highly visible pollution. We have worked closely with the two ball clay producers in the Bovey Basin area to solve this problem. A series of settlement ponds are now used to reduce the solids prior to discharge to watercourses.

Sand and Gravel

Sand and gravel extraction takes place in the Eocene deposits around Newton Abbot. Sand and gravel is used in the production of concrete and for building and asphalting sand. Processing of the material requires crushing, screening and washing to grade and sort the mineral. The end process water contains fine sand, silt and clay, and can be a pollution problem. Two sites, Royal Aller and Babcombe Copse, will have their resources depleted within the next five years. Following cessation of works at Royal Aller, the whole site will be restored to a wooded agricultural landscape.

Limestone

Limestone is quarried at Stoneycombe, near Newton Abbot. Limestone is used as roadstone, concrete aggregate and for other building uses. Limestone processing at this site includes washing, with a subsequent requirement for silt disposal. Permission has recently been granted for the disposal of silt on land outside the quarry area, thus releasing a further eight million tonnes of mineral reserves.

Dolerite

Dolerite is quarried at Crockham Quarry in the Teign Valley. The main uses of this igneous rock are roadstone, concrete aggregate and other building purposes.

Map 13 - Waste Disposal

This map is diagrammatic

5.4 Waste Management

The DoE's white paper on waste, 'Making Waste Work' [27] sets out the government's policy framework for the management of waste. It identifies ways in which waste can be managed in a more sustainable way, and sets targets for achieving that aim.

The Strategy is mainly concerned with controlled waste, which consists of household, industrial and commercial waste, as defined by the Environmental Protection Act 1990 [6]. The principles which it sets out, however, also apply to non-controlled wastes such as that from farms, mines and quarries.

The Strategy is based on three key objectives:

- to reduce the amount of waste that society produces;
- to make the best use of the waste produced;
- to choose waste management practices which minimise the risks of immediate and future environmental pollution and harm to human health.

To help achieve those objectives a hierarchy of wastes disposal options has been developed to give a broad indication of their potential risk to the environment, with the option presenting the least risk at the top:

- reduction;
- re-use;
- recovery (i.e. recycling, composting or converting into energy);
- disposal.

The document also 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 waste so that the waste strategy can be developed at a regional level.

Currently 70% of controlled waste is landfilled and a target has been set to reduce this to 60% by 2005. The main reason for initiating this move away from the use of landfills is that they have a large pollution potential. Landfill can release chemicals to surface and underground water and to the soil. They also generate significant quantities of methane which is a 'greenhouse gas'. 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, landfill sites are engineered to a high specification, their operation is governed by strict licence conditions and they are monitored for signs of pollution both during and after operation. Nevertheless, they are still considered as the least desirable waste management option.

Local Perspective

There are currently 47 licensed sites within the catchment. These include eight landfill sites, one of which also has a civic amenity facility, 12 transfer stations, three combination of landfill and transfer station and five civic amenity sites, one of which is also a transfer station. Appendix D and the Glossary at the end of the document explain some of the terms used here. The location of these facilities, their licence status and the waste types accepted are presented in Table 7 and Map 13. Effluent treatment works and metal recycling sites, of which there are 18 in the catchment, are not included in the table; see Map 7 for a description of sewage treatment works in the catchment. In addition, there are many closed, unlicensed, landfill sites in the catchment; these are also shown on Map 13.

Table 7: Waste Management Sites in the Teign Catchment

Site Name	Type	Licence Status	NGR	Waste Type
Heathfield North	Landfill	Current	SX 860 763	Household, commercial, industrial, and some difficult/special wastes
Ruby Farm	Landfill, Transfer Station, wood burner storage	Current	SX 850 682	Landfill; inert, general Transfer; inert, general, household
Bickley Ball	Landfill, Civic Amenity	Current	SX 883 740	Inert, general, household
Yannon Lane	Landfill, Transfer Station	Current	SX 871 682	Landfill; inert, general Transfer; Inert, general, household
Babcombe Copse	Landfill	Current	SX 869 758	Inert, general
Kerswell Gardens	Landfill	Current	SX 889 668	Inert, general
British Gas Site	Landfill	Current	SX 927 729	Inert, general
Stoneycombe Quarry	Landfill	Current	SX 860 674	Inert, general
Torbay Hospital	Transfer Station	Current	SX 899 658	Clinical
Quay Skips	Transfer Station	Current	SX 868 714	Inert, general, household
Tyre Collection Services	Transfer Station	Current	SX 855 712	Tyres (difficult waste)
Coventry Farm Estate	Transfer Station	Current	SX 885 666	Inert
Orcol Fuels Ltd	Transfer Station	Current	SX 832 761	Mineral Oils (special waste)
Armabridge Ltd	Transfer Station	Current	SX 904 663	Inert, general, household
Cremtor	Transfer Station	Current	SX 842 733	Animal carcasses (difficult waste), paper
Brunel Road, Newton Abbot	Civic Amenity	Current	SX 871 711	Waste from householders
Broadmeadow, Teignmouth	Civic Amenity & closed landfill	Current	SX 926 732	Waste from householders
Court Street, Moretonhampstead	Civic Amenity	Current	SX 751 860	Waste from householders
Jubilee Car Park, Chagford	Civic Amenity	Current	SX 701 874	Waste from householders
Colesville Quarry	Landfill	Current (closed)	SX 877 695	Inert
Torbay	Transfer Station, Civic Amenity	Current	SX 868 594	Inert, general, household, difficult and special
Claylands Cross	Landfill and Transfer Station	Current	SX 874 596	Landfill; Inert and general Transfer; Inert, general, household
Yalberton Tor	Transfer Station	Current (closed)	SX 870 593	Inert and general
Nethway Quarry	Landfill	Current (site being restored)	SX 905 528	Inert and general
ABC Siddalls	Transfer Station	Current	SX 885 666	Inert, general and household
Tyre Recycling	Transfer Station	Current	SX 872 593	Tyres (difficult waste)
County Skip Hire	Transfer Station	Current	SX 868 596	Inert, general, household and difficult waste
Torbay Recycling	Transfer Station	Current	SX 869 596	Inert, general and household

Issues concerning waste disposal in the catchment can be found in Section 4.1.

Waste Regulation

We regulate the recovery, treatment and disposal of controlled waste through the waste management licensing system, under the Environmental Protection Act 1990[6], which was implemented on 1st May 1994.

Agricultural waste, sewage sludge, and mines and quarry waste are covered by other legislation:

- All waste from agriculture premises, as defined in the Agriculture Act 1948 [28], is controlled by MAFF. Agricultural wastes cover a wide variety of potentially polluting materials including manures and silage effluent, sheep dips and pesticides. Further

guidance on handling, storage and disposal of these wastes is contained in the codes of practice published by MAFF [29] [30].

- Applying sewage sludge to agricultural land is regulated throughout the EC by Council Directive 86/278 which is enforced in the UK by the Sludge (Use in Agriculture) Regulations 1989 [31]. We audit sludge spreading records kept by water companies.

- Control over the disposal and recovery of mineral waste is provided under Town and Country Planning legislation and the Mines and Quarries (Tips) Act 1969 [32]. The Mineral Planning Authority is responsible for the planning aspect of this, but not matters relating to health and safety.

The objective of the waste management licensing system is to provide a separate control system and ensure that waste management facilities:

- do not cause pollution to the environment;

- do not cause harm to human health;

- do not become seriously detrimental to the amenities of the locality (only applicable if planning is not in force).

The new system brought in improved environmental standards and licence holders now have to prove their financial capability and their technical competence. These licences 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.

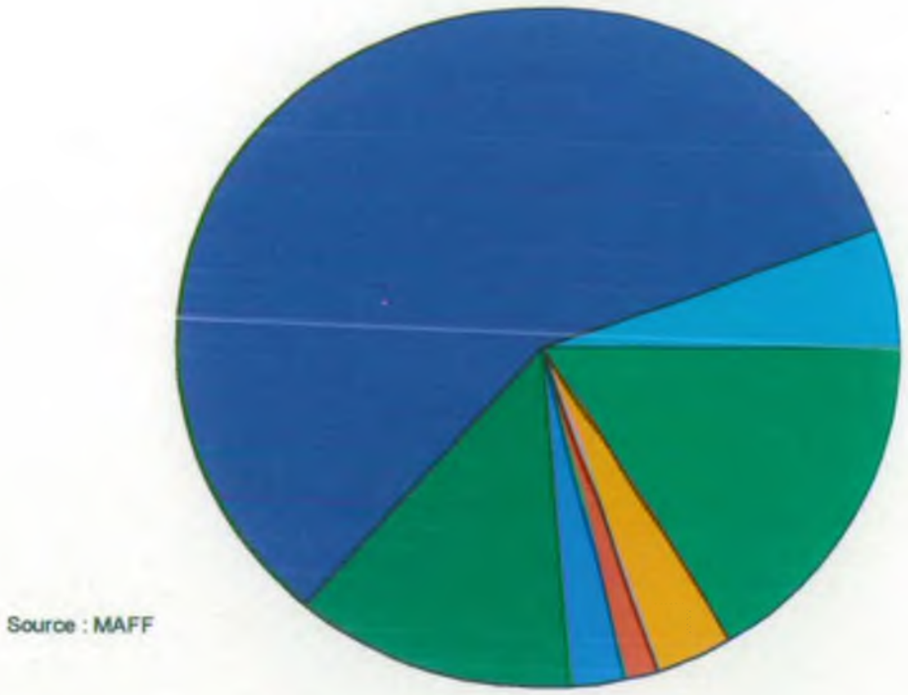
Certain waste management activities are exempt from the requirement for a waste management licence. This includes a range of activities such as shredding or baling materials for recycling and the spreading of waste on land for agricultural benefit. Each exempt operation must be registered with us, and comply with the criteria given in the waste management licensing regulations for that particular activity. There are currently a number of activities within the catchment which are registered as exempt.

Planning permission will normally be required for the development of a waste management facility, such as landfill, transfer stations, civic amenity sites, treatment plants, incinerators, scrap yards and recycling process plants. The siting of waste recovery and disposal facilities is determined through the land use planning system by the local planning authorities under the Town and Country Planning Act 1990[33].

The Landfill tax was introduced in October 1996 at two levels for inert or putresible. The tax is collected by the landfill operators, and is expected to raise over £450 million nation-wide. It has associated with it the opportunities to set up Environmental Trusts funded from the tax liability of the landfill operators. Landfill operators may choose to contribute up to 20% of this to Environmental Trusts, and will then receive a credit on their tax liability of 90% of the sum contributed. The contributions from landfill operators will be spent on projects on subject areas such as the environmental rehabilitation of former landfill sites, prevention /reduction / mitigation of pollution, and research on more sustainable waste management practices.

There has been concern that an increase in fly-tipping would occur following the introduction of this tax . We are monitoring the problem, taking action where necessary and actively seeking the support and assistance of local businesses, the public and local authorities within the catchment.

Figure 1 - Agricultural Land Use 1995



Source : MAFF

Rough Grazing
Grassland >5 years
Grassland <5 years
Set -Aside
Other Land
Farm Woodland
Crops & Fallow

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 has declined over the last ten years (by 6.3%). This goes against the general 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. However, farm woodland does cover a substantial area (5%) of agricultural land in the catchment.
- 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); 536 hectares (1.5%) 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.

5.5 Rural Land Use

Over 80% of the land in England and Wales is farmland. 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 the Ministry of Agriculture, Fisheries and Food (MAFF) also encourage sensitive farming practices using financial incentives.

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.

Local Farming

Land Use

Figure 1 and Table 8 summarise the changes in agricultural land use from 1985 to 1995.

Table 8: Agricultural Land Use in the Catchment

Land Use	1985 (ha)	1995 (ha)	% of Total Farmed Area (1995)	% Change (1984 - 1994)
Grassland < 5 years	4,657	3,575	9.9	-23.2
Grassland > 5 years	19,476	21,278	58.8	9.3
Rough Grazing	3,745	3,877	10.7	3.5
Crops and Fallow	6,106	4,578	12.6	-25.0
Farm Woodland	1,889	1,770	4.9	-6.3
Other Land	619	589	1.6	-4.8
Set-Aside	-	536	1.5	n/a
Total Agricultural Area	**36,491**	**36,203**	**100**	**-0.8**

Source: MAFF

Farming Types

Livestock farming based on grassland is the dominant activity in the area. On Dartmoor, cattle, ponies 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 for the catchment are shown in Table 9. Local trends in the catchment, such as on the high moor where livestock numbers are thought to have increased over a longer period of time (> ten years) are not reflected in the data.

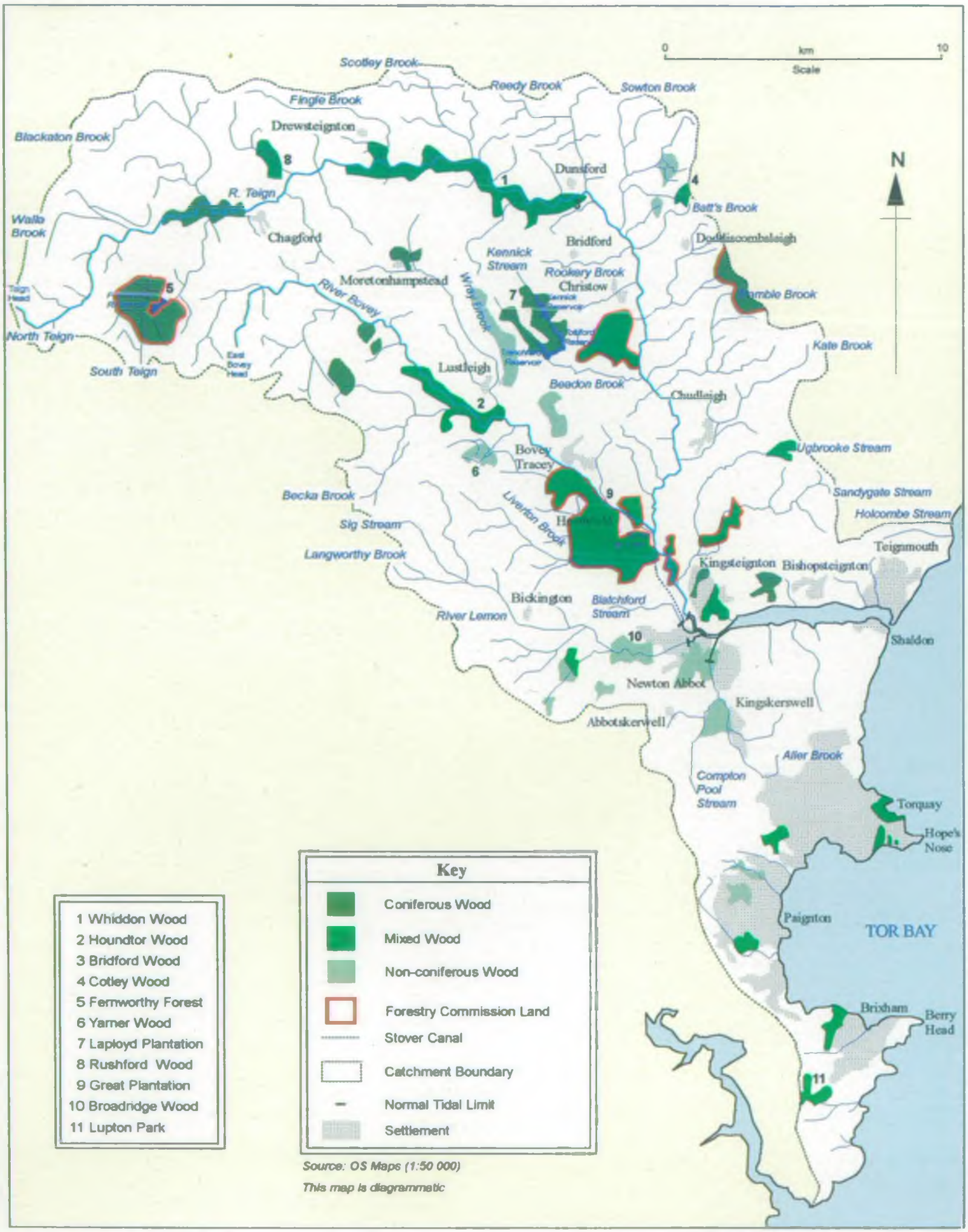
Table 9: Livestock Numbers in the Catchment

	1985	1995	% Change 1985 - 1995
Total cattle & calves	38,902	38,793	-0.3
Total sheep & lambs	95,608	100,691	5.3
Total Pigs	15,184	14,895	-1.9
Total Fowls	86,911	107,158	23.3

Source: MAFF

Although a considerable number of farms in the area grow cereals and other crops as their major enterprises, a large amount of cereals are grown as a mixed farming system in support of livestock. Table 10 summarises the farming types found in the catchment.

Map 14 - Forestry



Source: OS Maps (1:50 000)

This map is diagrammatic

Table 10: Farm Types Found in the Catchment

Farm Type	% of Total No. of Holdings (1995)	% of Change in No. of Holdings (1985 - 1995)	Notes
Dairy	8.1	-33.1	Quotas and more stringent hygiene and pollution standards have tended to favour larger farms.
Cattle and Sheep	20.2	39.3	Some dairy farms have switched to cattle and sheep.
Pigs and Poultry	1.4	-12.5	The numbers of pig and poultry holdings has fallen, although the fowl flock has increased by 23.3%. Both are, however, subject to rapid fluctuations.
Cropping	1.0	-16.7	The total **area** of crops and fallow has fallen substantially by 25 %, mainly due to set-aside at the expense of spring barley; the least profitable crop in a cereal rotation.
Horticulture	3.4	88.9	The **area** covered by horticultural crops has declined by 26 %. All categories of fruit and vegetables grown in the open have declined. Conversely a large increase in hardy nursery stock, bulbs and flowers has occurred.
Mixed	0.6	-66.7	
Part-time	65.3	7.7	

Source: MAFF

Farm Pollution Control

The farm inspection campaign was launched in 1984 by the former South West Water Authority, the National Farmers Union and the Country Landowners Association. This campaign aimed to tackle pollution problems from livestock farming. The farm inspection work looked at all areas of the catchment and this work is now continued within the framework of the 'Task Force' Inspections; 'Task Forcing' involves the targeting of particular river stretches to identify all actual and potential pollution sources. Problems were identified by Task Force on the Scotley, Reedy and Fingle Brooks; these have been successfully addressed by follow up action. Task Force activity in 1996 on the Liverton Brook revealed only a few relatively minor problems which were dealt with immediately.

Issues have been raised in Section 4.9 concerning pollution problems due to farming.

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 reduced management and increased opportunities for conservation and recreation within the countryside.

The existence of the Dartmoor Environmentally Sensitive Area (ESA) (see Section 6.4, Map 24) should result in a reduction in 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, using traditional methods, for the benefit of wildlife, archaeology and landscape. Payments are made which are intended to compensate for reduced income. The government also supports upland farming by the payment of Hill Livestock Compensatory Allowance, to which environmental conditions are attached.

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 for SSSI (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)

Map 15 -Recreation

National Trust Sites

1 Coleton Fishacre
2 Compton Castle
3 Bradley Manor
4 Little Haldon
5 Parke Estate
6 Castle Drogo
7 Milfordleigh
8 Higher Brownstone Farm
9 Woodhuish Farm
10 Man Sands
11 Southdown Cliff

Major Recreation Sites

1 Stover Country Park
2 Trago Mills
3 Decoy Country Park
4 Becky Falls
5 Fernworthy Reservoir
6 Fingle Bridge
7 Trenchford, Tottiford and Kennick Reservoir
8 Canonteign Falls
9 Steps Bridge/Dunsford Woods
10 Ugbrooke Park
11 Haldon Forest
12 Lemon Valley
13 Kent's Cavern
14 Paignton Zoo
15 Clennon Valley Park
16 Berry Head Country Park

Key

- Stillwater Trout Fishery
- Stillwater Coarse Fishery
- Principal Stretches for Salmon & Trout Fishing
- Principal Stretches for Coarse Fishing
- Footpath
- South West Coast Path
- Templer Way
- National Trust Owned Land
- Watersking
- Windsurfing
- Bathing
- Sailing
- Torbay and Dartmouth Railway
- Stover Canal
- Catchment Boundary
- Normal Tidal Limit
- Settlement

have been modest. There are also a large number of land management agreements managed and funded by Dartmoor National Park.

Farm Diversification

'Rural England: A Nation Committed to a Living Countryside' [34], published in October 1995, provides for the first time ever a comprehensive review of Rural Policy, describing how sustainable development can be put into practice in rural areas, building on the current strengths of the countryside and those who live and work there.

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 [34].

Local Forestry

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 Appendix E).

The ancient semi-natural woodlands remaining in Devon are concentrated on land unsuitable for agriculture, such as Whiddon Wood, which flanks the slopes of the upper Teign Valley. These woodlands are typically dominated by oak, with birch, ash, hazel and rowan.

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' [16] to ensure forestry operations do not damage the water environment. Issues relating to the impact of forestry as a rural land use are highlighted in Section 4.9.

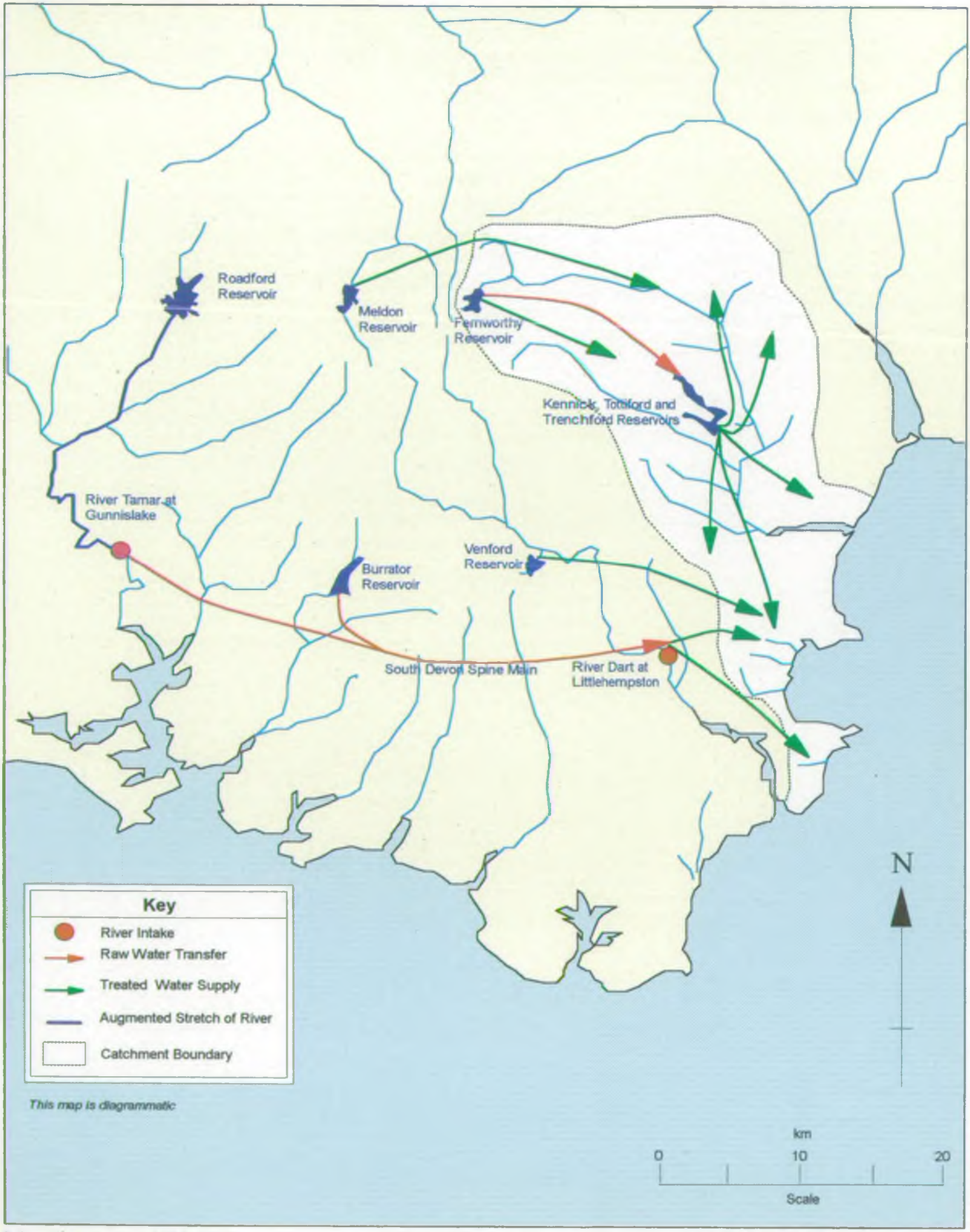
5.6 Recreation

Land-based recreation

Three long-distance footpaths cross the catchment and offer some access to the rivers and canal: the Two Moors Way runs roughly north-south across the upper catchment and alongside the River Teign for some way; the Templer Way links Haytor to the coast at Teignmouth; and the South West Peninsula Coastal Path also gives access to the coast (see Map 15). Various other footpaths provide some access to rivers or wetlands. There are also plans for cycle routes throughout the catchment, including a national cycle route which would cross the catchment near the head of the Teign Estuary on existing routes. Further access to the water environment is being investigated by the local authorities and ourselves (see Section 4.17).

There are a number of sites where it is possible to enjoy the water environment; lakes, reservoirs, rivers and Estuary are all open to the public at various locations (see Map 15), including some fine examples of typical Dartmoor river with associated valley woodland.

Map 16 - Public Water Supply



Water-based recreation

Water-based recreation is mainly linked to the Estuary and Torbay, although Decoy Country Park in Newton Abbot offers windsurfing and sailing. None of the reservoirs have facilities for watersports and there is no access agreement for canoeing on any of the catchment's rivers.

Angling

Angling for salmon is permitted from the 1 February - 30 September. Most fish tend to be caught in the middle and lower reaches of the River Teign, which are operated by the Lower Teign Fishing Association. The Upper Teign is also a popular salmon fishery operated by the Upper Teign Fishing Association. However, in low flow years, salmon may have difficulty in gaining access to the upper reaches before the end of the rod fishing season.

Sea trout rod fishing is permitted between March 15 and 30 September. Sea trout catches tend to be more evenly distributed across the catchment than salmon, with similar catches being taken in the upper and lower reaches. This may be due to sea trout being less reliant on flow conditions than salmon to ensure their migration through the catchment.

The most important brown trout fishing is found in the middle and upper reaches of the system. Although present in good numbers further downstream, the angling effort for this species is light as the water is essentially a salmon and sea trout fishery. The open season for brown trout angling on the Teign is March 15 - 30 September.

Although there are important coarse fish stocks on the Teign, there is little angling for them outside the lower reaches. This is mainly because fishing/riparian interest do not allow coarse angling on stretches which they operate primarily as game fisheries (see Section 4.17). Both the Lower and Upper Teign Fishing Associations offer salmon and brown trout fishing for their members and the general public through the issue of a limited number of permits.

There are a number of stillwater fisheries in the Teign Catchment area (see Map 15). Most of the major waters are managed by the Newton Abbot Fishing Association as coarse fisheries. Collectively, these fisheries offer varied coarse fishing opportunities for club members and the public who are able to fish several day ticket waters.

Stillwater trout fisheries in the catchment are found at Kennick Reservoir, operated as a stocked rainbow trout fishery, and Fernworthy Reservoir, operated as a brown trout fishery, with stocks being left to regenerate naturally. There is limited fishing for pike in Trenchford reservoir. Due to problems with maintaining water levels during the summer, Tottiford is no longer stocked.

There is considerable rod and line sport fishing carried out, targeting mainly bass and flounder.

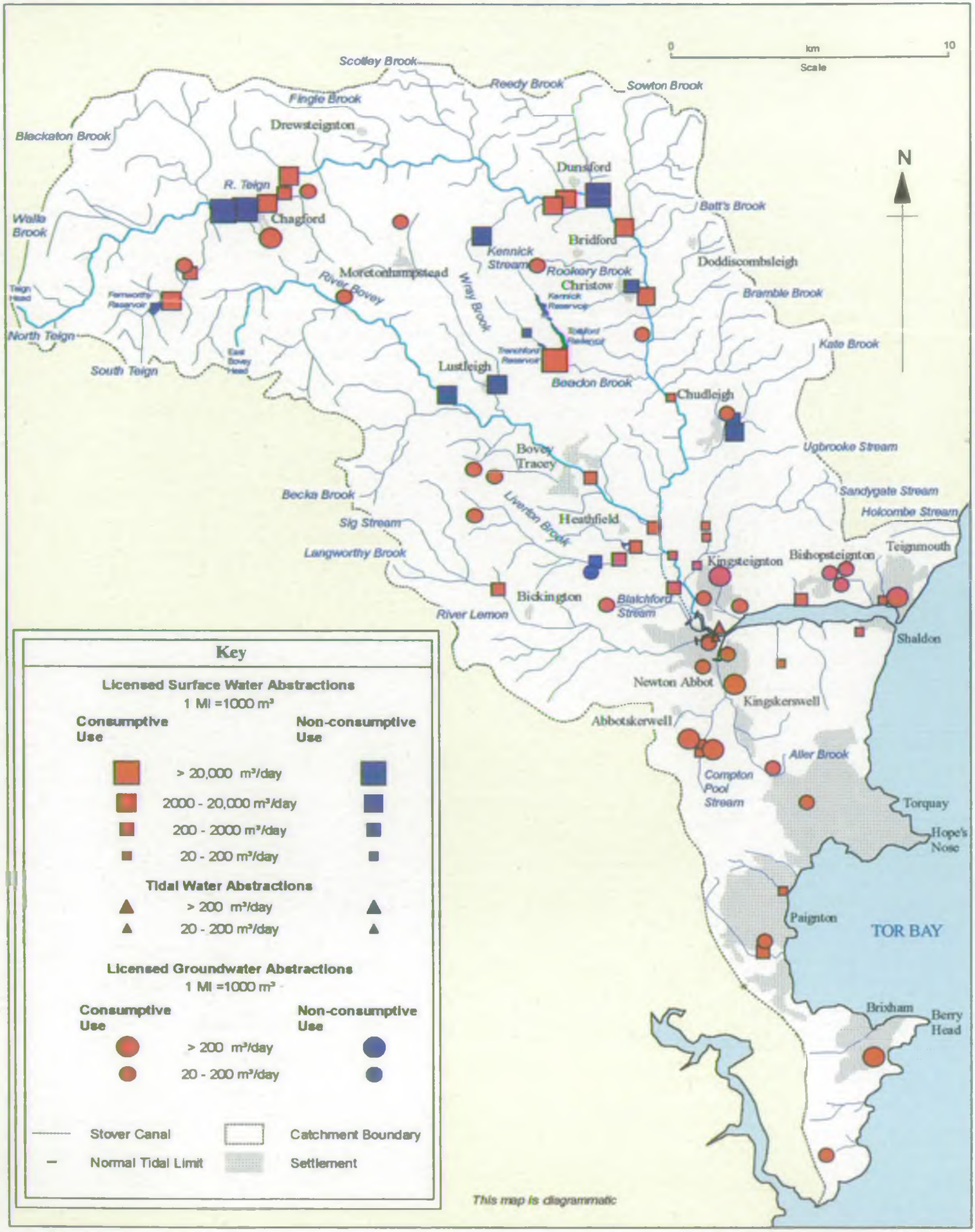
5.7 Water Abstraction and Supply

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.

Consumptive and Non-consumptive Abstractions

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

Map 17 - Groundwater and Surface Water Abstractions



Consumptive abstractions generally involve a loss 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.

Of the total annual licensed quantity of water for abstraction in the catchment, over 88% is for non-consumptive uses; the main component of which is hydropower (see Figure 2).

Public Water Supply

Abstractions for public water supply represents 10% 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 Teign 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. The zone is served by a complex water supply system, the centrepiece being Roadford Reservoir (see Map 16), which, in conjunction with other reservoirs and river abstractions, is used to supply North Devon, Plymouth and the South Hams.

The Demand For Public Water Supply

The total public demand for 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 in part by Teign Catchment sources. Demand in this area can increase considerably in the summer as a result of the influx of holiday makers.

Supplying The Public Water Supply Demand - Licensed Public Water Supply Abstractions

The sources available to SWWSL within the Teign Catchment are only able to meet a small proportion of the total Roadford SSA demand. The bulk of the water abstracted by SWWSL from the Teign Catchment is consumed within the catchment. The small proportion that is exported, supplies small local areas adjoining the edge of the catchment, for example Kennford, in the River Exe Catchment. During periods of peak demand, such as in the summer tourist season, significant amounts of water are imported into the catchment from other sources in order to help meet demand.

There are five public water supply licences within the catchment, with a total annual authorised abstraction of approximately 11,647 Ml. As Table 11 shows, surface abstractions (Kennick, Tottiford and Trenchford (KTT) and Fernworthy) comprise the vast bulk of the licensed resources available to SWWSL in the catchment; also see Map 16.

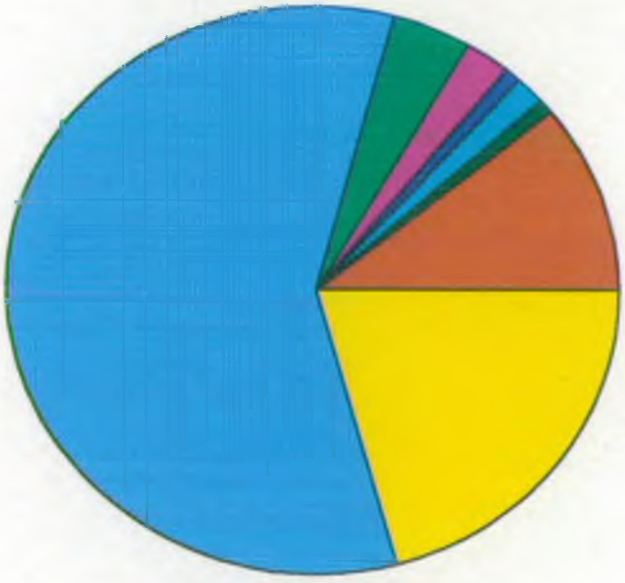
Table 11: Public Water Supply Abstractions

Source	Daily Licensed Quantity (Ml)	Annual Licensed Quantity (Ml)	Comments
Kennick, Tottiford & Trenchford (KTT) Reservoirs	34.09	5,909	Reservoirs combined and operated as one source. In addition water transferred from Fernworthy can also be abstracted.
Fernworthy Reservoir	17.05	5,455	Compensation release of 5.7 Ml/d. Most of water abstracted is transferred into KTT Reservoirs.
Brixham Spring	0.91	136	No longer used.
Mylor Borehole	0.68	90	No longer used.
Chagford Springs	0.23	55	

Figure 2 - Abstraction Statistics

Total Licensed
Abstraction by Volume

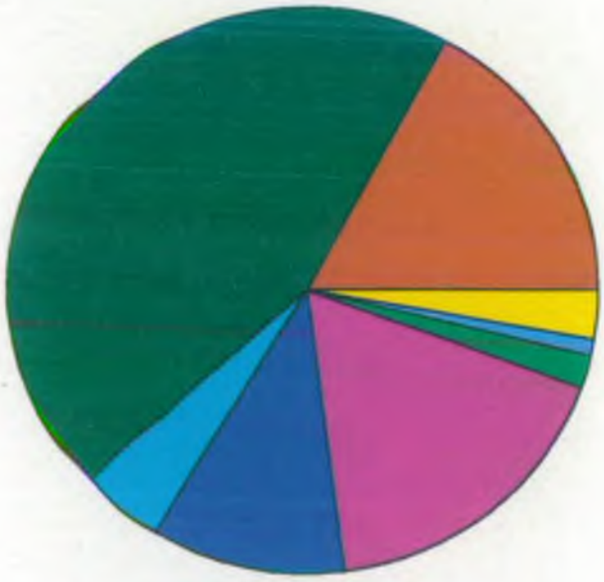
Surface Water 98.6%
Groundwater 1.4%



% Abstraction
of Surface Water by Volume

Authorised Total 111,137 Ml/year

Consumptive Use	Non-Consumptive Use
South West Water 10.23%	Fish Farms 1.16%
Agriculture 0.01%	Water Power 66.62%
Spray Irrigation 0.08%	Private Amenity 21.79%
Private Water Supply 0.01%	
Industrial 0.1%	



% Abstraction
of Groundwater by Volume .

Authorised Total 1,522 Ml/year

Consumptive Use	Non-Consumptive Use
South West Water 18.51%	Fish Farms 0.57%
Agriculture 47.94%	Water Power 0.15%
Spray Irrigation 1.49%	Private Amenity 0.91%
Private Water Supply 11.64%	
Industrial 18.79%	

The KTT reservoir complex supplies water to most of the catchment including Dunsford, Chudleigh, Newton Abbot, Teignmouth and Torbay. Fernworthy Reservoir at the head of the catchment is used to supply local demand in the North Bovey area. However, the vast bulk of

Fernworthy's water is transferred via underground pipes across to the KTT reservoirs for onward supply to the rest of the catchment.

In addition, other sources outside the catchment are used to supply the Teign Catchment. Water can be supplied to Newton Abbot and Torbay from Venford Reservoir in the Dart Catchment, the River Dart abstraction at Littlehempston and from the South Devon Spine Main (which is served by Roadford Reservoir, Burrator Reservoir and the River Tamar). Teignmouth can also be supplied from Vennbridge and Duckaller boreholes in the River Exe Catchment. Chagford Springs is a minor source used to meet a small localised demand in the Chagford area.

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 five licensed sources in the catchment is 13.8 Ml/d which is less than both the daily licenced maximum of 52.96 Ml and the annual licensed total of 11645 Ml (which equates to 31.9 Ml/d) and represents only 4.2 % of the Roadford SSA reliable yield (326 Ml/d). This illustrates the importance of sources from both within and outside the Teign Catchment for public water supply.

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 reliable yield of 326 Ml/d and assuming average demand of 246 Ml/d (1992 levels), the Roadford SSA currently has a surplus of 80 Ml/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, careful management and operation of the Roadford SSA is needed to avoid problems in meeting demand.

Under prolonged drought conditions, when demands are higher than average, 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. For example; maximising the use of river abstractions (there are none in the Teign Catchment) within licensed limits to conserve reservoir storage, demand

(customer) management such as enhanced leakage control and/or hosepipe bans as well as Drought Orders/Permits, where these are deemed necessary.

The reservoirs in the Teign 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 Fernworthy, Kennick, Tottiford and Trenchford Reservoirs, within the current abstraction licence limits, to ensure adequate water conservation during droughts. However, any changes would not adversely affect downstream interests in the catchment.

Public Water Supply and Cryptosporidium

Cryptosporidium is a microscopic parasitic animal which can infect the gut of mammals, birds and reptiles; one species *Cryptosporidium parvum* often causes prolonged severe diarrhoea. The disease is called Cryptosporidiosis, it resists water treatment processes and 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 oocsyt, shed in the faeces of infected individuals or animals. Oocysts 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 public water supply is often implicated in these situations. If Cryptosporidium enters the water supply it is difficult to remove as the oocysts are resistant to chlorine and chloramine disinfection.

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 are no direct river abstractions in the River Teign Catchment for public water supply (see Table 11). Water for public supply is obtained from Fernworthy, Kennick, Tottiford and Trenchford Reservoirs. The risk of Cryptosporidium entering the water supply from reservoirs is considered to be minimal.

In recognition of the national increased awareness of the potential risk to public health posed by this organism; we are working with South West Water, MAFF and Environmental Health Departments on a task group which will assess the risk of Cryptosporidium entering the public water supply and examine the possibility of introducing catchment controls in high risk catchments.

Private Water Use

The maximum licensed quantity of water which can be abstracted for private use represents 90% of the total licensed volume for abstraction in the catchment.

The majority (99%) of the water is from surface water abstractions, although these abstractions account for just 11% of the total number of licences. Private groundwater abstractions, although greater in number, tend to be for small amounts (see Table 12).

Table 12: Non-public Water Supply Abstractions

Source	No. of licences	Licensed quantity (Ml/year)
Groundwater	599	1241
Rivers	77	99,772
Total	**676**	**101,013**

The largest licensed annual abstraction in the catchment is 15,909 Ml/year for hydropower at Chagford power station (see Map 17).

The Impact of Private Abstractions

Overall the catchment is not stressed by abstraction; however, localised problems have been identified. For example, Chagford Power Station abstracts water into a leat which results in a deprived reach of river. When the power station operates at maximum capacity the river can be significantly depleted. The Power Station has not been in operation for a number of years; although some water is still abstracted to ensure the integrity of the leat is protected. This is operated in association with the Environment Agency to ensure environmental damage does not occur. SWWSL are the current licence holders.

The situation is being monitored and if further problems are experienced the situation will be reassessed.

5.8 Flood Defence

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.

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 5.1, Development Sites and Flood Risk in the Catchment.

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 catchment (see Map 18). These include Bovey Tracey on the River Bovey, Kingsteignton on the River Teign and Newton Abbot on the River Lemon. There is a major flood retention dam at Holbeam which protects Newton Abbot. There are sea defences at Teignmouth, which we manage.

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 13 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.

Map 18 - Flood Defence

Key

Known Flooding Problems

1 Bovey Tracey
2 Heathfield/Teigngrace
3 Chudleigh
4 Bovey Basin Clay Pits
5 Kingsteignton
6 Bishopsteignton
7 Teignmouth
8 Shaldon
9 Stokeinteignhead
10 Kingskerswell
11 Abbotskerswell
12 Torquay
13 Paignton
14 Brixham
15 Yalberton

Main River

Stover Canal

Flood Alleviation Schemes

1 Teignmouth Tidal Defence
2 Holbeam Dam (River Lemon)
3 Newton Abbot (River Lemon)
4 Bovey Tracey
5 Kingsteignton (Newton Abbot)

River Level Flood Warning Station

1 North Bovey
2 Ashton
3 Heathfield
4 Bickington
5 Kingsteignton
6 Newton Abbot

Catchment Boundary

Normal Tidal Limit

Settlement

This map is diagrammatic

Table 13: Indicative Flood Defence Standards for Different Land Use

Current Land Use	Land Use Band	Sea (Return Period - years)	River (Return Period - years)
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, extensive grassland, 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.

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.

Coastal Defences

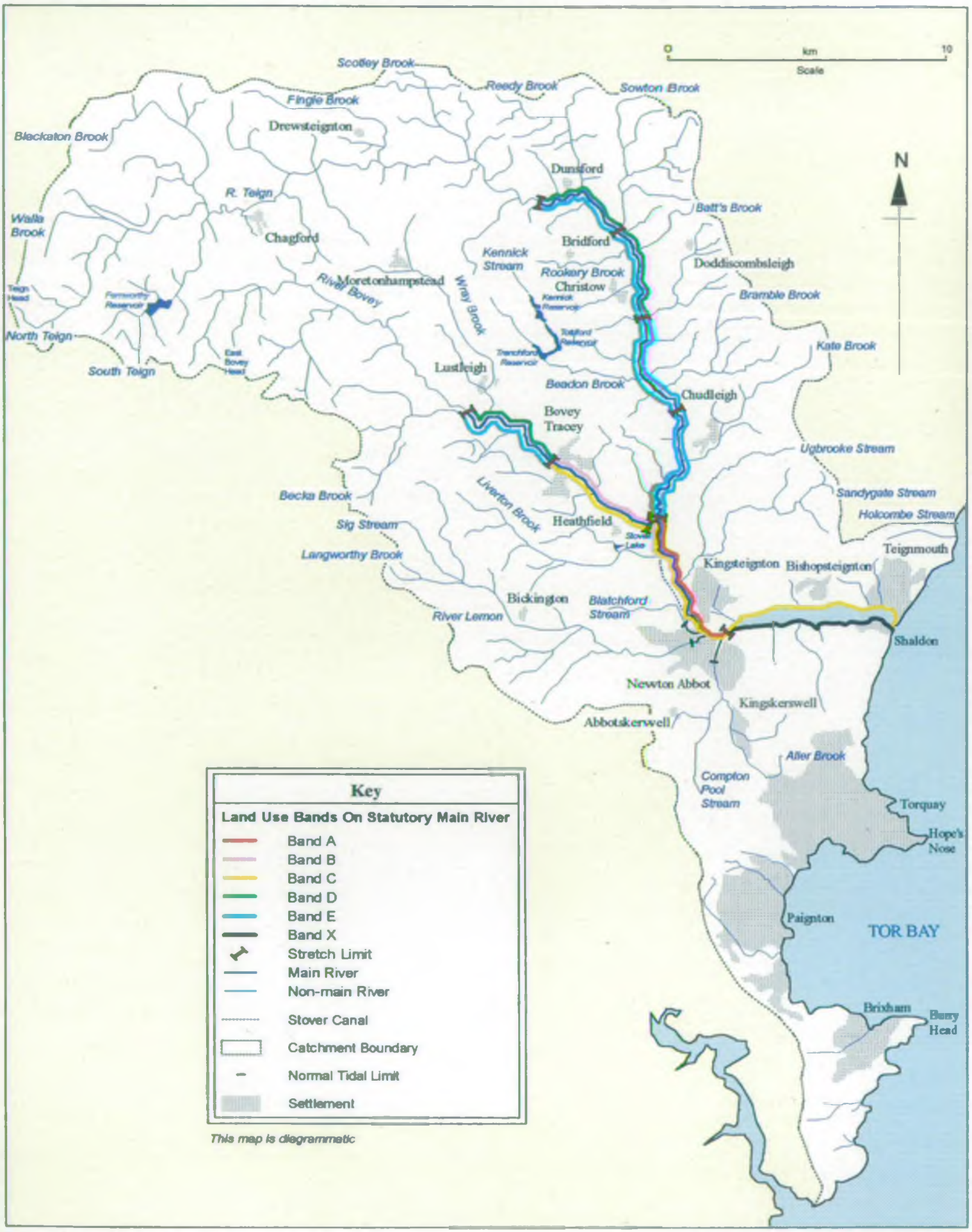
Shoreline Management Plan

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 Lyme Bay and South Devon SMP is entering Stage 2 of the process, which involves collecting data and setting objectives for the plan. The plan is being led by West Dorset District Council. It is planned to have the SMP 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.

Map 19 - Flood Defence Land Use Bands



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Sea Level Rise and Global Warming

The future planning of sea defences needs to take account of predicted sea level rise due to global warming. We have agreed an approach with MAFF, who grant aid much of our 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 potential effect of global warming is that of increased storminess, potential consequences of this include increased wave action and greater annual precipitation.

Flood Warning

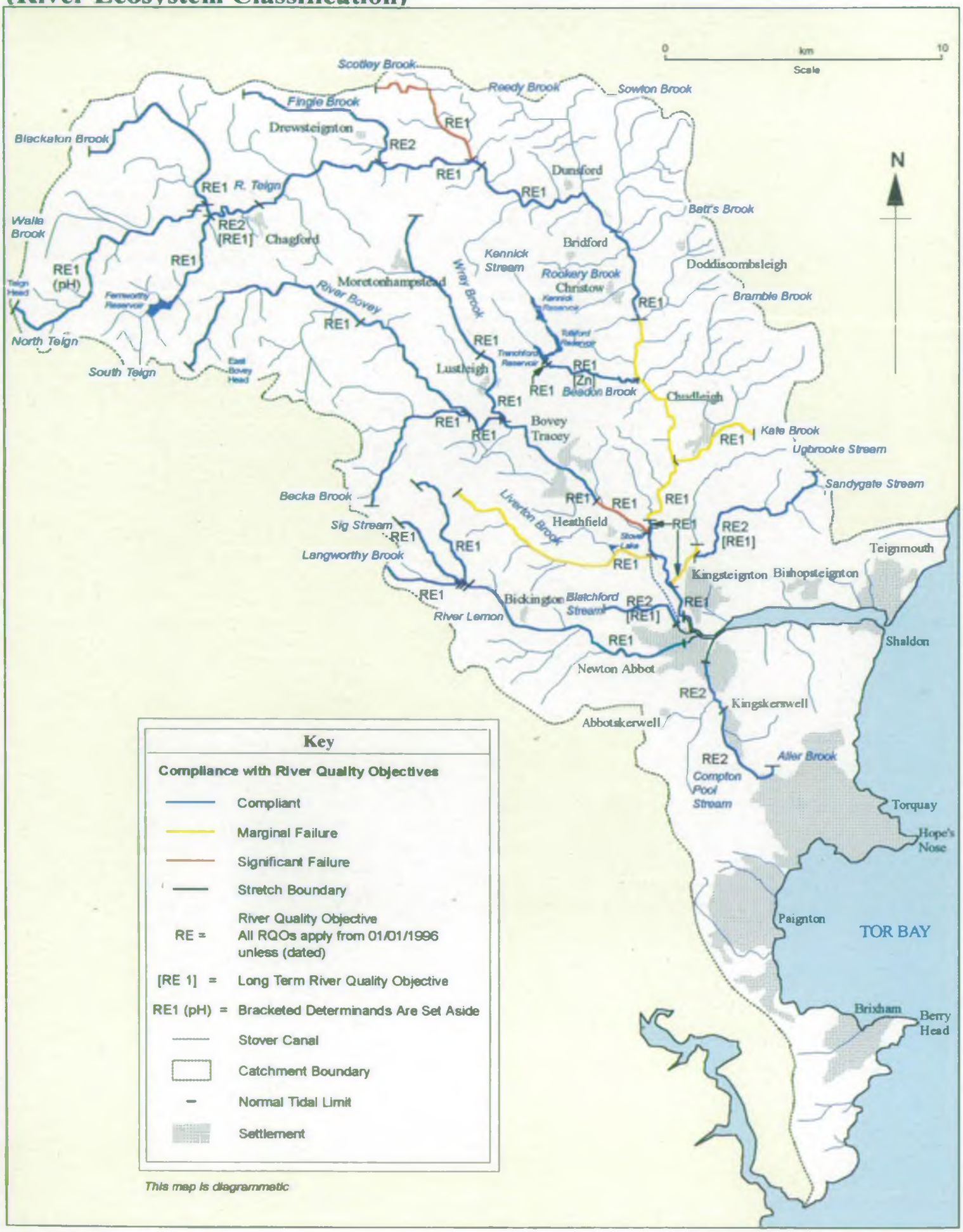
Absolute flood protection is not possible. Because of this we need to warn people when there is a danger of flooding. Flood warnings are issued from our Regional Office at Exeter. These are based on weather radar and forecasts, and on rainfall and measured river levels. Flood warnings are colour coded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

Within the catchment there are river level gauges at North Bovey on the River Bovey; Clifford Bridge, Ashton and Preston (Teigngrace) on the River Teign; and at Bickington and Holbeam (Newton Abbot) on the River Lemon. Rainfall information is also available from the gauges at Clifford Bridge and Bickington in addition to a separate gauge at Fernworthy. Flood warnings are issued on the River Bovey for the stretch from North Bovey to Heathfield, on the River Teign for the stretch from Ashton to Newton Abbot, and on the River Lemon for the stretch from Bickington to Newton Abbot. 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'.

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



Key

Compliance with River Quality Objectives

- Compliant
- Marginal Failure
- Significant Failure
- Stretch Boundary
- RE = River Quality Objective. All RQOs apply from 01/01/1996 unless (dated)
- [RE 1] = Long Term River Quality Objective
- RE1 (pH) = Bracketed Determinands Are Set Aside
- Stover Canal
- Catchment Boundary
- Normal Tidal Limit
- Settlement

This map is diagrammatic

Information correct as of July 1996

6. State of the Environment

6.1 The Quality of Surface Waters

In 1995 77.7% of the River Teign Catchment was of very good chemical quality and 22.3% was of good chemical quality. In biological terms, 95.4% of the river was of good or very good quality, while the remaining 4.6% was of poor or bad quality. Between 1990 and 1995 there was an overall improvement in chemical quality of 44.3%, while biological quality improved in 34% of the river. Although water quality has recently improved there are parts of the catchment where it is not good enough. These shortfalls in quality are described in this report.

River Quality Objectives (RQOs)

Our proposed targets for RQOs are set out in Section 3. 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 RQOs 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.

Of the 32 monitored river stretches (179.9 km) in the catchment there are two stretches (6.2 km) which significantly fail to meet their RQO, and five stretches (9.9 km of river) which marginally fail to meet their current RQO. We have also assessed whether river stretches meet their long term RQO. Map 20 shows compliances with proposed RQOs and Long Term RQOs. Reasons for non-compliance are detailed below.

River Teign - The Teign from Spara Bridge to above Heathfield landfill marginally failed its proposed RQO of RE1 as a result of a single high BOD result in 1995. See Section 4.7, for more information.

The Teign from the Gidleigh Park Hotel to below Chagford STW fails to comply with its long term RQO in some years because of high BOD and total ammonia concentrations. See Section 4.7, for more information.

River Bovey - The River Bovey from Little Bovey to the Teign confluence significantly failed the proposed RQO of RE1. See Sections 4.7 and 4.9 for more information.

Scotley Brook - The Scotley Brook from its source to the Teign confluence, significantly failed the proposed RQO of RE1 because of low DO concentrations; see Section 4.7.

Ugbrooke Stream - The stretch Higher Sandygate to Teign confluence marginally failed its RQO of RE1 as a result of two high BOD results recorded in 1994 and 1995. The cause of these high results is unknown with no relevant pollution incidents being recorded on either of these occasions. In the event of further failures, we will take action to identify the source.

Liverton Brook - The Liverton Brook from its source to the Teign confluence, marginally failed its RQO of RE1 in 1995 as a result of three high BOD results recorded in 1994, all of which were preceded by heavy rainfall. The cause of these high results is unknown with no relevant pollution incidents being recorded on either of these occasions. In the event of further failures, we will take action to identify the source.

Map 21 - EC Directives Monitoring

Key

- Salmonid Fishery
- EC Urban Wastewater Treatment Directive - High Natural Dispersion Area of 5 km radius
- Stover Canal
- Catchment Boundary
- Normal Tidal Limit
- Settlement

EC Directive Monitoring Sites

Freshwater Fish

1. Fernworthy Res
2. Leigh Bridge (Teign)
3. Gidleigh Park Hotel (Teign)
4. Bridford Bridge (Teign)
5. Preston (Teign)
6. Bradley (Lemon)
7. Twinyeo Farm (Bovey)
8. Kennick Res
9. Tottiford Res
10. Trenchford Res

Surface Water Abstraction

1. Fernworthy Res
2. Trenchford Res
3. Kennick Res

Dangerous Substances

1. Teignmouth LSO
2. Teignmouth LSO
3. Teignmouth LSO
4. Teignmouth
5. Teign Estuary Mouth
6. Teign Estuary Lower
7. Sharkham Point Outfall
8. Sharkham Point
9. Sharkham Point
10. Hope's Nose Outfall
11. Hope's Nose
12. Hope's Nose
13. Teign at Preston
14. Teign D/S Heathfield
15. Bovey at Twinyeo Farm
16. Chudleigh STW

Bathing Beaches

1. Holcombe
2. Teignmouth Town
3. Shaldon
4. Ness Cove
5. Maidencombe
6. Watcombe
7. Oddicombe
8. Babbacombe
9. Redgate
10. Meadfoot
11. Beacon Cove
12. Torre Abbey
13. Hollicombe
14. Paignton
15. Paignton (Preston)
16. Goodrington
17. Broadsands
18. Shoalstone
19. St Mary's

This map is diagrammatic

Kate Brook - The Kate Brook from its source to the Teign confluence marginally failed its RQO of RE1 as a result of a single high BOD result. This appears to be an isolated incident, the cause of which is unknown. In the event of further failures we will take action to identify the source.

EC Directives and Other International Commitments

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

EC Bathing Waters Directive

The EC Directive *concerning the quality of bathing water*[19] seeks to protect public health and the amenity value of popular bathing waters (see Appendix B3). There are 19 identified EC Bathing Waters in the catchment (see Map 21), eight of these receive freshwater stream inputs, the quality of which are monitored during the bathing season, shown below.

Failures were recorded at 10 of the 19 Bathing Waters in the period 1986 to 1996 and are shown in Table 14. Where action is required to improve Bathing Waters this has been raised as an issue in Section 4.7.

Table 14: Compliance Against EC Bathing Water Directive, as Assessed by the Department of Environment.

Bathing Water	86	87	88	89	90	91	92	93	94	95	96
Teignmouth (Town)	F	F									
Teignmouth (Holcombe)				F					F		
Shaldon	F	F	F			F					
Ness Cove	F					F					
Torre Abbey							F				
Hollicombe	F										
Paignton (Paignton Sands)			F						F		
Paignton (Preston Sands)			F								
Goodrington		F									
Broadsands									F		

Bathing Water non-compliance at Teignmouth Town, Shaldon and Ness Cove were caused by high bacterial levels from sewage discharges to the River Teign and Teign Estuary. Following the Teignmouth "Clean Sweep" scheme by SWWSL and commissioning of the Teignmouth Long Sea Outfall in April 1993, bathing water quality has improved.

Non-identified Bathing Waters

We also monitor the quality of six beaches which are not identified as EC bathing waters but are still popular recreational areas, these are at; Livermead Sands, Saltern Cove, Elbury Cove, Churston Cove, Man Sands and Scabbacombe Sands. These sites are monitored to gauge the effects of river inputs on the identified Bathing Water sites. Livermead exceeded the imperative EC Bathing Water Directive standards in 1992, due to four high results for total and faecal bacteria, the causes of which are not known. In 1995 all results met with imperative Directive standards. The Bathing waters at Scabbacombe and Man Sands exceeded the standards on the same sampling occasions in 1995.

Water Contact Sports

There are eight water contact sports monitoring sites in the Teign Catchment; one off the Teign Estuary and seven in Tor Bay. These were monitored from 1992 to 1994 for total coliforms, faecal coliforms and faecal streptococci.

If the imperative bacteriological standards of the Bathing Waters Directive are applied to the water contact sports sites, these standards were exceeded in 1992 and 1993 at a site at the mouth of the Teign Estuary. The recent Teign Estuary improvement scheme has improved water quality in this area.

Estuarine/Coastal Water Quality

The NWC Estuary Classification Scheme provides a simple, subjective assessment for estuaries based on biological, chemical and aesthetic quality. The classification is shown in Table 15.

Table 15: Estuary Classification Scheme

Estuary Class	Description
A	Good
B	Fair
C	Poor
D	Bad

In 1995, the Teign Estuary was classified as Class A under the subjective NWC classification.

Throughout the estuary, dissolved oxygen and ammonia concentrations comply with standards for the passage of migratory fish in the AMP2 ' guidelines. Orthophosphate and Total Oxidised Nitrogen values are elevated, however this is not significant as we would expect these values to be exceeded in most estuaries in the South West. Levels of chlorophyll-a, which are used to monitor levels of algae in the estuary, also suggest nutrient values are not significant since there is no evidence of extended algal blooms which can indicate an estuary is becoming eutrophic.

EC Surface Water Abstraction Directive

The EC Directive *concerning the quality required of surface water intended for the abstraction of drinking water* [35] protects the quality of surface water used for public supply (see Appendix B4); there are three identified surface water abstraction monitoring points in the catchment (see Map 21).

The standard for chromium was exceeded in Fernworthy Reservoir in 1993. This was due to a single high result, the cause of which is unknown. There have been no further exceedences to date. In the event of further failures we will take action to identify the source. The standard for dissolved iron was exceeded in 1995 at this site. No action was taken since the exceedence was due to natural runoff, during rainfall following a very dry summer.

Trenchford Reservoir exceeded the imperative standards for coloration and dissolved iron in 1995. Exceedences were due to exceptional conditions of a very dry summer followed by rainfall prior to the exceedence. No further action is proposed.

All three sites exceeded the standards for phenols and/or dissolved and emulsified hydrocarbons in the period 1993 to 1995. We are concerned about the suitability of the methods for analysis for dissolved and emulsified hydrocarbons as specified in the EC Surface Water Abstraction Directive. Exceedences of the Directives' 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 natural vegetation. We are involved in discussions with the Department of 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 in the

catchment we are not planning to undertake any further studies until we receive direction from the DoE.

EC Dangerous Substances Directive

The EC Directive *on pollution caused by certain substances discharged in the aquatic environment of the community*[36] protects the water environment by controlling discharges to rivers, estuaries and coastal waters (see Appendix B5). 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.

Five designated **List I** sites are monitored in the Teign Catchment. These are shown in Table 16.

Table 16: Discharges with Receiving Waters Monitored for List I Substances

Site	Substance(s) monitored
Heathfield STW	Cadmium
Chudleigh STW	Dieldrin, HCH
Teignmouth Long Sea Outfall	Mercury, Cadmium, HCH
Sharkham Outfall	Cadmium
Hopes Nose Outfall	Mercury, Cadmium, HCH

There have been no EQS exceedences in the receiving waters for any of these discharges in the period 1990 to 1995.

There are National Network sites on the River Teign at Preston, the Teign Estuary off Ness House and in the coastal waters off Teignmouth. Since 1990 there have been no EQS exceedences at these sites.

We monitor water quality for **List II** substances downstream of four discharges in the Teign catchment, see Table 17.

Table 17: Discharges with Receiving Waters Monitored for List II Substances

Site	Substance(s) monitored
Heathfield Landfill Site	Copper, zinc, lead, nickel, iron
Heathfield STW	Copper, zinc, lead, chromium, nickel
Teignmouth Long Sea Outfall	Copper
Hopes Nose Outfall	Copper

The EQS for copper downstream of Heathfield landfill site was exceeded in 1993, while both copper and zinc standards were exceeded in 1992 and 1994. We carried out investigations which showed that Heathfield landfill site was not responsible. High copper and zinc concentrations were recorded upstream and downstream of the monitoring site in 1991, prior to the downstream monitoring site being designated a dangerous substances site. Analysis of copper and zinc data in 1992 and 1993 showed non-compliance for both metals at both the upstream and downstream sites. Analysis of the consented discharge from Heathfield landfill site shows no exceedences of the consent conditions for copper and zinc since monitoring of the discharge started in 1991. The cause of non-compliance is likely to be the natural geology of the area and/or the result of historic mining activities upstream (see Section 4.2) and therefore no further action is proposed. The leachate from Heathfield landfill is now treated at Buckland STW and discharged through Teignmouth

Long Sea Outfall. As a result of this, monitoring of this site under the EC Dangerous Substances Directive ceased at the end of 1996.

At Heathfield STW the EQS for copper was exceeded in 1993, while both copper and zinc standards were exceeded in 1992 and 1994. We carried out investigations which showed that these were caused by elevated metal levels due to local geology. No further action is proposed.

During the period 1993 -1995 the EQSs for List II substances in the receiving waters at both Teignmouth Long Sea Outfall and Hopes Nose have been met.

EC Urban Waste Water Treatment Directive

The Directive *concerning urban wastewater treatment*[11] specifies minimum standards for levels of sewage treatment and sewage collection systems (see Appendix B6).

In the Teign Catchment, there are three Urban Wastewater Directive Schemes; Torbay, Chudleigh Knighton, and at Compton and Marldon. There is one scheme under the Appropriate Treatment provisions of the Directive at Ideford.

Since the SWWSL Teignmouth improvement scheme was completed, the DoE have identified the sea off Teignmouth as a High Natural Dispersion Area (HNDA). Since the improvements to sewage treatment at Teignmouth were driven by EC Bathing Water Directive requirements, we would not allow any deterioration in effluent quality from Teignmouth Long Sea Outfall.

The Torbay scheme is being carried out in two phases. The first phase, which aims to improve EC bathing water quality, is described in Section 4.7. The second phase, to meet the requirements of the EC Urban Wastewater Treatment Directive, will combine flows from the Hope's Nose and Sharkham Point discharges which will be discharged from a new 900 m outfall off Sharkham Point. The DoE have identified the sea off Sharkham Point as an HNDA. This means that the Sharkham Point discharge will receive primary treatment. SWWSL will be carrying out comprehensive studies to establish whether this level of treatment will be sufficient to prevent harm to the environment. We will be working closely with SWWSL on these studies.

Annex 1A Reduction Programme

At the Second and Third North Sea Conferences in 1987 and 1990, the UK Government made a commitment to reduce the load of certain harmful substances, known as Annex 1A substances, entering tidal waters from rivers and direct discharges (see Appendix B7).

Three sites in the Teign Catchment are monitored for Annex 1A purposes: River Teign at Teign Bridge, Hope's Nose outfall and Sharkham Point outfall.

Metals - During the period 1990-1994 nationally significant loads of cadmium, mercury, copper, zinc, lead, chromium, nickel and arsenic were found at the Teign Bridge site. Concentrations of these metals did not exceed their EQSs. These high loads are due to the local geology and possibly from historical mining activities in the catchment. We are not planning any further action.

At Hope's Nose discharge significant loads of copper were found in 1991 and lead in 1994. We monitored the sea off this outfall and found that concentrations of these metals were well below their EQSs, therefore we are planning no further actions. However, where necessary we will use our powers to control the entry of these substances into the environment.

Organic Compounds - During the period 1993-1994 significant loads of hexachlorobutadiene (a by-product from the production of organic chemicals), HCH, gamma

HCH commonly known as lindane, (a pesticide and wood preservative), dieldrin (an insecticide) and trifluralin (a herbicide) were found at the Teign Bridge site. The use of dieldrin has been banned in the UK since 1989. There have been no EQS exceedences for any of these substances at the receiving water site. We are not planning any further action. However where necessary we will use our powers to control the entry of these substances into the environment.

At Hope's Nose nationally significant loads of dieldrin, malathion (a fungicide and also used in the chemical industry) and endrin (a insecticide) were found in the period 1993-1994. The use of endrin has been banned in the UK since 1984. We monitored the sea off this outfall and found that concentrations of these substances were well below their EQSs. We are not planning any further action.

During the period 1993-1994 significant loads of hexachlorobenzene (a fungicide), malathion and dieldrin were found at Sharkham Point. The agricultural use of hexachlorobenzene has been banned in the UK since 1975. We monitored the sea off this outfall and found that concentrations of these substances were well below their EQS. We are not planning any further action.

Biological Assessment of Water Quality

Biological river quality is based on the diversity of aquatic macroinvertebrate life, the small animals present in the river. They are unable to move far and respond to long term conditions within the watercourse. This provides a good indication of the biological condition of the river. In order to present biological river quality, a Biological General Quality Assessment (GQA) Classification has been devised (see Appendix B8).

Map 22 depicts the Biological GQA data of the catchment. Biological quality is of a high standard for the majority of the Teign Catchment. The catchment supports a diverse and pollution sensitive macroinvertebrate fauna.

There are a number of stretches of upland rivers where biological quality is recorded as good. These stretches of the Rivers Teign and Bovey and Blackaton Brook miss the 'very good' category by a small margin, as a result of slightly lower diversity. This is partly due to the nature of these watercourses, but there may be a minor impact from metals.

The Blatchford Stream has been classified as having poor biological quality (see Section 4.3). This is consistent with previous surveys, and no deterioration has occurred. Also see Section 4.1 for issues relating to biological quality.

EC Freshwater Fish Directive

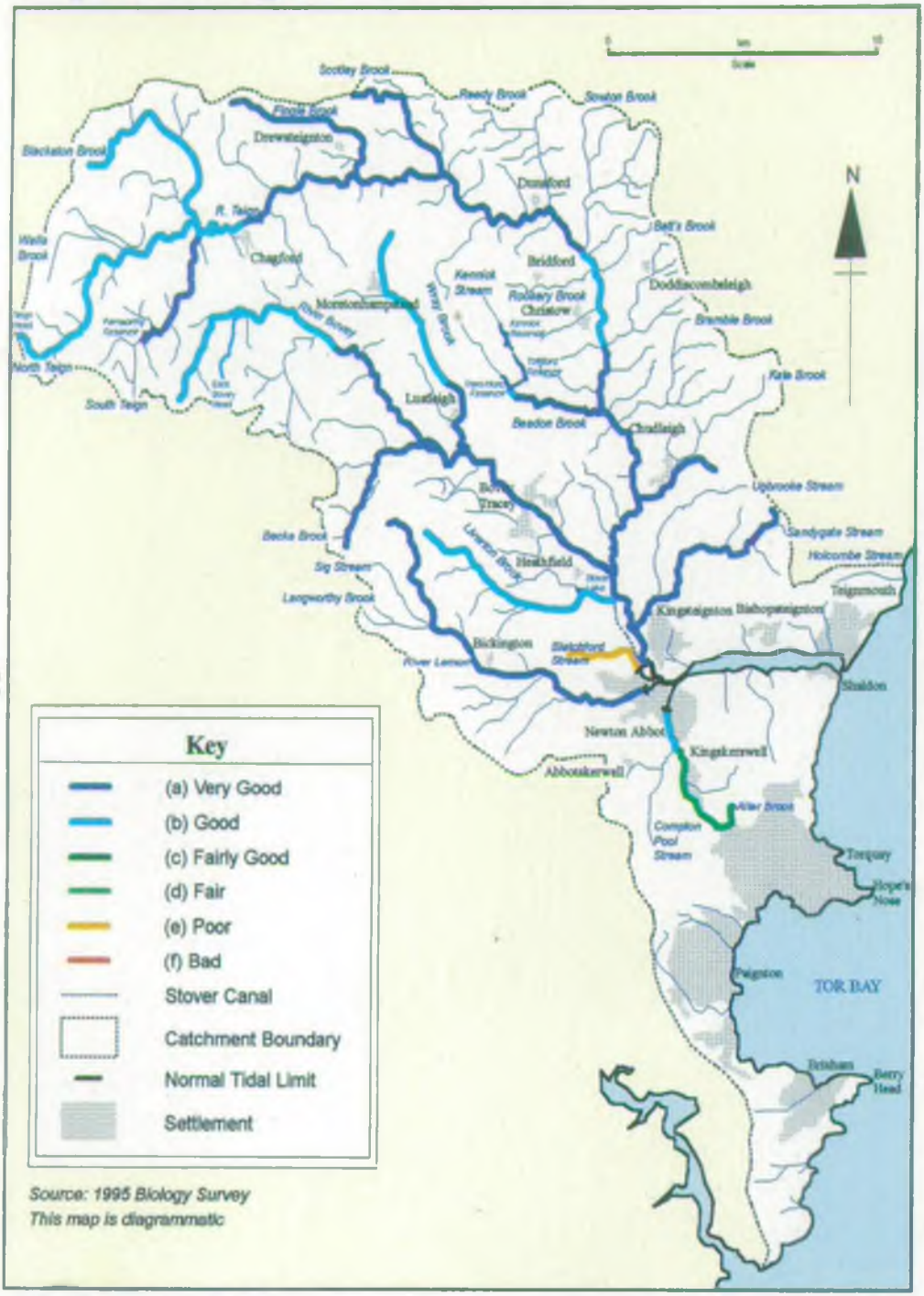
The EC Directive *on the quality of waters needing protection or improvement in order to support fish life* [37] ensures that water quality in designated stretches of water is suitable for supporting certain types of fish (also see Appendix B9).

In the Teign Catchment 76.5 km^2 of reservoirs and 76.2 km of river have salmonid designations under the EC Freshwater Fish Directive. Details of these are shown on Map 21.

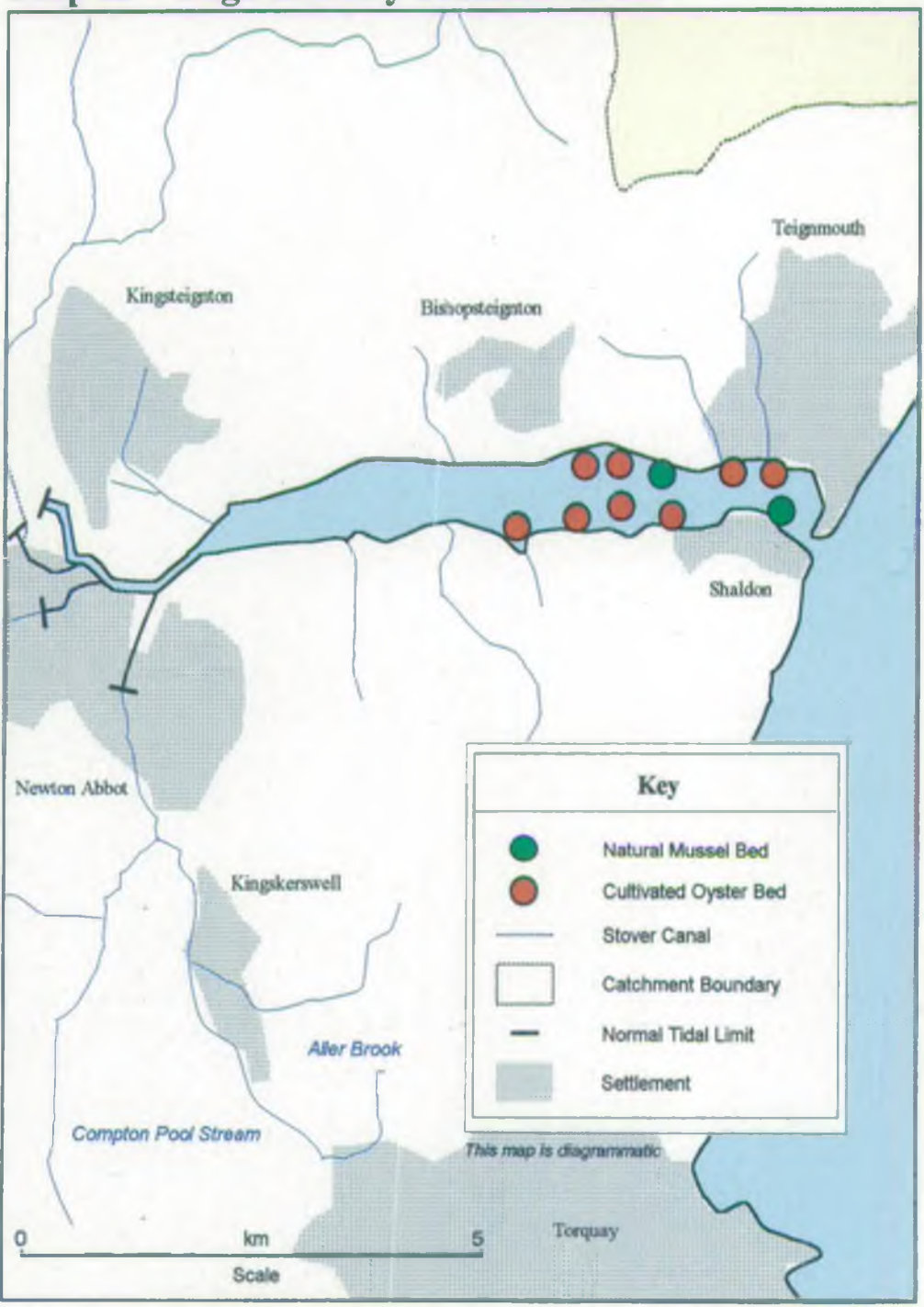
Where natural factors result in exceedences of Directive standards, derogations can be sought. Derogations for zinc apply to designated stretches of the Teign and South Teign Rivers, while pH is derogated in the North Teign River.

The River Bovey exceeded the zinc standard in 1991. The cause of this exceedence is not known (see Section 4.2).

Map 22 - Biological Classification



Map 23 - Teign Estuary Shellfish Areas



River Teign Local Environment Agency Plan
Environment Agency

In 1995 levels of dissolved oxygen in the River Lemon did not comply with the minimum standards of the Directive. This was due to low flows resulting from an exceptionally warm and dry summer (see Section 4.5).

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* [14] protects the health of consumers of live bivalve molluscs such as mussels and oysters (see Appendix B10).

All classified shellfish harvesting beds in the Teign Estuary are Class B where harvested shellfish are required to be depurated, heat treated or relayed to meet Category A prior to marketing.

EC Shellfish Waters Directive

This Directive *on the quality required of shellfish waters*[15] protects shellfish populations (defined as bivalve and gastropod molluscs) from harm caused by pollution (see Appendix B11).

There are no areas designated under the Shellfish Waters Directive in the catchment. However, the waters designated under this Directive are being reviewed.

Note: The Teign Musselmen's Society made a request to the Secretary of State for the Environment for the Teign Shellfish beds (as set out in the 'River Teign Mussel Fishery Order 1966') to be designated under this Directive, in June 1996.

Non-designated Shellfish Waters

There are two sites in the Teign Estuary where shellfish (oysters) are harvested. We monitored water quality and the quality of shellfish (oyster) tissue at these sites in 1993. Water quality and the quality of shellfish were assessed using the EC Shellfish Waters Directive standards. Levels of monitored substances in the water column were all below EQS.

The concentrations of organochlorine compounds in tissue samples were all within the typical range expected for shellfish. Tissue levels of cadmium, copper, arsenic, nickel, zinc and mercury were all within the typical range expected in oysters.

The shellfish (mussel and oyster) areas in the Teign Estuary are shown on Map 23.

6.2 Air Quality

Air quality is another indicator of environmental quality. Air pollution may be in the form of gas or particulate matter. Its dispersion and dilution depends on climatic conditions.

Main Emission Sources

The main emission sources that influence air quality are:

- **Industrial** - sites registered under Integrated Pollution Control (IPC), Local Authority Air Pollution Control (LAAPC), Clean Air Act and others;
- **Traffic** - especially in urban environments;
- **Domestic** - for example from gas, coal, oil fired boilers or open flame; and

- **Diffuse** - from, for example, sewage treatment works, agricultural and landfill sites.

We do not have powers to regulate LAAPC, domestic, traffic or diffuse sources such as agricultural, but we do for Landfill and IPC. However, we can indicate where we feel attention ought to be directed in order to improve conditions locally or nationally. The roles of other organisations are detailed below:

- The **Department of Transport** (DTp) enforces controls on vehicle manufacturers;
- The **Health and Safety Executive** monitors the nuclear industry and issues site licences etc.;
- The **County Council** Structure Plan contains policies on the need to control pollution and the County Analyst provides an analytical service for District Council Environmental Health Officers (EHO's);
- **District Councils** Environmental Health Departments regulate air pollution from industrial premises under Part I of the Environmental Protection Act 1990[4]. These are premises with generally a lesser potential to pollute than those the Agency regulates. The processes concerned are known as Part B processes and only the releases to the air are controlled. District Councils also deal with a wide range of non-industrial and other forms of pollution, such as smells from domestic and agricultural premises, smoke from outdoor burning and noise pollution; dealing with the types of problems that constitute a 'statutory nuisance';
- The Motor Vehicle (Construction and Use) Regulations govern the standards of emissions from new vehicles. Vehicle exhaust emission standards are part of the MOT test but there is very little control of emission from vehicles in transit. The **Police** are responsible for controlling emissions from vehicles, but can only stop vehicles if the exhaust is so smokey that it presents a hazard to other motorists.

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.

Local Air Quality Management

Local authorities are due to take on new responsibilities for assessing and managing air quality under the Environment Act[1] 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.

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).

The Agency has published 'The Environment of England and Wales - a Snapshot' [40] which describes the state of the environment, including air, in the UK.

Ground Level Ozone

Ozone in the upper atmosphere shields the earth from harmful Ultra-Violet 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 [40].

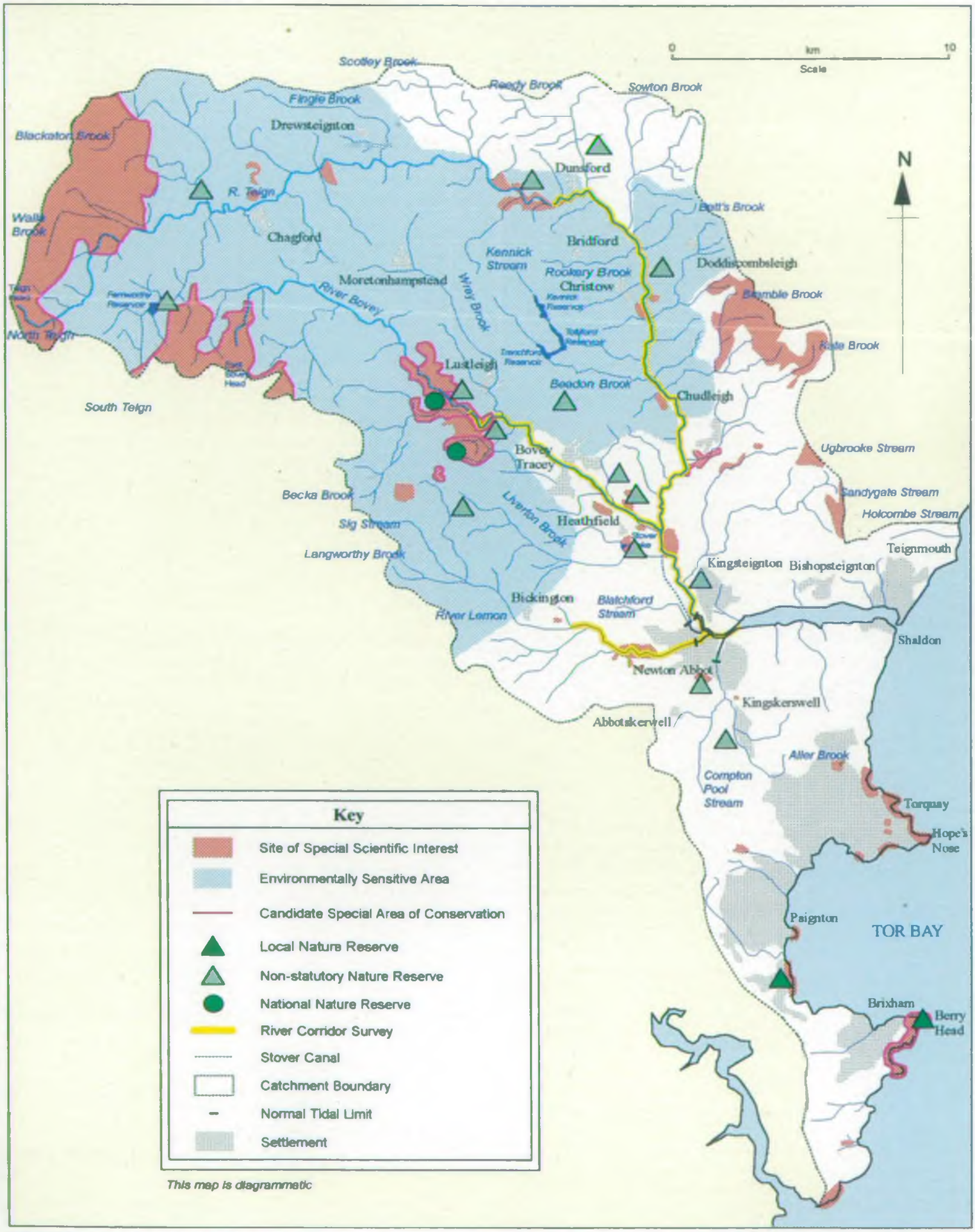
6.3 Contaminated Land

The Environment Act 1995[1] 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 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 are 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.

Catchment Status

The precise nature and full extent of contaminated land 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).

Map 24 - Nature Conservation



This map is diagrammatic

All open and closed non-inert landfill sites are by definition contaminated sites, but other waste management activities may have the potential to cause contamination. Current landfill management is addressed in Section 5.4.

The other main potential causes of contamination within the catchment is industry, including mining and quarrying; issues relating to these activities can be found in Section 4. Due to the rural nature of much of the catchment, industry is largely concentrated in current and former industrial estates. However, it should not be forgotten that a large number of non-industrial activities have the potential to cause contamination, for example, agriculture, petrol filling stations or even domestic oil storage.

6.4 Conservation of the Natural Environment

Large parts of the catchment are covered by conservation designations, particularly in the upper reaches and along the coast. Three groups of sites are considered to be of international importance; three locations for their populations of greater horseshoe bats, an extensive area of Dartmoor for blanket bog, and Bovey Valley and Yarner Wood (part of South Dartmoor Woods). These three groups are candidate Special Areas of Conservation under the EC Habitats Directive [12]. This directive, and its implementing legislation in this country, place additional duties on the Environment Agency. We will need to review consents and other authorisations which may adversely affect these sites.

Most of the upper half of the catchment is within Dartmoor National Park. In addition there are some 45 Sites of Special Scientific Interest (SSSI's) throughout the catchment (see Map 24). About half are notified for their biological interest, while the remainder are geological sites, perhaps reflecting the very diverse geology of the catchment. The Bovey Valley Woodlands and Yarner Wood are both in the proposed Special Area of Conservation (SAC) for South Dartmoor Woods (as mentioned above) and National Nature Reserves open to the public, but most SSSI's are privately owned and access may not be permitted. Appendix E provides further details on these sites in this catchment.

The intertidal and subtidal areas of Tor Bay cohave been defined as a Sensitive Marine Area.

In addition there are a large number of sites of lesser importance; Devon Wildlife Trust (DWT) have carried out a survey programme to identify sites which qualify as County or Local Wildlife Sites. Generally, these sites do not have any statutory protection, but they are recognised as being important at a local level and may be 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. Some sites are also identified as Local or Non-statutory Nature Reserves, for example DWT and RSPB Reserves (see Map 24 and Appendix E).

Two major initiatives are underway to help define priorities and objectives for wildlife and earth science conservation. The *Countryside Character programme*, from Countryside Commission, and 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, to provide a framework for local biodiversity and geology action plans. Most of the Teign Catchment falls within the Dartmoor and South Devon Natural Areas, with smaller, eastern and northern parts included in the Culm and Devon Redland Areas. The coast 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 (see box).

Conservation effort is now largely being targeted through Biodiversity Action Plans (BAPs), which use a prioritisation process to agree, among all involved parties, on what and where to concentrate efforts. BAPs are derived from the UK BAP, via a regional stage, to county and more local plans. 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 addressed. A Dartmoor BAP will be developed shortly from the biodiversity profile mentioned above.

Loss or deterioration of semi-natural habitats is a serious and continuing problem almost everywhere. This catchment is no different, with threats from several directions (see Section 4). Agricultural intensification or neglect, new urban and suburban development and mineral extraction all contribute to the losses, while the effect of some other impacts, such as deteriorating air quality, have been shown to be significant in some areas but are harder to quantify or control.

Key Wetland Habitats
Blanket bog
Valley mire
Purple moor grass meadows
Lowland heath
Fast-flowing acidic rivers
Wet woods
Bovey Basin ponds
Marine caves
Tidal swept channels

Key Geological Features
Granite and surrounding rocks
Extensive peat deposits
Periglacial features
Coastal features
Limestone caves
Sticklepath Fault

Key Wetland Species
Salmon
Freshwater pearl mussel
Yellow skirt sea slug
Keeled skimmer dragonfly
Southern damselfly
Marsh fritillary
Three-lobed water crowfoot
Wild daffodil

Species protection is often achieved through actions to conserve habitats, although there are sometimes more particular actions which need to be carried out. The species listed here include some whose status in this catchment is uncertain, but which have been present in the past.

Guillemots are the only key species not currently under threat in this catchment. Guillemots breed in large numbers on the cliffs at Berry Head, one of the best colonies on the South Coast. The cliffs are also extensively used for climbing and there is a potential conflict which is currently well managed, avoiding undue disturbance of nesting birds. Sea birds are vulnerable to oil pollution from offshore sources and batches of oiled birds are not an uncommon sight. A charitable trust is located in Teignmouth, who are able to clean and rehabilitate these casualties. We can offer practical help in retrieving oiled birds. Losses of auks to monofilament nets has been a problem elsewhere in the South West. This colony is not threatened as a result of good practice, co-operation by fishermen and monitoring of the situation by Devon Sea Fisheries Committee.

6.5 Fisheries

Salmonid Species

The River Teign is important for salmon and sea trout, sustaining a significant run of both species; the River Teign is one of the most important sea trout rivers in England and Wales. Brown trout are widespread in the middle and upper reaches of the river.

The main spawning areas and juvenile nursery areas are surveyed every three years, the most recent survey being in 1996 (see Maps 25-28). The most important areas for juvenile production tend to be in the upper reaches of the system although some spawning of all salmonid species is known to take place further downstream. Where numbers of juvenile salmon show 'cause for concern' issues and draft actions proposed to resolve them are shown in Section 4.

Although salmon and sea trout are known to be entering the Teign system throughout the year, the majority of the salmon run occurs in August through to early October when fish ascend the river to access spawning areas in the upper reaches. The peak run of sea trout tends to occur earlier in the year, generally in May and June. The majority of salmonid spawning in the Teign takes place in the late autumn and early winter months although some spawning as late as February has been observed in the lower reaches by late running winter 'Greenbacks'.

The run of salmon is dominated by grilse of around 3 kg weight which are returning to the river having spent a single year at sea. The proportion of fish running the river in the Spring 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 Southwest.

Coarse Species and Eels

Map 29 shows the coarse fish distribution in the catchment.

Dace are common in the middle and lower reaches of the Teign, and large shoals may often be observed in this area. Pike have been seen in the Teign as far up as the Teign/Bovey confluence, but are found more commonly further downstream. Carp, which probably originate from the nearby Rackerhayes ponds, are also found in the lower reaches. The Stover Canal is known to support a variety of coarse species.

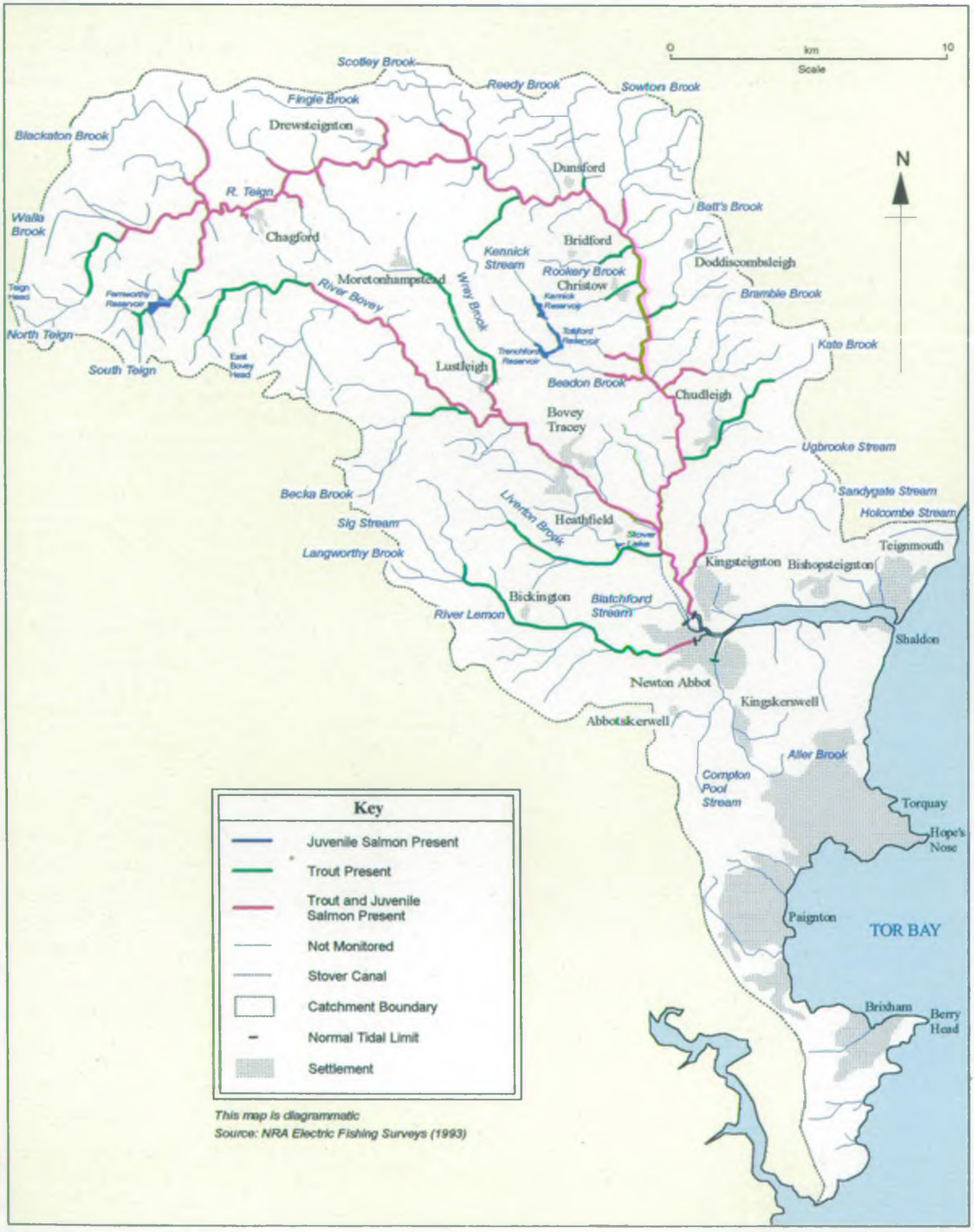
In the remainder of the freshwater river, bullheads, stoneloach and minnows are widespread. Eels are found in most parts of the catchment, but are most common in the lower reaches and the estuary. Brook lampreys are also known to be present in the River Lemon.

Coarse fish are also found in a number of stillwaters in the lower catchment which are managed by local angling clubs as fishing ponds.

Estuarine Species

The Teign Estuary is a designated bass nursery area. This affords protection for juvenile bass which proliferate in the tidal reaches at certain times of the year. Mullet are also common and often move upstream with the tide in large shoals, occasionally beyond the tidal limit. Molluscan shellfish are common in the estuary, mussels and oysters being of particular importance.

Map 25 - Salmonid Distribution



This map is diagrammatic

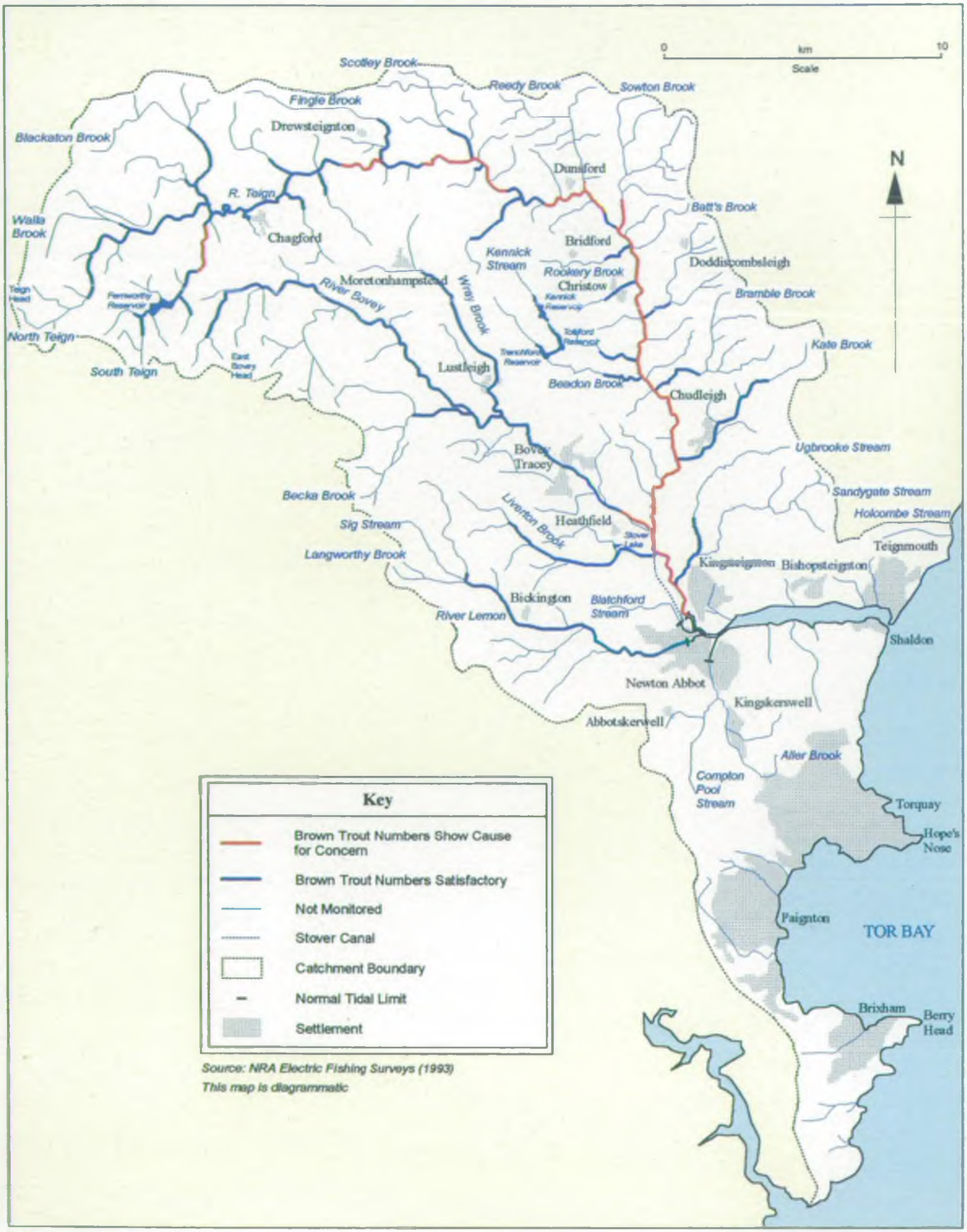
Source: NRA Electric Fishing Surveys (1993)

Map 26 - Juvenile Salmon Fisheries Status

This map is diagrammatic

Source: NRA Electric Fishing Surveys (1993)

Map 27 - Brown Trout Fisheries Status

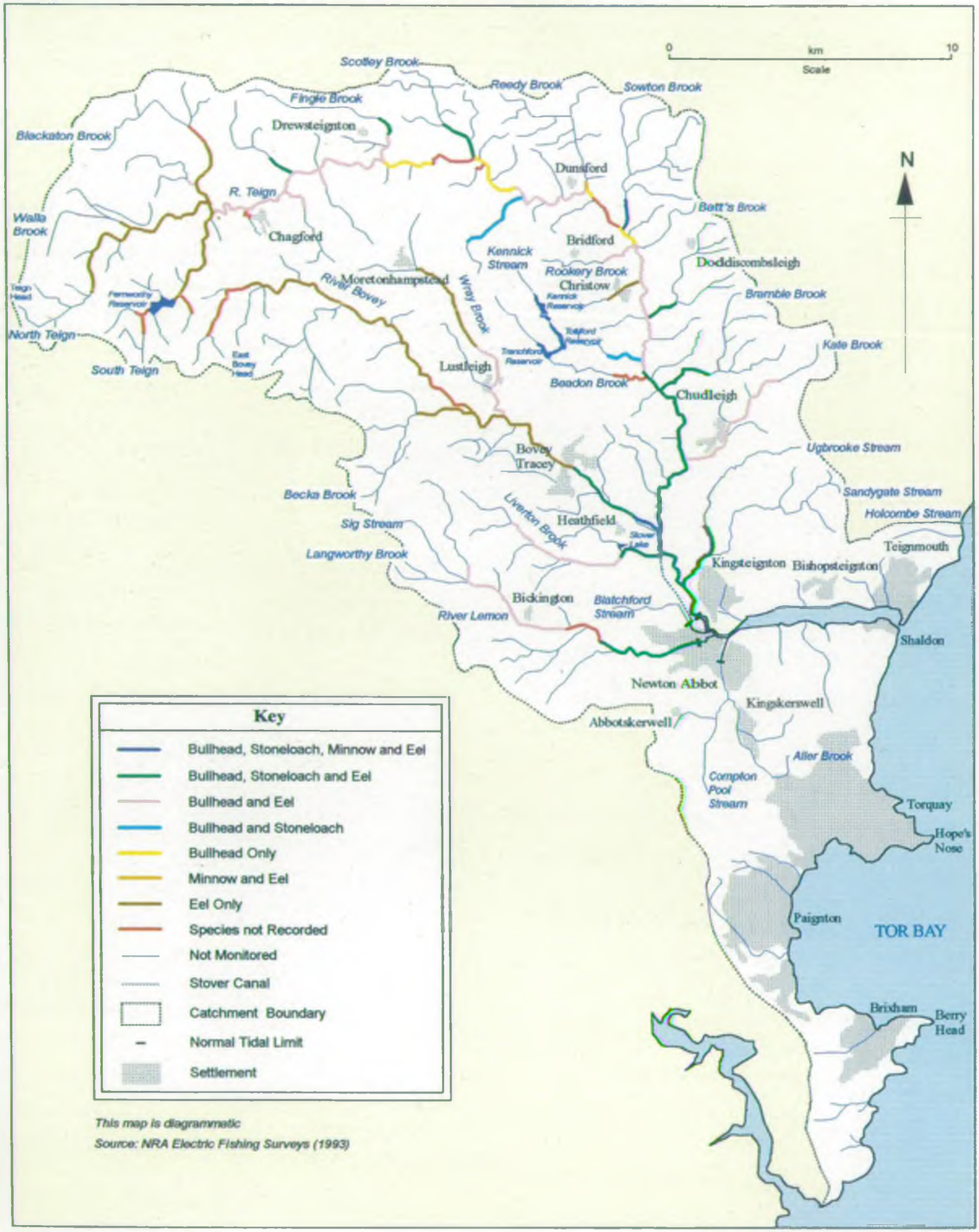


Source: NRA Electric Fishing Surveys (1993)

This map is diagrammatic

Map 28 - Spawning Gravels

Map 29 - Coarse Freshwater Fish Distribution



This map is diagrammatic

Source: NRA Electric Fishing Surveys (1993)

Commercial Fisheries

There are ten licences issued for seine netting of salmon and migratory trout in the Teign Estuary. Licensed nets are allowed to operate in the period 15 March - 31 August. 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. Increased licence fees, alteration in the timing of the run, and availability of manpower have all contributed to a recent reduction in the number of licences taken out. In 1996 only four of the ten available licences were used to any effect.

Fyke nets licensed by the Agency are occasionally operated in parts of the Teign and in the estuary for the capture of eels; otter guards, which prevent otters getting trapped in these nets are a legal requirement. This activity is presently carried out on a relatively small scale.

The bass nursery area prohibits the capture of bass from a boat during the period 1 May - 31 October, although fish taken by rod and line are permitted if above the minimum size limit. A limited number of bass are taken in the estuary outside this period. There is a viable fishery for grey mullet which are taken in drift nets from the middle and upper reaches of the estuary.

The most important commercial fishery in the estuary is for shellfish. Large quantities of edible mussel are harvested during the winter months from beds in the inter-tidal zone. Seed mussel is often imported from adjacent estuaries to supplement natural recruitment to the beds. The shellfish harvesting beds between a line drawn from Archbrook to Luxtons steps on the east and a line drawn 20 m upstream of Shaldon Bridge to the west; are protected by the 'River Teign Mussel Fishery Order 1966' (varied to include Oysters in February 1996). This order is vested in the Teign Musselmen's Society and expires in 2029. Mussels and oysters may not be taken from this area without a licence issued by the Society. Oysters are increasing in importance in the estuary and are farmed in large numbers in the lower estuary. Cockles, winkles and clams are also harvested to a lesser degree. Also see Section 6.1 on the Shellfish Directives.

The collection of recently moulted shore crabs ('peelers') for sale as angling bait is widespread throughout the lower estuary.

Sea fisheries in the Teign Estuary are regulated and managed by the Devon Sea Fisheries Committee, and the Bass nursery area by MAFF; we assist MAFF with the enforcement of bass legislation.

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Appendix A: 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 **Navigation** function is responsible for managing and improving over 800 km of inland waterways, the Harbour of Rye and Dee Estuary. Its aim is to make these resources widely available to the public for water or land based recreational use.

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.

What we do not do

We do not cover all aspects of environmental legislation and service to the general public. Local authorities deal with all noise problems, litter and air pollution arising from vehicles, household areas, small businesses and small industries.

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.

Environmental Health issues should also be directed to your Local Authority.

Appendix B: 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.

B1: 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

B2: 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.

Set aside of data

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. A manual has been published (NRA, 1994) which describes how data may be set aside.

In slower-flowing, nutrient-rich rivers, substantial growth of planktonic algae can occur. During laboratory analysis the algal cells can exert a high BOD. However, these elevated values do not necessarily represent the BOD exerted in rivers, or that resulting directly from effluent discharges. If these results are not discounted when we assess compliance, there is a risk that we will falsely

identify a river as being non-compliant, and therefore investment to improve discharges may not be targeted efficiently.

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 $CaCO_3$	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.

B3: 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 sticks	Visual inspection	Absent

B4: 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					
			A1		A2		A3	
	Parameters		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	$\mu s/cm^{-1}$ at 20°C	1000	-	1000	-	1000	-
6	Odour	(dilution factor at 5°C)	3	-	10	-	20	-
7	Nitrates	mg/l NO_3	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
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

Characteristics of Surface Waters Intended for the Abstraction of Drinking Water			Categories					
			A1		A2		A3	
Parameters			G	I	G	I	G	I
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_4	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_2O_5	0.4	-	0.7	-	0.7	-
31	Phenols (phenol index) paranitraniline 4 aminoantipyrine	mg/l C_6H_5OH	-	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_2	-	-	-	-	30	-
36	Dissolved oxygen saturation rate	% O_2	> 70	-	> 50	-	> 30	-
37	Biochemical oxygen demand (BOD_5) (at 20°C with nitrification)	mg/l O_2	< 3	-	< 5	-	< 7	-
38	Nitrogen by Kjeldahl method (except NO_3)	mg/l N	1	-	2	-	3	-
39	Ammonia	mg/l NH_4	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

B5: 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 [1]
Mercury	µg Hg/l	1.0	AA,T
Cadmium [2]	µg Cd/l	5.0 1.0	AA,T AA,T,B [4]
Hexachlorocyclohexane (HCH) [2]	µg/l	0.1 0.05	AA,T AA,T,B [4]
Tetrachloromethane (CTC)	µg/l	12	AA,T
DDT (para-para DDT isomer) [2]	µg/l	0.01	AA,T
Total DDT [2]	µg/l	0.025	AA,T
Pentachlorophenol (PCP) [2]	µg/l	2	AA,T
'The Drins' (from 1 Jan 1989)	µg/l	0.03 [3]	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) [2]	µg/l	0.03	AA,T
Hexachlorobutadiene (HCBD) [2]	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 [1]
Mercury [2]	µg Hg/l	0.3	AA,D
Cadmium [2]	µg Cd/l	2.5	AA,D
Hexachlorocyclohexane (HCH) [2]	µg/l	0.02	AA,T
Tetrachloromethane (CTC)	µg/l	12	AA
DDT (para-para DDT isomer) [2]	µg/l	0.01	AA
Total DDT [2]	µg/l	0.025	AA
Pentachlorophenol (PCP) [2]	µg/l	2	AA
'The Drins' (from 1 Jan 1989)	µg/l	0.03 [3]	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) [2]	µg/l	0.03	AA
Hexachlorobutadiene (HCBD) [2]	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) [1]

Parameter	Units	Value [3]		Hardness ($mg\ CaCO_3/l$)	Status [2]
		A Std	B Std		
Lead	µg Pb/l	4	50	0 to 50	AA,D
		10	125	50 to 100	
		10	125	100 to 150	
		20	250	150 to > 250	
Chromium	µg Cr/l	5	150	0 to 50	AA,D
		10	175	50 to 100	
		20	200	100 to 150	
		20	200	150 to 200	
		50	250	200 to > 250	
Zinc	µg Zn/l	8	75	0 to 50	AA,T
		50	175	50 to 100	
		75	250	100 to 150	
		75	250	150 to 200	
		75	250	200 to 250	
		125	500	>250	
Copper	µg Cu/l	1	1	0 to 50	AA,D
		6	6	50 to 100	
		10	10	100 to 250	
		28	28	150 to >250	
Nickel	µg Ni/l	50	50	0 to 50	AA,D
		100	100	50 to 100	
		150	150	100 to 200	
		200	200	200 to > 250	
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	20	0 to 200	AA,T
		60	60	200+	
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 [1]	Status [2]
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 [3]	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.

B6: 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.

B7: Annex 1A Reduction Programme

At the second and third North Sea Conferences in 1987 and 1990, the UK Government made a commitment to reduce the load (load = concentration × flow) of certain substances known as Annex 1A substances (listed below) entering tidal waters from rivers and direct discharges. Loads of most Annex 1A substances were to be reduced by 50%, and loads of mercury, cadmium and lead were to be reduced by 70%, by 1995 compared to a 1985 baseline (or a 1991/1992 baseline where data for 1985 is unavailable).

We are responsible for carrying out monitoring and identifying significant sources of the following substances. We identify significant sources by ranking loads of Annex 1A substances in rivers and direct discharges according to their size. A discharge is significant if it belongs to the group of discharges that contribute the first 95% of the total load entering tidal waters. In accordance with DoE guidelines we identify where reductions can be made.

Third North Sea Conference - Priority Hazardous Substances (Annex 1A List of Substances)

Mercury
Cadmium
Copper
Zinc
Lead
Arsenic
Chromium
Nickel
Aldrin
Dieldrin
Endrin
Isodrin
HCH
DDT
Pentachlorophenol
Hexachlorobenzene
Hexachlorobutadiene
Carbon tetrachloride
Chloroform
Endosulphan
Simazine
Atrazine
Triorganotin compounds
Azinphos-ethyl
Azinphos-methyl
Fenitrothion
Fenthion
Malathion
Parathion
Parathion-methyl
Dichlorvos
Trichloroethylene
Tetrachloroethylene
1,1,1-trichloroethane
Trichlorobenzene
1,2-dichloroethane
Polychlorinated biphenyls
Dioxins (*)
Trifluralin

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.

B8: 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.

B9: 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		
	G	I	G	I	
Dissolved Oxygen as mg/l O_2	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_2	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 $CaCO_3$)				
	0-50	-	0.03	-	0.30
	50-100	-	0.20	-	0.70
	100-250	-	0.30	-	1.00
	>250	-	0.50	-	2.00
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.

B10: 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.

B11: 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 C: Pollution Events

The following is a summary of confirmed pollution incidents, the majority of which were recorded as minor.

Origin of Pollution	No. of Incidents			
	1992	1993	1994	1995
Farm	21	15	13	20
Oil	12	5	3	7
Trade	16	11	11	19
Sewage - Storm Overflow	27	48	31	17
Vehicle	3	5	9	23
Misc./Other	85	84	84	87
Not Found	21	23	17	6
Total	185	191	168	179

Appendix D: Waste Categories

Waste Category A

Soil
Rock
Stone
Clay
Sand
Brick Bats
Slates
Uncoated clay-based tiles

Exclusions

Wastes included in this category are **not** permitted if they:

(a) are mixed with or contaminated with any material other than those listed in Category A above, or
(b) are in sludge or liquid form, or
(c) contain concentrations of contaminants above those given as "Threshold Values" in the Inter-Departmental Committee for the Redevelopment of Contaminated Land, or
(d) are in a dust, ash, powdered or particulate form.

Waste Category B:

Brickwork & concrete (hardcore)
Weathered/ excavated coated roadstone (tarmac)
Weathered/ excavated cement and cement products
Glass, pottery, ceramics, china, enamels (baked and finished products) and mica
Silica
Plastics (as finished products or manufacturing scrap)
Metal (iron, steel, aluminium, brass, copper, tin, zinc)
Incinerator residues (excluding household, difficult and special wastes)

Exclusions

Wastes included in this category are **not** permitted if they:

(a) are mixed with or contaminated with any materials other than those listed in Category A or B above, or
(b) are in sludge or liquid form (not self supporting), or
(c) contain concentrations of contaminants above those given as "Threshold Values" in the Inter-Departmental Committee for the Redevelopment of Contaminated Land, or
(d) are in a dust, ash, powdered or particulate form and are not double bagged in polythene or other suitable handling means as agreed in writing by the Agency prior to its acceptance of the material.

Waste Category C:

Waste food
Household waste (or similar waste from institutional, industrial or commercial premises) - including separately collected fractions
Garden, arboricultural, botanical, aquacultural and horticultural waste (excluding chemicals)
Plasterboard
Wood, wood products and wood based processing wastes
Leather
Incinerator residues
Treated sewage sludge
Road gully and sweeping detritus
Natural and man made fibres
'Fresh' Cement
Packaging, absorbents, wiping cloths, filter materials, protective clothing
'Fresh' coated roadstone (tarmac and bitmac)

Exclusions

Wastes included in this category are not permitted if they:

(a) are mixed with or contaminated by any wastes not authorised elsewhere in this licence, or
(b) are in a liquid or sludge form (not self supporting), or
(c) contain concentrations of contaminants above those given as "Action Values" in the Inter-Departmental Committee for the Redevelopment of Contaminated Land, or
(d) are in a dust, ash, powdered or particulate form and are not double bagged in polythene or other suitable handling means as agreed in writing by the Agency prior to its acceptance of the material.

Waste Category D: Difficult Wastes

Waste Management Paper No 26 contains a classification of Difficult wastes to which this category applies. From the Difficult Wastes classification only the following types of waste are authorised by this licence:

C12 Calcium oxide
C91 Calcium hydroxide
C92 Sodium and/or potassium carbonate
J12 Asbestos - hard bonded types only
J40 Silt and Dredging
L20 Finished products and manufacturing scrap
L60 Ion-exchange resin wastes
M40 Vegetable and other oils
M60 Fats, waxes and greases
Q10 Used filter materials e.g. kieselguhr, carbon, filter cloths
Q20 Contaminated rubbish (including bags and sacks) - *But only if contaminated by wastes authorised elsewhere by this licence.*
Q30 Empty used containers - *Must be decontaminated if previously contained o moterial not authorised by this licence.*
S20 Cellulose wastes (natural and synthetic)
S50 Soap and detergents
T20 Food Processing wastes (including starch)

Wastes within this category will be permitted in quantities in **combined total** up to 5% by weight of the monthly intake of category C wastes and only into cells of waste having sufficient absorptive capacity.

Exclusions

Wastes included in this category are **not** permitted if they:

(a) are mixed with or contaminated by any wastes not authorised elsewhere in this licence, or
(b) are in a liquid or sludge form (not self supporting), or
(c) are in a dust, ash, powdered or particulate form and are not double bagged in polythene or other suitable handling means as agreed in writing by the Agency prior to its acceptance of the material.

Waste Category E: Clinical Wastes

Clinical waste Groups A to E as categorised in the Health and Safety Commission document on the safe disposal of clinical waste (1992 revision) and listed below:

Group A

All human tissue, including blood (whether infected or not), animal carcasses and tissue from veterinary centres, hospitals or laboratories and all related swabs and dressings.
Waste materials where the COSHH assessment indicates a risk to staff handling them, for example from infectious disease cases.
Soiled surgical dressings, swabs and other soiled waste from treatment areas.

Group B

Discarded syringe needles, cartridges, broken glass and any other contaminated disposable sharp instruments or items.

Group C

Microbiological cultures and potentially infected waste from pathology departments (laboratory and post-mortem rooms) and other clinical or research laboratories.

Group D

Certain pharmaceutical products and chemical wastes.

Group E

Items used to dispose of urine, faeces and other bodily secretions or excretions assessed as not falling within Group A. This includes used disposable bed pans or bed pan liners, incontinence pads, stoma bags and urine containers.

Category F:

Fibrous asbestos is found commonly in three forms, crocidolite (blue), amosite (brown) and chysotile (white). It also occurs as anthophyllite, tremolite and actinolite. The handling and disposal of this material shall have due regard to the relevant information contained within the following Regulations and Code of Practice:

- The Control of Asbestos at Work Regulations 1987 (S.I. 1987 No. 2115);
- The Control of Asbestos at Work (Amendment) Regulations 1988 (S.I. 1988 No. 712);
- The Control of Asbestos at Work (Amendment) Regulations 1992 (S.I. 1992 No. 3068);
- Waste Management Paper Number 18 - Asbestos Waste;
- IWM Code of Practice for the Disposal of Asbestos Waste.

Waste Category G: Special Waste

Special Waste shall apply to any controlled waste which;

(a) consists or contains any of the substances listed in Part I (below) and by reason of the presence of such substance,
  (i) is dangerous to life within the meaning of Part II (below), or
  (ii) has a flash point of 21°C or less as determined by the methods and with the apparatus laid down by the British Standards Institution in BS3900: Part A, 8: 1976 (EN53),or

(b) is a medicinal product, as defined in Section 130 of the Medicines Act 1968(b), which is available only in accordance with a prescription given by an appropriate practitioner as defined in Section 58(1) of that Act.

SCHEDULE 1

Part I

Acids and alkalis
Antimony and antimony compounds
Arsenic Compounds
Asbestos (all chemical forms)
Barium compounds
Beryllium and beryllium compounds
Biocides and phytopharmaceutical substances
Boron compounds
Cadmium and cadmium compounds
Copper compounds
Hexavalent chromium compounds
Heterocyclic organic compounds containing oxygen, nitrogen or sulphur

Hydrocarbons and their oxygen, nitrogen or sulphur compounds
Inorganic cyanides
Inorganic halogen-containing compounds
Inorganic sulphur-containing compounds
Laboratory chemicals
Lead compounds
Mercury compounds
Nickel and nickel compounds
Organic halogen compounds, excluding inert polymeric materials
Phosphorus and its compounds
Peroxides, chlorates, perchlorates and azides
Silver compounds
Pharmaceutical and veterinary compounds
Tellurium and tellurium compounds
Selenium and selenium compounds
Vanadium compounds
Tarry materials from refining and tar residues from distilling
Thallium and thallium compounds
Zinc compounds

Part II

1. Waste to be regarded as dangerous to life for the purposes of these regulations if;
   (a) a single dose of not more than five cubic centimetres would be likely to cause death or serious damage to tissue if ingested by a child of 20 kilograms' body weight, or
   (b) exposure to it for fifteen minutes or less would be likely to cause serious damage to human tissue by inhalation, skin contact or eye contact.

2. Special waste delivered to the site. These may include any of the Department of the Environment Categories:

Waste Category		**Typical examples**
A	Inorganic acids	Hydrochloric, sulphuric acids
B	Organic acids	Acid anhydrides
C	Alkalis	Ammonia
D	Toxic metal compounds	cadmium, mercury, lead solutions
G	Metal Oxides	cadmium oxide
H	Inorganic compounds	cyanide, arsenic, nitrates
J	Other inorganic materials	asbestos
K	Organic compounds	phenols, peroxides, trichloroethene, alcohols
M	Fuels, oils and greases	petrol, diesel, paraffin, vegetable oil
N	Fine chemicals and biocides	pesticides, herbicides
P	Miscellaneous chemical waste	lab. chemicals, unidentified cans, bottles etc.
R	Tars, paint, dyes and pigments	paint, ink, varnish
T	Animal and food waste	blood, fat, glue

Appendix E: List of Nature Conservation Sites in the Catchment

Sites of Special Scientific Interest

Aller Sand Pit	SX 880 695	Geological
Babbacombe Cliffs	SX 928 662	Geological and palaeontological
Berry Head to Sharkham Point	SX 947 565	Geological plus limestone grassland with plant interest and sea cliffs with bird and mammal interest
Bovey Heathfield	SX 823 766	Lowland heath with invertebrate interest
Bovey Valley	SX 770 810	Semi-natural woodland with lichen and bryophyte interest
Buller's Hill Quarry	SX 882 847	Geological
Brocks Farm	SX 842 758	Herb-rich meadow
Chipley Quarries	SX 808 721	Geological
Chudleigh Caves and Woods	SX 866 785	Limestone woods and caves with floral and faunal interest
Chudleigh Knighton Heath	SX 838 776	Lowland heath with floral and faunal interest
Crockham Quarry	SX 848 808	Geological
Daddyhole	SX 927 628	Geological, palaeontological, plant and animal interest
Dyer's Quarry	SX 922 628	Geological and palaeontological
East Dartmoor	SX 695 815	Heather moorland with acid grassland and valley mires
East Ogwell Quarry	SX 839 706	Geological and palaeontological
Froward Point	SX 905 497	Coastal heath and coastal grassland
Great Haldon Heaths	SX 900 785	Lowland heath
Haldon Forest	SX 886 838	Bird and invertebrate interest with some lowland heath
Haytor Rocks and Quarries	SX 757 770	Geological
Haytor and Smallacombe Iron Mines	SX 773 772	Geological and mammal interest
Hopes Nose to Walls Hill	SX 944 633	Botany, especially of limestone grassland, plus geology
Kent's Cavern	SX 934 641	Geological and palaeontological
Little Haldon Heaths	SX 915 762	Lowland heath
Lower Dunscombe Farm Quarry	SX 886 790	Geological
Lummaton Quarry	SX 912 665	Palaeontological
Meadfoot Sea Road	SX 934 633	Geological
New Cut	SX 935 657	Geological and palaeontological
North Dartmoor	SX 580 850	Western blanket bog and valley mire with bird interest
Occombe	SX 876 634	Unimproved grassland plus associated habitats
Ransley Quarry	SX 844 701	Geological and palaeontological
River Lemon Valley Woods	SX 837 710	Calcareous ancient woodland plus geological and palaeontological
Roundham Head	SX 898 601	Geological
Rushford Wood	SX 703 898	Pedunculate oak/hazel wood with lichen interest
Ryecroft Quarry	SX 843 847	Geological
Saltern Cove	SX 895 585	Geological plus intertidal communities
Scabbacombe	SX 916 522	Plant interest
Southacre Clay Pits	SX 853 754	Geological
Spara Bridge	SX 841 845	Geological
Stover Park	SX 833 751	Open water habitat plus invertebrate interest
Teign Valley Woods	SX 798 883	Upland oak/hazel woodland
Tower Wood Quarry	SX 877 857	Geological
Ugbrooke Park	SX 870 779	Lichen communities and species

Widdon Deer Park	SX 725 893	Pasture woodland with lichen and invertebrate interest
Wolborough Fen	SX 864 701	Wetland habitats with plant, fungus and insect interest
Yarner Wood and Trendlebere Down	SX 778 788	Ancient oak woodland, heathland, grassland and valley mire

Candidate Special Areas of Conservation

Dartmoor - East Dartmoor SSSI and North Dartmoor SSSI (Blanket bog)

South Dartmoor Woods - Bovey Valley SSSI and Yarner Wood SSSI (Western acidic oak wood)

South Hams - Berry Head to Sharkham Point SSSI (Greater horseshoe bat)
Chudleigh Caves and Woods SSSI
Haytor and Smallacombe Iron Mines SSSI

National Nature Reserves

Bovey Valley
Yarner Wood

Local Nature Reserves

Berry Head
Sugar Loaf and Saltern Cove

Non-statutory Nature Reserves

Blackaton Wood, Gidleigh (WT)	Dartmoor oak wood	SX 677 885
Chudleigh Knighton Heath, Bovey Tracey (DWT)	Lowland heathland	SX 837 776
Dunsford Wood, Bridford (DWT)	Woodland, heath and grassland	SX 798 875
Fernworthy Reservoir (DBWPS)	Open water, meadow, wood, scrub	SX 665 842
Great Plantation, Dunsford (WT)	Woodland	SX 823 903
Hisley Wood, Lustleigh (WT)	Woodland with lower plant interest	SX 777 805
Little Bradley Ponds, Bovey Tracey (DWT)	Ponds and other habitats	SX 827 777
Lower East Lounston, Ilsington (DWT)	Woodland, meadow, bracken	SX 791 750
Mill Bottom, Lustleigh (DWT)	Woodland and stream	SX 786 810
New Cross Pond, Kingsteignton (DWT)	Pond and woodland	SX 861 737
Pullabrook Wood, Bovey Tracey (WT)	Mixed woodland	SX 787 800
Scanniclift Copse, Doddiscombsleigh (DWT)	Woodland	SX 843 840
Shaptor and Furzeleigh Woods, Bovey Tracey (WT)	Oak woodland	SX 804 815
Snakey Copse, Kingskerswell (WT)	Woodland	SX 874 675
Stover Country Park (DCC)	Lake, woodland, heathland	SX 833 751
Wolborough Fen (DWT)	Fen and woodland	SX 864 700

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.

Benthic - relating to organisms living on the bed of rivers or the sea .

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.

Chemoautotrophic Bacteria - microscopic organisms which obtain energy through reactions which are independent of light. These reactions are based on inorganic substances.

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.

Combined Sewer Overflow (CSO) - an overflow structure which permits a discharge from the sewerage system during wet weather.

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.

Deemed consent - discharges to tidal waters that commenced before 1987 for which applications were submitted in 1987. Consents were deemed to have been granted unconditionally until the determination of the application becomes final.

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. The terms and conditions under which Drought Orders may be obtained are given in Sections 73-81 of the Water Resources Act 1991. 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.

Dry Weather Flow (DWF) - the flow of wastewater, including industrial discharges and infiltration (if any) to a treatment works and measured after a period of seven days of dry weather (rainfall less than 0.25 mm).

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.

Farm Waste Management Plans - voluntary plans drawn up by farmers describing the planned disposal of waste on the farm, e.g. when and where.

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

Fykenet - a tube-like net, supported by hoops, which is laid on the bed of a river or lake in order to catch fish, particularly eels.

General Waste - see Appendix D.

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.

Leachate - solution formed when water percolates through a permeable medium. Can be mineral-rich, toxic or carry bacteria.

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.

Maintained flow - an abstraction licence may require maintenance of a river flow at a specified threshold value, as a condition of the abstraction. Water is normally released from a reservoir or pumped from a groundwater source in order to support river flows in this way.

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.

Soakaway - system for allowing water or effluent to soak into ground, commonly used in conjunction with septic tanks.

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
CSO	Combined Sewer Overflow
DAS	Devon Archaeological Society
DBWPS	Devon Bird Watching and Preservation Society
DCC	Devon County Council
DMP	Drought Management Plan
DNP	Dartmoor National Park
DO	Dissolved Oxygen
DoE	Department of the Environment
DTp	Department of Transport
DWT	Devon Wildlife Trust
EC	European Council
EPA	Environment Protection Act
EH	English Heritage
EHO	Environmental Health Officer
EN	English Nature
EQI	Environmental Quality Indices
EQS	Environment Quality Standard
ESA	Environmentally Sensitive Area
FA	Forestry Authority
FE	Forestry Enterprise
FWAG	Farming & Wildlife Advisory Group
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
IPC	Integrated Pollution Control
KTT	Kennick, Tottiford and Trenchford
LA	Local Authority
LAAPC	Local Authority Air Pollution Control
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
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
WDA	Waste Disposal Authority

Units

°C	degrees centigrade
g	grams
ha	hectare
km	kilometres
km^2	square kilometres
l	litres
m^3/s	cumecs; cubic metres per second
mg	milligrams
Ml	megalitre
Ml/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.

Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol BS12 4UD
Tel: 01454 624 400 Fax: 01454 624 409

ENVIRONMENT AGENCY REGIONAL OFFICES

ANGLIAN
Kingfisher House
Goldhay Way
Orton Goldhay
Peterborough PE2 5ZR
Tel: 01733 371 811
Fax: 01733 231 840

NORTH EAST
Rivers House
21 Park Square South
Leeds LS1 2QG
Tel: 0113 244 0191
Fax: 0113 246 1889

NORTH WEST
Richard Fairclough House
Knutsford Road
Warrington WA4 1HG
Tel: 01925 653 999
Fax: 01925 415 961

MIDLANDS
Sapphire East
550 Streetsbrook Road
Solihull B91 1QT
Tel: 0121 711 2324
Fax: 0121 711 5824

SOUTHERN
Guildbourne House
Chatsworth Road
Worthing
West Sussex BN11 1LD
Tel: 01903 832 000
Fax: 01903 821 832

SOUTH WEST
Manley House
Kestrel Way
Exeter EX2 7LQ
Tel: 01392 444 000
Fax: 01392 444 238

THAMES
Kings Meadow House
Kings Meadow Road
Reading RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

WELSH
Rivers House/Plas-yr-Afon
St Mellons Business Park
St Mellons
Cardiff CF3 0LT
Tel: 01222 770 088
Fax: 01222 798 555

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 AGENCY

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Devon Area
Manley House
Kestrel Way
Exeter
EX2 7LQ
Tel 01392 444000